Lessons from DTV Datacasting
As They Apply to Digital Radio Deployment Strategy
By David Maxson

Abstract

Some lessons from the development of Digital Television in the USA may be instructive in the development of digital radio technology. Digital Television (DTV) in the USA has had a rocky start. One of the shining stars that illuminated the DTV vision of the future was datacasting. In this context, datacasting is the use of the broadcast medium to transmit data (content) other than the video program of the DTV station. Several large datacasting initiatives blossomed over the past few years, and some hard lessons have been learned. There are parallels to the development of digital services on radio broadcast channels with the impending launch of In Band On Channel (IBOC) radio technologies. The issues affecting the launch of DTV data services are mirrored in the radio broadcasting business. Radio broadcasting can build its strategy based on the lessons of the DTV datacasting universe.

DTV Datacasting Insights

John Abel Speaks

The June 27th, 2001 issue of TV Technology magazine contained a front page article about DTV Datacasting, prompted in part by an interview with a major player in a now-defunct startup, Geocast. John Abel was EVP of Operations at NAB before moving to be Vice President of Business Development at Geocast. In a June, 2001 interview with TV Technology, Abel talks about the factors involving the launch of a DTV Datacast Service. He reveals some key insights into the issues in deploying a new service and technology.

Transmission Is only One Leg of the Stool

Abel admits to a major mistake in focusing primarily on the transmission of a signal. He says, "the companies involved in this business have way, way, way underestimated the consumer/receiver/application side of the equation." He continues, "you have to have a method of getting the receiver into the hands of the customers."

Abel makes the point that in the Satellite TV business and the Wireless business the user's electronics are subsidized. He says DirecTV fronted $53 per receiver sold. In mobile phones, he says, "there are subsidies of both the service and the appliance...It's subsidized to get the market started." He concludes, "no broadcaster, and certainly no data broadcaster, has allocated the kind of money needed to subsidize these receivers. The subsidies alone can cost $50 to 100 million."

Hardware Is Not the Biggest Problem

It's the software that is the biggest problem, says Abel. "How do you use intelligent caching? How often are you going to rebroadcast things? How are you going to do packet repair (of packets damaged in transmission)? …subscriber management (if a subscriber model)? …customer service?" He says today's datacasting wannabe's have not dealt with this.[1]

Cost

Abel says the price tag for a rollout of datacasting is far in excess of the $30-40 million that companies are estimating. He figures $200 million is the minimum, and quotes a "media mogul" he spoke with in 1997 as saying it would be more like $500 million.

He doesn't see any successful business models emerging yet. If any become successful, it will be because they are hybridized. That is, advertising would only be one component. "You can't say it's going to be an advertiser-supported model. This goes back to my central argument that there's no receiver strategy, no understanding of the consumer, and no way to deploy the receiver in quantity. If you don't do quantity, you can't do advertising."

Small Potatoes

When asked whether receivers on PC cards would be a good way to start, Abel implies the volume would be insignificant, pointing out that only 4% of computer users even crack open their PC's. He also says focus groups express skepticism that some broadcaster would be writing to their hard drives.

Abel qualifies his observations by saying, Computers for this service probably are the right device, but the receiver can't be a card."

On the subject of switching to a B2B strategy, Abel dismisses it as a sign of trouble, "because the big hit for broadcasters is in the consumer market." B2B is a "small niche" that broadcasters do not have the expertise for.

Competition from Other Realms

Abel says, "the window is closing" on datacasting. The wireless services are moving forward in the data arena, plus, they have subscribers and are generating revenue. He suggests that if AOL had the desire, it would be a good candidate for launching datacasting. The only player in the media business that he sees as having a good understanding of what it would take and the wherewithal to do it is Disney.

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[1] The accompanying TV Technology article mentions, in addition to Geocast, which burned through $83 million in a year, iBlast (requires new iBlast enabled PC's to launch in 2002), Dotcast (Disney backed-using NTSC as well as DTV), Wavexpress (leaning now toward cable delivery).

