

United Kingdom

Digital radio services commenced in the UK with the introduction of a BBC national multiplex in 1995. The national commercial multiplex operator, Digital One commenced broadcasts in 1999 with simulcasts of the three national commercial stations (Virgin, Classic FM & TalkSport) and a range of brand new 'digital only' national stations.

The UK adopted the Eureka 147 technology for digital radio and has, to date, allocated seven 'frequency blocks' in VHF Band III, from 217.5 to 230 MHz. These frequency blocks are allocated and licensed to the multiplex operators. Two national multiplexes, BBC and Digital One, operate on single frequency networks across the UK. The other blocks are licensed to local and regional multiplex operators.

It is intended that each metropolitan area will have, on average, two or three local and regional multiplexes on-air planned in the five remaining frequency blocks to avoid interference with neighbouring multiplex operators. In all, this means that each area will have around four or five multiplexes on-air including the nation-wide multiplexes, with each multiplex carrying, on average, ten stations.

Release of further spectrum in the L-Band (1452-1467.5 MHz) is planned for use by 'general' multiplexes in 2007.

Regulation

Under the *Broadcasting Act 1996*, digital radio in the UK is regulated by the Radio Authority. Part II of this Act deals with Digital Terrestrial Sound Broadcasting (s.40-72). With the recent passage of the *Communications Act 2003*, the Authority's functions will pass to the newly formed regulator, OFCOM at the end of 2003. It appears that the regulatory framework relating to digital radio will remain fundamentally similar to the current analog radio rules in the *Broadcasting Act 1996*.

Overall, the UK Government takes a deregulatory approach to broadcasting policy, and aims to 'help broaden the choice of and access to modern communications technologies while protecting consumers and the essential qualities of public sector broadcasting'¹.

The BBC, the national broadcaster, is governed by a *Royal Charter* and an accompanying *Agreement*. These documents set out the public obligations of the BBC to provide 'sound and television broadcasting services (whether by analog or digital means)'. Specifically the Agreement states that the BBC's services are subject to Government approval.

The ownership regulations relating to digital radio include measures to ensure that in any locality there will be at least three separate owners of local digital sound program services, and no individual will be able to own more than one local digital multiplex in areas where they overlap. Overlap of multiplexes occurs where the primary protected area of a multiplex covers more than 50 per cent of the adult population in the primary protected area of another multiplex. This rule is designed to prevent any

¹ Regulatory impact assessments, *TV and Radio Assessment*, www.communicationsbill.gov.uk

one company holding a position of gatekeeper over all the local digital services in any area.

Agencies

In the commercial sector, the Radio Authority is charged with planning frequencies and allocating licences with a view to regulating programming so as to broaden listener choice. Specifically for digital radio, the Radio Authority regulates such things as: minimum bit-rate for services (based on the type of content on offer, for example mono-speech, stereo music); mandatory 'must carry' obligations (for instance the holder of a multiplex licence may have to reserve some capacity on the multiplex for one or more BBC local or 'national regional' services); maintenance of service providers' commitments; and control of the amount of data content.

The Digital Radio Development Bureau (DRDB) is an industry body that aims to promote and encourage take up of digital radio in the UK. It is funded by both the BBC and the commercial multiplex operators.

Licensing

The Radio Authority is required under the *Broadcasting Act 1996* to licence nationwide and local commercial digital radio services.

The Radio Authority issues Digital Multiplex Licences to broadcast a multiplex of program services in digital form on either a nation-wide or local coverage basis, and Sound Programme Service licences, which allow an applicant to provide a program service via a digital multiplex.

The *Broadcasting Act 1996* (s.64) also provides for the licensing of digital additional services. These licences are awarded by the Radio Authority who may place any 'appropriate conditions' on its operation.

Changes to the life of analog licences have been enacted in the new *Communications Act 2003*. The life of all analog radio licences has been extended from eight to twelve years. Digital radio licences are already awarded for twelve years. The extension aims to improve certainty for the industry by recognising the time it takes for a provider to get a satisfactory return on new licences, especially those covering smaller areas. However, the extension only applies if the analog licence holder continues to simulcast on digital radio.

