



The following is an edited text of speech given by Mr Colin Knowles, ABA General Manager, Planning and Corporate Services Division, at the Audio Engineering Society (Australia) 6th Regional Convention, 10-12 September 1996.

Developing digital radio broadcasting services in Australia

The development of digital radio broadcasting (DRB) has been driven by a number of factors. These include the wide-spread acceptance of the compact disk which brought digital sound quality to consumers, the search for ways of better using satellite transponder capacity, and finally, the desire to find capacity to deliver more broadcasting services. Approaches taken in different parts of the world have varied markedly in response to the local regulatory and commercial environment.

DRB in Europe through the Eureka 147 DAB project started out as a solution to satellite delivery but has finished up as principally a terrestrial delivery system. This is because of the political concerns about transborder broadcasting, and the practical realization that DRB offered a solution to the relatively poor quality service due to a heavily congested European broadcast environment.

In the USA, concerns about the inability of the Federal Communications Commission (FCC) to make new spectrum available to broadcasters led to the conclusion that any DRB service should co-exist with existing analog services. The many small, virtually family-owned stations saw digital radio as a looming threat of more competition in what they saw as an already over stretched market. This led to pressures to find solutions that would perhaps constrain digital entry to those stations already having licences.

Broadcasters must maintain audience share to sustain their commercial viability, for commercial broadcasters, to support continued government funding for national services, and in the case of community broadcasters to sustain economically feasible operations that can be supported by their local communities. DRB is thus seen as both a threat and an opportunity. DRB is also seen by many as a passport to continued survival in the face of growing digitization of most other forms of communications and entertainment delivery.

What do we want from DRB

Digital radio broadcasting is the first real opportunity to deliver to consumers audio broadcasts with



virtually no significant perceptible degradation of quality. At the preferred 'CD Equivalent' bit-rate of 256 kbits/s per stereo audio pair, it is hard to distinguish any difference between the CD source and the received broadcast. Yet we find that broadcasters, who are seriously considering the uses of this medium, are thinking about using lower bit-rates to enable them to carry more programs and data. Technical decisions such as these will be determined by the environment in which the broadcasters are operating.

In countries adopting DRB for music, bit-rates under 200kbits/s are those where the available DRB spectrum is at present seriously constrained and this is a response to try to gain the maximum benefit from the new medium. Further, many see gaps in the existing programming line-up and DRB as a means to new delivery capacity to fill the gaps. Finally, it reflects a view about what the consumer will be prepared to pay for and the relative improvement DRB might offer over existing services.

Broadcasters will need to make substantial capital investment to provide the infrastructure and services to the market before there will be any market for receivers. At present there is no agreed final design for the first generation of commercial DRB receivers. The technology is able to offer a vast panoply of options but they cannot all be practically incorporated in every receiver at reasonable cost. The receiver product is however a means to an end and without services it is as useless as a computer without software.

The current consensus of broadcasters is that DRB is the technology of the future; and that program content rather than pure audio quality will be the driver of consumer demand. The

technical prospect of providing better and more uniform coverage of services will be attractive to both consumers and broadcasters.

Promoting investment in DRB

Investment in DRB is seen by broadcasters as an essential strategic necessity to take their business into the next century. In many respects it might be seen as similar to upgrading their studio technology from analog to digital. Traditional studio and production changes have not required the consumer to purchase new equipment. With the event of an immediate switch to digital transmissions all radio receivers would be declared useless overnight. There are few parallels in history to changes of this magnitude. In television the move from the original 405 line system in the UK to 625 line, and in France from 819 lines to 625 lines required 20 years even with the attraction of colour. The availability of receivers on the market was not an issue, however for DRB, consumer products will not be put on the shelves if there are not programs.

To find success in convincing consumers to switch to DRB, broadcasters and manufacturers will need to believe in the product and actively promote it. Broadcasters, who are subject to various forms of Government regulation, will need a stable and flexible regulatory environment that will allow them to move to DRB with minimal constraints on what programming initiatives they might take to attract consumers. Australian broadcasters have asked for automatic rights to access DRB spectrum so that they can build their digital radio business and to provide an element of continuity for the general public while the transition is being made. They also want the opportunity to explore new service options either through extending the programming of their current services or by participating in new licences that might be offered. The national and community broadcasters also see significant benefits from DRB. The SBS for example, believes that DRB will provide a way of more effectively addressing the multiple language groups in which it provides programming. It has programming available but has a limited capacity to deliver it on its current outlets. DRB might offer the capability to provide several parallel programming streams. Similar strategies are being explored in several overseas countries.

Attracting consumers

Selling features for DRB in the Australian market can be summarised as follows:

- more uniform coverage of the service area of the station (a benefit for those who currently suffer degraded reception) will be attractive to a small percentage of consumers;
- CD equivalent sound quality might be attractive to some consumers who have high quality home audio systems well adapted to their listening environment. The attractiveness of this might be limited to particular program types rather than the general range of mass appeal broadcasting; and
- new programming adapted to the DRB vehicle might have attraction to some consumers but the appeal is more likely to be to niche audience segments rather than main stream.