Outlook

Abel's outlook on DTV datacasting is bleak. His company crashed in an attempt to make it happen. As he sees it, a ubiquitous consumer-based datacasting model will require an almost instantaneous deployment of receiver hardware, a massive subsidy of the hardware to push it out, and a fee or subscription driven revenue model to pay for the investment. He indicates the rollout of the new technology should be comparable to the rollout of satellite TV and wireless technologies.

Analysis

DTV Broadcasting Deployment

Abel's remarks about datacasting on DTV may apply somewhat to the deployment of datacasting's host service, DTV video broadcasting. DTV was adopted with a mandate to the broadcasters to deploy DTV transmission on a timetable. DTV programming is allowed to be different than the programming on the analog TV channel, but only to start. This gives broadcasters an opportunity to broadcast more productions of digital TV programming than would be possible by simulcasting the station's analog schedule. Over time, increasing amounts of the programming on the analog station will be produced in digital formats. The broadcaster must meet a timetable in which it must steadily increase the amount of simulcasting it does between the analog channel and the digital channel. Ultimately, it is mandated that the DTV broadcaster would shut off his analog signal on schedule in 2006 (assuming a certain level of receiver and cable penetration).

So it is that the plan for deploying the DTV service is keyed first on having TV stations set up DTV channels; second that the channels contain increasing amounts of mainstream DTV programming; and third, that manufacturers will provide, and consumers will buy, DTV receivers and adapters.

Pre-Moore

In the day's before Moore's law[2], broadcasting was the main consumer use of the airwaves. Radios and TV's could be purchased for long useful lives. The advent of new features (color, stereo, etc) were enhancements that were backward compatible. That is, the enhancements did not materially compromise the performance of existing receivers.

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[2] From the Jargon Dictionary: *"The observation that the logic density of silicon integrated circuits has closely followed the curve (bits per square inch) = 2^(t - 1962) where t is time in years; that is, the amount of information storable on a given amount of silicon has roughly doubled every year since the technology was invented. This relation, first uttered in 1964 by semiconductor engineer Gordon Moore (who co-founded Intel four years later) held until the late 1970s, at which point the doubling period slowed to 18 months. The doubling period remained at that value through time of writing (late 1999). Moore's Law is apparently self-fulfilling. The implication is that somebody, somewhere is going to be able to build a better chip than you if you rest on your laurels, so you'd better start pushing hard on the problem."*
Moore's Law drives technological devices rapidly into obsolescence. This has profound implications on the nature of standardization and the economics of new technology adoption.

As a result, new radios and TV's could contain the new features—or not, while old receivers would still work. The deployment of receivers with the new features could be slow. The essential characteristic of backward compatibility[3] was that new features could be offered at price points that suited consumers. Replacement of receivers could follow the life cycle of the receivers. New receiver purchases could incorporate the new features if the purchaser wanted them enough to pay the premium for the feature. Over time, the cost of a stereo radio set or a color TV diminished and new-featured receivers steadily became available in lower-priced models.

This pre-Moore model of deployment suited the receiver manufacturers at a time when technological change was glacial in pace. New features such as color or stereo could take their time to deploy because there were few competing alternatives for consumers' technology dollars.

For the Broadcasters, the pre-Moore deployment model was not too painful. Key TV programs would be the first to be delivered in color or in stereo, and the delivery would be accompanied by promotional announcements (viz. NBC's famous peacock and the phrase "the following program is brought to you in living color on NBC"). The rate of consumer adoption paralleled the rate of broadcaster adoption. Slowly a critical mass was achieved in which all programming and the vast majority of receivers sold contained the new features.

There had to be faith in the enhancement on the parts of both the electronics manufacturers and the broadcasters.

This model of slow pre-Moore migration was based on two important factors—competition and technology change. The broadcast media were the *sine qua non* of consumer media. There were few other technological media competing for consumer dollars and favor, and broadcasting offered among the best reproduction quality available to the consumer. Also, without a Moore's Law rate of change in the capability of technology, devices were not becoming outdated rapidly and new features were not being developed at today's feverish pace.