Licence Allocations

Digital Multiplex licences are advertised in an open competition and are awarded using a 'beauty contest' formula. The Radio Authority considers applications in relation to a range of issues including the company's constitution, their plans for new radio services, as well as financial arrangements and technical plans. For both nationwide and local coverage Multiplex licences the Radio Authority is required to consider:

- How much of the potential coverage area the applicant plans to serve, and by what timetable this will be achieved;

- Whether the applicant appears sufficiently resourced to deliver their proposals;
- To what extent the radio services proposed by the applicant appeal to a variety of local tastes and interests. The analog rules on taste and decency also apply to digital radio. The analog rules state that the Radio Authority must ensure that ‘nothing shall be included in programmes which offends against good taste or decency or is likely to encourage or incite to crime or to lead to disorder or to be offensive to public feeling’; and
- How fair the applicant has been in contracting with providers of radio programs, or data services, who wish to appear or be included on the multiplex.

Sound Programme Service licences are awarded to the program providers after the award of the relevant Multiplex licence. Multiplex licences are awarded for a twelve year period with an automatic renewal of a further 12 years. Sound Programme Service licences and licences of digital additional services, however, are indefinite.

When the Radio Authority considers applications for nation-wide coverage licences it must examine how the applicant plans to encourage listeners to invest in new digital radio sets. When considering applications for local coverage licences, the Radio Authority must examine the amount of local support for the applicant's proposals.

Licence Conditions

Once the licence has been awarded there are several conditions on the operators. For example, both commercial and national operators are allowed to carry broadcast data services. However, commercial services can apply no more than 20 per cent of multiplex capacity to audio-related data services, and half of that capacity can be used for non-audio related services. While there are no specific requirements on the BBC, it generally aims to adhere to similar targets.

Another condition relates to minimum percentage population coverage that should be achieved by specified dates. By the end of 2002 the nation-wide commercial multiplex operator, Digital One, was required to achieve 85 per cent coverage and the BBC must achieve the same coverage by early 2004.

Digital One, as the nation-wide commercial operator is also required to invest in promoting and marketing digital radio. No such explicit regulatory obligation is placed upon the BBC or the local/regional commercial operators, however, the BBC does contribute to the work of the DRDB.

An additional condition has been enacted in the new *Communications Act 2003*, which requires all broadcasters to provide subtitling, sign language and audio description services for people with sensory impairments.

There are minimum bit rates for broadcasters, stipulated by the Radio Authority, which are 128 kbits/sec for music stations and 64 kbits/sec for speech stations. The Radio Authority has said that when these rates are reviewed it is expected that the minimum rates will be lowered, not raised. This comment anticipates improvements to audio coding, which are likely to give better audio quality at lower bit rates. This is

however, a contentious issue, as some believe the lower bit rate also reduces audio quality.

Implementation

The nation-wide commercial stations currently broadcasting in analog in the UK are guaranteed places on the national digital multiplex. The BBC has its own national multiplex enabling it to carry its existing national analog stations. The range of BBC local stations are also given a guaranteed place on each local multiplex.

Local radio stations, however, do not have guaranteed slots on local digital radio multiplexes, but if a local station successfully secures a place on a local digital multiplex it will automatically have its analog licence renewed for a further twelve years.

The *Communications Act 2003* includes provisions to encourage digital switchover at some point in the future. At present, nation-wide analog licence holders will simulcast on digital radio partly because simulcasting means their analog licence is automatically renewed. The Government has recognised that when the current analog licences come up for renewal, a new applicant not committed to digital could have a competitive advantage over broadcasters who are committed to digital. Therefore, it has imposed a requirement that a bidder for a new nation-wide analog licence has to include in its application a proposal for providing a simulcast service. The UK Government believes that this will help build momentum behind the introduction of digital radio.

The UK has not set an analog switch-off date as yet. A possible time-frame of between 2010 and 2015 was mentioned in 2000 by the then Secretary of the Department of Culture, Media and Sport, Chris Smith. The *Broadcasting Act 1996* (s.67) provides for a review of digital radio to be conducted for the purpose of considering 'how long it would be appropriate for sound broadcasting services to continue to be provided in analog form'. The current Secretary of the Department of Culture, Media and Sport, Tessa Jowell, ordered such a review in March 2003.