Some of the additional features DRB can offer with associated data and information services, and some flexibility in multi channel programming might be seen as a positive benefit.

The move to digital transmission and the rapid digitization of most consumer electronic products open up enormous potential for the emergence of new and exciting uses for radio broadcast that will not only provide new features and capabilities from our systems but also will enhance the listening experience and the way in which radio can be used. For example, coupled with an onboard navigation system, the car radio might store route and traffic information for the intended route and alternatives so that the driver need not be bothered with information of no relevance. It might also be possible to have the routing information varied in response to traffic information so as to streamline commuter traffic flow around accidents etc.

It was recently suggested to me that DRB receivers should build in special features to assist persons with sight impairments. This was a response to suggestions that future radios might have LCD displays etc. that are difficult to see. When you think about this, drivers in motor vehicles may not be visually impaired but they should not have to see the controls or readout on the radio if they are to operate their vehicle safely. This suggests that the same features needed for a visually impaired person may be exactly what is needed in a car radio (e.g. buttons that can be identified by touch, audio responses to certain actions such as station identification announcements (on demand)).

Video screens seem to be attached to most of the demonstration products presented in consumer surveys and promotional material intended to excite consumer interest in DRB. Such screens might go beyond simply text display to provide graphics and limited motion video. This might provide not only for additional informa-



Innovations

tion sources, but also new ways of promotional advertising. The downside of such proposals is the current cost of adding a suitable display device to an already expensive receiver. However, if there is a market for this type of service, it might initially emerge through the interconnection of a standard PC to the radio receiver. Already manufacturers are considering the development of PC Card DRB radio receivers that would rely on the PC for the data processing and control elements. It remains to be seen, the extent to which consumers will be prepared to adopt and to pay for such features.

Infrastructure for DRB delivery

The present preferred option for DRB in Australia is the European Eureka 147 system. This is the only DRB system that has been demonstrated to achieve the required objectives for digital

complementary terrestrial DRB and this is at present the preferred band for establishing digital radio services. Given the significant frequency difference and signal characteristics compared to AM and FM radio, new infrastructure will be needed to deliver DRB. The basic transmitted signal provides a carriage capacity of around 1.5Mbits/sec which can be allocated to services, error correction and overhead data. A typical service mix would be five CD quality stereo pairs using an aggregate channel rate of 256kbts/s. This represents a significant bandwidth efficiency gain over FM service planning. In addition, the use of OFDM modulation allows co-channel re-broadcast to extend coverage or fill-in coverage gaps and this provides for further spectrum efficiencies.

Current planning suggests that a city the size of Sydney would require at least four main transmission sites all operating on a co-channel basis.

Further in-fill transmitters might be required to resolve particular problems. These transmitters would need to be fed directly by microwave or cable rather than off-air in order to achieve optimal results. This compares with a single high-power transmission site for FM. However, initial costing studies show that the ability to carry several services on the one transmission, and the significantly lower transmitter power needed result in immediate capital savings and good on-going savings in transmission costs.

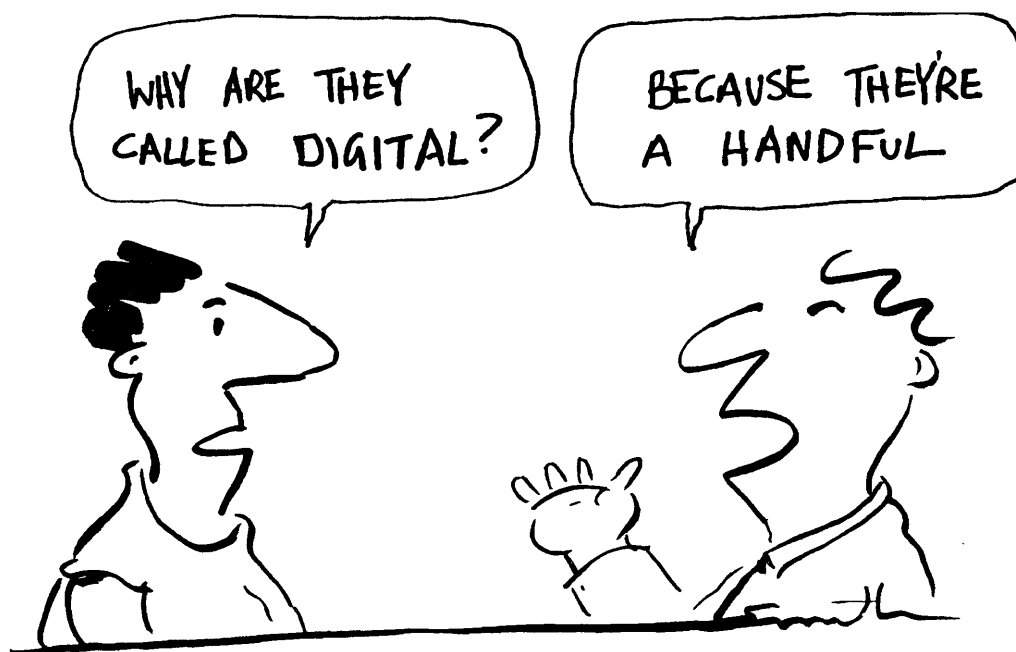
The Eureka system is also designed to allow direct satellite reception on the same receiver and in the same bands as used for terrestrial broadcast. This provides an opportunity for true

radio, and is the only system close to production. Transmitters for Eureka 147 are now available, and the first consumer radios will be available later this year. It will nevertheless be about another four years before the necessary VLSI chips are developed and incorporated into low battery drain, fully portable receivers.