Technology Change

Backward compatibility, then, is a tool that protects the status quo while allowing slow migration to new features and services. It has several distinguishing characteristics: Collective interest in the status quo, slow uptake of technology, room for refinement.

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[3] Backward compatibility makes performance compromises in exchange for not upsetting the existing installed base of hardware, which is necessary to enable a smooth economic migration to the new technology or features. While there is a strong public interest function in backward compatibility (for instance, consumers are not forced to discard old receivers and buy new to continue to receive the service), backward compatibility is a tool for maintaining the economic order—that is, the existing service providers maintain a lock on their market as it makes the transition to new technologies.

Collective Interest in Status Quo

Backward compatibility relies upon a standards-setting process in which the participants have a collective interest in building on an existing service. In the case of free over-the-air broadcasting the participants are the broadcasters, the electronics industry, and the public, whose interest is ostensibly represented by the FCC.

When a standards committee convenes and decides to create color television, it is in the interest of all three participant groups to move the process forward. FM stereo worked pretty much the same way. Quadraphonic sound in the 70's did not catch on in the same way. (Note that stereo and quadraphonic sound relied on another interested participant, the record labels, who had to produce the content that most benefited from the technology; and consumers seemed to see the value in stereo but not in quadraphonic.) Later, AM stereo languished as a double standard (the parties in interest failed to force a uniform standard, contributing to its lackluster results).

In contrast, the adoption of FM as a new radio service was stymied until the FCC mandated that all new radios be AM-FM. This was a clear case of collective interest in expanding the service beyond the status quo.

Certainly the DTV participants had a collective interest that led to the "Grand Alliance" and produced a DTV standard, although the standard is apparently a collection of formats and features that is in some ways less a single standard and more a menu of options. The FCC was persuaded to permit migration to the DTV technology in the old-fashioned way, following somewhat the lifecycle of the installed base of receivers. The technology is not truly backward compatible, because analog TV sets do not have to deal with additional information in an occupied analog TV channel. Hence, TV straddles the divide between backward compatibility style development and the realm of Moore's Law development with its intended obsolescence.

Slow Uptake of Technology

People accustomed to their existing technologies and services are not inconvenienced by the backward compatibility approach. When a new service or feature is added (color, stereo, etc) the growth of available content and available signals runs in parallel with the growth of receiver penetration and user awareness. Each reinforces the other. Manufacturers, broadcasters, content providers and consumers are each emboldened by the others' steady acceptance of the new technology.

In contrast, the Moore's Law approach leaves in the lurch owners of old software, content, and hardware as new technologies require more memory, greater processing power, new interfaces, greater bandwidth, new protocols and languages, and so on. Backward compatibility in this realm is limited to offering new products that for a short time incorporate the old and the new, and offering flimsy unreliable adapters to make the old work with the new.

The Moore's Law approach requires a periodic investment in new technology in order to keep running. The interested parties create a standard, when they have to, and lay their concept on the open market. It fails or succeeds based on demand and performance. There is little interest in the status quo and a strong interest in rapid adoption.

Room for Refinement

The last characteristic of backward compatibility is the need for "room for refinement." Color TV would not have been adopted as readily if new channels had to be carved out, licensed, built, and programmed. That certainly would not have protected the status quo as well. However, in-band color TV would have not been possible except that technology enabled more efficient use of the spectrum (the TV channel).

There was room in the TV signal to add color information without seriously affecting the reception of the original black and white transmission. While it meant that the TV committee acronym NTSC would be derisively called "Never Twice the Same Color," the use of the existing bandwidth to pack in more information in a backward compatible fashion was an effective mechanism for maintaining the status quo of TV broadcasting, TV watching, and TV sales. Perhaps in the long run, it increased the value of the medium to each group, but it did so by allowing incremental change.