Services

In any one area in the UK, a listener currently has access to around 12 – 15 analog radio services (5 BBC, 3 nation-wide commercial and 4 – 7 local stations). On digital radio, listeners can access an average of 35 – 40 services (12 BBC, 8 nation-wide commercial and 15 – 20 local stations).

The BBC broadcasts: Radio 1, Radio 2, Radio 3, Radio 4LW, Radio 4FM, Radio 5Live, Radio 5 Live Sports Extra, BBC World Service, BBC 6 Music, BBC 1Xtra, BBC Asian Network and BBC 7. Of these BBC 6 Music (a nation wide music service), BBC 1Xtra (featuring contemporary black music for a young audience); and BBC 7 (featuring classic and new comedy, drama, books and children's programs) are uniquely digital. The BBC also runs a 'teletext for radio' data service called BBC Vision Radio, which provides road traffic information, and an electronic program guide.

Digital One is the nation-wide commercial multiplex operator in the UK. It is a joint venture backed by the GWR Group and NTL. Digital One's current audio services are Classic FM, Virgin, TalkSport, Core, Planet Rock, Life, PrimeTime, and Oneword. Of these, Oneword, Planet Rock, Core, Life and PrimeTime Radio are uniquely digital.

Digital One also provides a nation-wide commercial data channel. The Digizone is an interactive service featuring games for download from the Cartoon Network, background material to support the classics on Classic FM, and an interactive service linked to Core, the 'fresh hits' service. This multimedia service is accessed via a PC and the Psion interactive digital radio receiver, the Wavefinder.

There are a number of companies and consortia of existing local broadcasters and new investors who have joined forces to apply for and operate the local multiplex licences across the UK. These include:

- Score Digital, which includes Scottish Radio Holdings, the leading analog player in Scotland. It holds local digital radio licences in Northern Ireland and across Scotland - Ayr, Glasgow, Edinburgh, Dundee/Perth and Inverness.
- MXR, a consortia of leading radio operators including Chrysalis Radio Group PLC, Capital Radio PLC and other media players - Guardian Media Group, Soul Media Ltd and UBC Digital Ltd, and the Ford Motor Company Ltd. It holds the regional digital radio licences for Central Scotland, greater London, South Wales and Severn estuary, West Midlands, and Yorkshire.
- Switch Digital, shareholders in Switch Digital Ltd include Wireless Group Ltd, Clear Channel International UK Ltd, Ginger Media Group Ltd and Carphone Warehouse Ltd (a UK retailer). It holds the second regional digital radio multiplex licence for Greater London.
- There are a number of other local/regional multiplex holders, operating in areas where they have a strong analog radio presence, including: Now Digital, Emap Digital, CE Digital, Capital Radio Digital, TWG Digital, The Digital Radio Group (London) Ltd and TWG Emap Digital.

In addition to general appeal formats, a number of the commercial services cater for niche markets. These include:

- Oneword (the national broadcaster of books, plays and comedy programs);
- PrimeTime Radio (targeting an older generation of listeners);
- The Groove (devoted to soul music);
- Flix (playing movie soundtracks);
- 3C (a country music service);
- Fun (a service for children);
- The Arrow (playing jazz and soul); and
- Purple Radio (a service aimed at the Gay and Lesbian community).

Some successful local analog stations in London and Manchester, are now broadcasting across the UK on a range of local digital multiplexes. For instance Kiss, Galaxy, Century, Xfm, and Jazz.

A recent study conducted by the DRDB found that 80 per cent of consumers bought digital radio sets to listen to the new digital-only services. In particular the survey found that one in five digital radio buyers bought the sets specifically to listen to BBC7.

Rollout

At the end of 2002, Digital One had achieved its required 85 per cent population coverage and BBC 65 per cent, including the major motorway network. BBC's coverage is expected to rise to 85 per cent in 2004.

Awareness of digital radio has grown by 88 per cent in the past 18 months, up from 16 per cent in 2001 to 30 per cent in 2003, representing a population figure of 17.2 million. There are now 175,000 digital radio sets in UK homes, with between 300,000 and 500,000 sales forecast by the end of this year. However, for purposes of comparison, consumers in the UK purchase an estimated 10 million analog radios each year.