The Eureka system can operate over a range of frequencies but because it requires a channel bandwidth of 1.5MHz it is easier to implement in new spectrum than to integrate into existing broadcast spectrum. The International Telecommunications Union (ITU) has allocated frequencies in the vicinity of 1.5GHz for satellite and

national coverage in the future when suitable satellites become available. The system also allows for co-channel re-broadcast of the satellite service to cover blind spots.

Combining several services into the one multiplex ensemble is common in telecommunications services, but requires broadcasters, accustomed to a one to one relationship between service and transmitter, to reconsider the nature of their business. Are they program providers, transmission operators or both? To date they have been both but the choices have been simple. They are less obvious in a multi-service transmission. Furthermore, the flexibility of the Eureka transmis-





sion system allows variable numbers of services with variable data and service protection rates to be operated on the one multiplex meaning there is no longer a necessary fixed relationship between the services that might be delivered at any point in time. It is potentially open for a broadcaster to negotiate and acquire the transmission capacity needed for his particular service, and perhaps to obtain additional capacity for other related or unrelated services.

The ABA has convened a task force of broadcaster interests to examine some of these questions and to present a broadcaster's perspective to the Digital Radio Advisory Committee (DRAC) appointed by the former Minister for Communications and the Arts. To assist its work the task force established an expert working party which has wide representation from broadcasters. It has examined the ways in which broadcasters could use the 1.5GHz DRB spectrum with the least disruption to existing spectrum users, and determined how much spectrum would be needed to achieve particular service objectives.

The alternative DRB systems being developed in the USA are mostly intended to work in conjunction with existing FM services. There has also been a proposal for a digital AM solution. Prototypes of these systems have been the subject of extensive laboratory testing and some are undergoing field testing. So far all have fallen short of expectations and will require further development. They have the advantage of not requiring additional spectrum, but limit the development of new services, and are constrained by the very difficult task of having to operate within the constraints imposed by an already highly congested spectrum environment. The final outcomes of this evaluation process are not yet clear.

Promoting diversity

Australian broadcasters have argued to DRAC that they be granted priority access to DRB spectrum. The Australian radio broadcasting system currently comprises four main sectors, national, commercial, community and narrowcast.

The development of radio has to this stage been fairly highly regulated primarily because the broadcasting spectrum, in common with the approach taken elsewhere in the world, has been considered a scarce resource. The introduction of DRB potentially removes the scarcity argument, nevertheless, spectrum will remain a valuable resource both as a means of public access, and on account of the opportunity cost in making it available for broadcasting over other communications uses.

Digital radio broadcasting should however make it easier to enter and exit the industry, particularly if the broadcaster is not unnecessarily required to establish separate transmission facilities, but can lease space on available transmission multiplexes. This may open the way for increased diversity of services by making more marginal services commercially feasible, and allowing for perhaps part-time rather than full-time broadcasting services whereby a range of services might share capacity.

Progress towards a DRB Policy

The Digital Radio Advisory Committee recently circulated a public discussion paper outlining a number of issues and has invited public submissions. Following receipt and analysis of submissions, the committee will formulate policy options and recommendations for the Minister on how DRB might be introduced into Australia.

Meanwhile, there are a number of DRB field trials in progress which seek to evaluate DRB performance and programming options.

Receiver availability, the time to construct infrastructure and the public policy development process is likely to see limited DRB implementation before the year 2000. After that there will hopefully be a rapid acceptance of DRB as portable consumer receivers become available at reasonable prices.

Conclusion

The Government's role in DRB is likely to be that of facilitator providing an environment in which DRB can flourish. Governments around the world are progressively moving away from attempting to 'pick winners' in technology, but having swung to the extreme of total technological neutrality and ignorance, the pendulum is returning to a more realistic approach of technologically informed public policy making whereby the needs of consumers and business are balanced against the needs for some appropriate regulatory or standards regulation. While some may argue that standards stifle innovation, significant consumer investment is unlikely to be made unless there is some certainty as to the system specifications of future receivers. Whether industry consensus standards can achieve this or whether some government intervention will be needed is not yet certain. Meanwhile, Government has provided a forum in which the issues can be widely canvassed by interested parties, and this alone will assist in facilitating agreement on the important issues that will be critical to the successful development of DRB in Australia. ▢