Analog TV had no room for refinement, so DTV had to be created with a channel transition plan (initial spectrum inefficiency that maintains the status quo), a time frame (perceived backward compatibility for a while that approximates receiver life cycles), a projected sunset date (the Moore's Law approach where it is assumed that at some point the receiver cost will be sufficiently low and the perceived performance and quality will be sufficiently high that the sudden obsolescence of millions of receivers will not be earth-shaking).

Competition

Slow Evolution, Low Competition

Pre-Moore's Law migration relied upon slow evolution of technologies as discussed above, and upon a competitive environment that fostered a broadcast model. When broadcasting was the wideband high quality way to obtain content, it was possible because advertising dollars funded the investment in the mass media infrastructure. Big audiences were found to be of value to big advertisers, so it made sense to invest big dollars in producing and transmitting free radio and TV programming.

In early broadcasting days, the media that were directly sold to consumers were records, movies, paper publications and the telephone. Free over-the-air broadcasting ruled the airwaves. Spectrum was readily carved out for FM radio, VHF TV, and UHF TV. Licenses were issued for no charge to parties who could demonstrate that they would broadcast in the public interest.

Over time, spectrum demands increased. Meanwhile, new delivery media evolved—videotapes, CD's, cable, satellite, dial-up on line service, broadband on line service, wireless calling, data transmission and networking. Broadcasting no longer sits in the catbird seat. Other services with incredible spectrum efficiency press for spectrum—in fact they pay dearly for spectrum. Other media deliver high quality content to the consumer's living room, for which people are willing to pay.

The LP was eclipsed, but FM and AM Chug Along Unchanged
The competing media steadily evolve new products and services. Backward compatibility is not their first priority. DVD's provide in-home high quality video and offer extra features. The VCR may soon become a relic. Cassettes are still around, but the CD is now recordable and may ultimately displace tape in the consumer market, unless memory and hard disk based media take over on the portable music front.

None of these media has to be backward compatible in this era of Moore's Law. The car media player of today (car radio?) may have both a cassette slot and a CD slot. A personal computer may be equipped with a DVD that also plays CD's and a CD slot that records and plays CD's. These media cross the data/multimedia divide, offering audio, video and/or data.

On the wireless side, bandwidth is still a limiting factor. Ubiquitous and instant connectivity is the driving feature. Bandwidth will follow. Wireless streaming content, akin to broadcast programming, will become more readily available.

Paying for Hardware
Consumers plunk down cash for new hardware when the perceived value is high enough. DVD players are replacing VCR's for home video viewing. In some cases it follows the life cycle of the VCR, but in others it is the promise of higher quality entertainment that may drive the consumer to retire the VCR prematurely. Content providers, retailers, and manufacturers have to share a common interest in deploying the new medium. When consumers bear the up-front cost of new hardware the adoption rate for the new technology may be slower than when hardware is bundled in the price of a subscription service.

The wireless universe addresses the hardware cost issue by rolling it into the subscription price. So while a video store relies on *a la carte* purchases and consumer ownership of the hardware, the wireless telephone services, wireless TV services, and the cable TV services command subscription revenue and subsidize the deployment of receivers.

Growth of cellular telephony and satellite TV services was colossal. As John Abel said in his interview, these providers integrated the hardware deployment problem with the content and distribution problems and developed a whole solution.

This is the environment broadcasting competes in today. It is more diverse, more limited in spectrum, less centralized in control, and more competitive than in the old days.

Implications on Roll-out of Digital Radio

If IBOC Sets Its Sights Low…
The classic evolution of the backward compatibility era might work for IBOC. With the addition of IBOC signals, like the addition of FM stereo decades ago, could evolve into more and more purchases of IBOC capable radios over time. As users begin to realize the benefits, they replace their radios with new models that have the new features. Their ears still hear the same programming with the same commercials and underwriting announcements, so the broadcasters do not have to sell and grow a new medium.

In the backward compatibility model, broadcasters only have to equip their transmitters and wait for the world to catch up.