The DRDB released a survey in June 2003 predicting increased rollout and consumer take up. The survey found that six per cent of respondents were likely to buy a digital radio set in the next 6 months. Of this six per cent, one in five said they would buy an in-car digital radio and would be willing to spend around £150. And around one third of that 6 per cent said they would buy a kitchen radio for which they would be willing to spend up to £100.

Products

There are currently 35 different digital radio sets available in the UK. By the end of 2003 it is expected that this will more than double, so that there will be at least 75 products made by 31 different manufacturers. The sets range in price from £100 to £715 with the average receiver costing between £150 and £250. The largest proportion of sets sold now are the £99 kitchen radios, accounting for around half of sales to date, with hi-fi tuners the second largest group.

Prices for kitchen radios are expected to fall to £80 by the end of 2003. There is also an increasing range of hand-held portable DAB digital radios in the shops in the UK this year.

Although there are a range of in-car systems available the prices have yet to reach the lower levels needed to increase volume demand. This is set to change later in 2003 with in-car systems available at under £200 and car manufacturers begin to offer DAB digital radio as a standard option on new cars. In November 2002, Ford announced plans to become the first car manufacturer in the UK to offer digital radio receivers.

United States

The Federal Communications Commission (FCC) has authorised two different technologies to provide digital radio in the US. The FCC approved Rules and Policies for the introduction of Satellite Digital Audio Radio Service (SDARS) in 1997, and the In-Band On-Channel (IBOC) technology for trials of terrestrial digital radio broadcasting in 2002.

SDARS has been in operation in the US since 2001 on a subscription basis, and is slowly increasing its subscriber base. While the IBOC technology has been approved for trials, its rollout to consumers has since been delayed pending the development of final standards.

Spectrum has been made available for SDARS in the S-Band (2310- 2360 MHz²), while the IBOC system has been designed to utilise the side-bands of broadcasters existing AM and FM band frequency allocations.

Regulation

Media legislation in the US authorises the FCC to develop and regulate media policy. The FCC is responsible for radio communications and spectrum issues.

The FCC was created by the *Communications Act 1934* to ‘regulate interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the United States a rapid, efficient, nation-wide, and world-wide wire and radio communications service...’.

The FCC has five commissioners, under which are various operating bureaus, including the Media Bureau. The Media Bureau has day-to-day responsibility for developing, recommending and administering the rules governing radio and television stations. The Audio Division of the Media Bureau issues radio licences.

Terrestrial digital radio – IBOC

The IBOC system delivers a narrow-band digital simulcast signal alongside the transmission of an existing analog AM or FM radio service. This allows the receiver to ‘blend’ the digital and analog signal in areas of poor reception, and provides that existing analog receivers can continue to access existing stations. The IBOC system also provides for the eventual phasing out of the analog signal to provide more bandwidth for a full, digital only service.

The IBOC system was developed by an alliance of major US radio networks and technology developers. In August 2000, this alliance formed iBiquity Digital Corporation to develop, market and licence the proprietary IBOC platform for the direct digital conversion of existing AM and FM broadcasters.

² The US Table of Frequency Allocations contains primary allocation to BROADCASTING-SATELLITE in the 2310-2360 MHz range, but there are co-primary allocations to other services (such as FIXED, MOBILE and RADIOLOCATION in the 2310-2320 and 2345-2360 MHz segments). At this stage, only satellite services have been licensed in the 2320-2345 MHz range. It should also be noted that this band is not available for satellite-sound broadcasting in Australia.

iBiquity initiated the FCC's consideration of IBOC by filing a Petition for Rulemaking in 1998. The National Radio Systems Committee (NRSC), an industry based technical advisory committee co-sponsored by the National Association of Broadcasters and the Consumer Electronics Association, had been conducting extensive laboratory tests of several digital radio systems, including IBOC. The NRSC concluded that the iBiquity IBOC system should be authorised by the FCC as an enhancement to sound broadcasting in the US.

In considering whether to adopt the NRSC recommendation, the FCC was of the view that it was worthwhile to foster, develop and implement digital radio in the US. It reasoned that digital radio is in the public interest as it will vastly improve radio services for the public and help create 'a vibrant and vital terrestrial radio service'.

The FCC outlined 10 criteria it would use to evaluate a candidate digital radio system for implementation in the US:

- enhanced audio fidelity;
- robustness to interference and other signal impairments;
- compatibility with existing analog service;
- spectrum efficiency;
- flexibility;
- auxiliary capacity;
- extensibility;
- accommodation for existing broadcasters;
- coverage; and
- implementation costs and affordability of equipment.

On 11 October 2002, with strong support from both the commercial and public broadcasters, the FCC approved IBOC as the national standard for the introduction of terrestrial digital radio broadcasts in the US on a voluntary and interim basis. The FCC noted that this decision did not rule out future consideration of out-of-band and non-IBOC systems.

IBOC licensing

In approving IBOC for voluntary trials, the FCC deferred establishing a formal standard and the associated broadcast licensing amendments. It did, however, place some restrictions on its use, including that a station is required to notify the FCC within 10 days of commencing digital broadcasts, and that users of the AM IBOC system are restricted to daytime use only, subject to further testing.

IBOC rollout

With the FCC's decision to approve voluntary IBOC transmissions in 2002, approximately 40 broadcast groups and stations in 26 US states intended to commence IBOC broadcasts in 2003.

- Markets include (by market rank); New York, Los Angeles, Chicago, San Francisco, Dallas, Philadelphia, Houston, Boston, Detroit, Atlanta, Miami, Seattle, Baltimore, Tampa-St. Petersburg, Cleveland, Cincinnati, San Jose, Milwaukee, Middlesex-Somerset-Union NJ, New Orleans, Raleigh, West Palm Beach-Boca Raton, Monmouth-Ocean NJ, Louisville, Richmond, Birmingham, Greenville-Spartanburg SC, Syracuse, Ft. Wayne IN, Roanoke-Lynchburg, Morristown NJ, Jackson MS, Charleston WV, Morgantown WV, Cedar Rapids and Lafayette IN.

However, it appears the NRSC has suspended its standards setting process until the audio quality of the IBOC system can be approved. This will delay the commercial production of IBOC receivers, which is closely dependent on the completion of the NRSC standards.

While standards are being finalised, iBiquity has established a program to help broadcasters convert to digital broadcasting. The 'EASE' program provides broadcasters with early access to equipment, and station assessments evaluating the compatibility of the broadcasters present systems with IBOC technology.

Additionally, in February 2003, iBiquity announced an incentive program for broadcasters wishing to convert to digital IBOC technology. The incentives include cheaper licence fees for use of its proprietary technology for commercial stations and a waiver of licence fees for not-for-profit stations.

iBiquity has alliances with a number of receiver manufacturers including Alpine, Blaupunkt, Clarion, Delphi, Harman Kardon, JVC, Kenwood, Mitsubishi, and Panasonic. iBiquity has also formed an alliance with the Ford Motor Company for installation of IBOC receivers in new vehicles in return for an equity position in iBiquity. Other alliances include Philips Semiconductors, STMicroelectronics and Texas Instruments.

Satellite digital radio – SDARS

The *Communications Act 1934* defines SDARS as a radiocommunication service in which audio programming is digitally transmitted by one or more space stations directly to fixed, mobile, and/or portable stations, and which may involve complementary repeating terrestrial transmitters.

In 1990, Satellite CD Radio Inc (now Sirius) initiated the process of establishing rules for SDARS by filing a petition to allocate spectrum and an application to provide the service.

In February 1992, the World Administrative Radio Conference (WARC-92) adopted international frequency allocations for Broadcasting Satellite Service (BSS) and then in January 1995, the FCC allocated the S-Band for SDARS.

In considering whether to licence SDARS the FCC considered a number of factors. It weighed up the public interest benefits of SDARS, including its potential to offer high quality radio signals to listeners who currently receive few terrestrial radio signals, against its potential adverse impact on terrestrial radio. In addition, it would be able to provide services that local radio inherently cannot provide. With its national reach, SDARS could provide continuous radio services along highways, service to people living in remote areas, and new forms of emergency services.