This mode has several shortcomings. First, the receiver manufacturers have to be convinced that broadcasters will equip their transmitters to bother building the radios. Second, both the broadcasters and the receiver manufacturers have to be convinced that the value proposition of digital radio as a highly desirable medium truly appeals to consumers. Third, the consequences of putting on a digital carrier have to be outweighed by a fairly rapid growth curve in digital receiver market penetration. Fourth, it relies upon the broadcasters' maintaining a status quo and does not incorporate innovation of new free-over-the air services.

The positive features of the backward-compatibility mode are evident in these same conditions. Broadcasters don't have to be innovative or invested in changing the way they do business. If the technical attractiveness of the technology is compelling, the performance as a replacement medium for analog radio will sell the radios, and no broadcaster will have to lift a finger (other than to spend the $100K to upgrade to digital).

Leveraging the New Medium for Maximum Value
Alternatively, the broadcast industry could set their most creative programming and marketing minds to work on the idea that radio has an opportunity to utilize IBOC to become more useful, more compelling, more interactive for consumers. If the industry acknowledges that the audio improvements alone may not be a way to make a fast transition, then a concerted effort must be applied to launching radio as a new medium. This puts the industry on the Moore's law bandwagon. Rapid adoption of the new technology is driven by the steady rise in the performance and capabilities of the new service, in essence driving the obsolescence of the old. The goal is to make it so *just listening is not enough.* People will have to feel caught in a wave in which will feel compelled to buy a new digital radio to stay on top of things and not be left behind. The rising performance of the new radios, driven by sales volume and by Moore's law, would rapidly drive the cost of a digital radio into the ballpark of an analog one.

Abel has convincingly suggested that an advertiser based, free medium needs an influx of receivers and content immediately after launch in order to rationalize the construction of a new business model around it. To use the data capacity of IBOC for program related

content, commerce, and activities is to create a new medium. Unlike stereo, it is not an enhancement to existing content—it is a new medium. Radio operators will have to leverage their existing sales channels to derive early revenue on the new medium, their existing program sources for the bulk of the content to start, and their existing audiences to appeal to the need for a new digitally-featured radio.

Other media rely upon recurring revenue from subscribers to pay back the up-front costs of launching a new service and rolling out millions of receivers. As Abel suggests, an advertising based medium has to have a different funding mechanism. Broadcasters will have to see that there is tremendous additional revenue potential and market share growth potential in order to organize themselves behind setting up a new business model. It is likely to take some large partnering deals to get the thing going. Cross promotion with and funding with major brands, major radio manufacturers and major broadcasters will be necessary to get things going.

The "cool" factor will have to play into the plan. Early adopters were once audiophiles looking for the latest audio tweaks and features. While the mentality is much the same, early adopters of digital radio are likely to be interested in a coolness or fashion statement that a new medium offers. It's the buzz of interactivity and the hum of connectedness that will sell the new radios, rather than the clarity and presence of FM stereo that would have sold an early stereo radio.

To make the most of the potential of digital radio, a major push to develop content, audience, sales, hardware and most of all, coolness, is required from all elements of the radio industry. Receivers may not have to be subsidized, if they roll out hard and fast, driven by content ready-to-go.

Digital TV has learned that it must count on Moore's law to drive the cost down and performance up in order to get more receivers sold, it is ultimately following the slow-burn backward compatibility track to deployment. DTV datacasting entrepreneurs have been hard pressed to devise a new way to generate audience and revenue from DTV's data capabilities.

If digital radio is to learn anything from the DTV saga, it is that the business model for the data services should mirror that of the primary business of broadcasting. Massively funded subscription models are unrelated to the business of broadcasting and if they are crashing around DTV, they are all the more unlikely to be a big player in radio. Digital radio has a tremendous potential for making radio competitive and relevant and lucrative. It will require the cooperation of major players in intertwined industries to guide radio away from the DTV tribulations and toward its true potential.