The FCC concluded that it was unlikely that SDARS would greatly affect listening audiences of terrestrial radio as it is expected to grow slowly over many decades. Additionally, it would not adversely affect terrestrial radio's advertising revenue. The FCC believed that SDARS would mainly attract national advertising revenue. It noted that nationally based advertising revenue amounts to only 18 per cent of terrestrial radio advertising revenue. Local advertising revenue is thus much more important for terrestrial radio, and the FCC believed it had no evidence that SDARS would be able to compete for local advertising revenue.

The FCC released its Rules and Policies to govern SDARS in 1997. This document established that the FCC would licence SDARS and would award these licences via a competitive auction.

SDARS licensing

In April 1997, XM Satellite Radio Holdings Inc, formerly known as American Mobile Radio Corporation, submitted a winning bid of almost \$US90 million to secure the 2332.5 – 2345 MHz spectrum in the S-Band, and Sirius Satellite Radio Inc, formerly known as Satellite CD Radio Inc, submitted a winning bid of over \$US83 million to secure 2320 – 2332.5 MHz.

XM commenced broadcasting across the US in 2001 using two geostationary satellites (named Rock and Roll) and a network of about 1,000 terrestrial repeaters. Sirius commenced its service in 2002 using three Highly Elliptical Orbit (HEO) satellites and, due to the high elevation of these satellites, a network of only 91 terrestrial repeaters in the major cities.

SDARS licences are issued for a period of 8 years. The licences commenced when each providers first satellite was launched and put into operation. Both the XM and Sirius services operate on a subscription basis of around US\$10- US\$13 per month.

When issuing licences the FCC decided to place very few licensing conditions on satellite radio:

- There are no broadcasting classification requirements on SDARS licensees, as the FCC believes they should be able to tailor their services to meet customer needs.
- There are no requirements that satellite broadcasting should be entirely subscription based as the FCC believes that the flexibility for licensees to meet market demands is crucial.
- There is no restriction on the provision of ancillary services.

- The foreign ownership restrictions applying to broadcasting licences in the US do not apply to subscription SDARS services. This is an extension of a previous decision that those restrictions do not apply to subscription video services.

The FCC did apply some conditions, however, including that:

- SDARS licensees were required to discuss frequency coordination with neighbouring countries to prevent unacceptable interference.
- The SDARS licensees' terrestrial repeaters may only be used for 'simultaneous retransmission of the complete satellite service'. This FCC Order was in response to concerns by terrestrial radio broadcasters that XM intended to deliver local programming via its terrestrial network.
- SDARS licensees must cease terrestrial repeater operations if those repeaters interfere with any wireless communications service.

SDARS services

XM delivers 101 digital radio channels including 70 music channels and 31 channels of news, sports, talk, comedy, children's and entertainment programming. Around half of XM's music channels carry advertising. XM also offers a real-time graphical weather service for aviation, marine and emergency services customers, and has plans to provide in-flight radio entertainment in the US next year.

XM has alliances with a number of content providers including *CNN*, *Weather Channel*, *Fox News*, *CNBC*, *BBC*, *Bloomberg*, *CNET*, and *USA Today*. XM also offers themed music channels covering a variety of genres including: the decades, country, hits, Christian, rock, urban, jazz and blues, dance, Latin, world and classical.

In addition to its news and music services, XM offers children's services (such as Radio Disney), sport services (eg, ESPN, and Fox Sports), comedy services (eg, XM Comedy and Laugh USA) and talk services (eg, Discovery Radio, E! Entertainment, Radio Classics, and Family Talk). XM has recently added a premium channel, Playboy Radio, for an extra monthly fee.

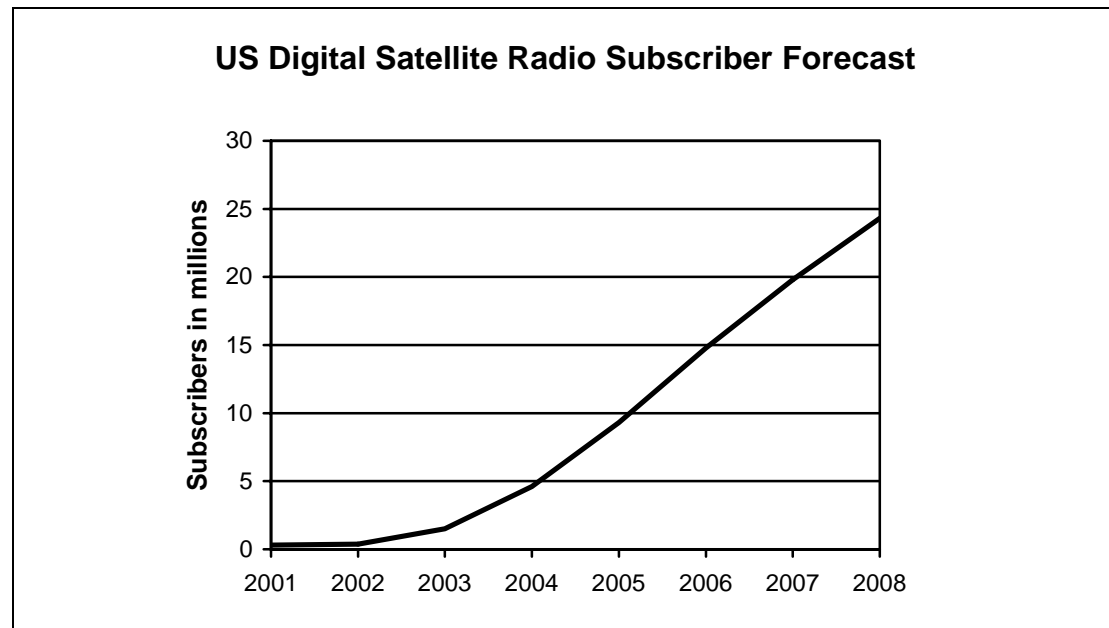
The Sirius programming concept is very similar to that offered by XM with 60 music channels and over 40 channels of news, sports, and entertainment programming. A key difference is that all of the Sirius music channels are free of advertising. Only the rebroadcast services, including CNN News, CNBC, Fox News and others, feature commercials. Sirius currently appears to have no plans to provide data services.

SDARS rollout

In April 2003, XM claimed to have over 500,000 subscribers, and estimate that this will exceed 1 million by the end of 2003. In June 2003, Sirius claimed to have 100,000 subscribers and estimates that it will have 300,000 subscribers by the end of 2003.

Recent research indicates that there is significant interest in satellite radio. This is especially seen amongst 18 to 24 year olds, with an estimated 17 million people in this age category 'very interested' in the concept of satellite radio.

Recent analysis by the Carmel Group suggests that 2003 will be the year when subscription satellite radio reaches a critical mass of around 1.5 million subscribers. By 2006, it is estimated that satellite radio will have almost 15 million subscribers, corresponding to a 6.9 per cent penetration of total US cars.



Source: The Carmel Group in *Via Satellite*, July 2003

SDARS products

Both XM and Sirius have a wide variety of proprietary receivers available on the market, especially in the car receiver range.

Both XM and Sirius have a 'plug and play' style receiver system available, both of which require the use of an external 2.3 GHz aerial.

- The Delphi SkyFi system for XM consists of a US\$130 tuner, which then requires the purchase of either a home docking station (US\$70) for connection to existing home stereo equipment, or a vehicle adaptor kit (US\$70) for connection to an existing car stereo.
- The Audiovox Satellite Radio Shuttle for Sirius is a similar unit to the Delphi SkyFi unit. The receiver unit, and its required vehicle docking station, each retail for US\$100, which is the same installed cost as the XM equivalent at US\$200. The home docking unit retails for US\$70.

In May 2003, Delphi announced that its satellite radio sets are going to be available through Wal-Mart stores. Sirius receivers are already available in Avis rental cars.

A number of the major car stereo manufacturers are now producing 'XM and Sirius ready' head units. Activation of such a head unit requires the purchase of an additional XM or Sirius receiver for around US\$150 to US\$250.

General Motors is currently installing XM receivers, as standard or optional, in its 2003-04 model Chevrolet, Pontiac, Oldsmobile, Buick, Cadillac, Saturn, and GMC branded vehicles. Honda, Toyota, Isuzu, Infiniti, Nissan, Audi and Volkswagen have plans to include XM receivers in some of their cars.

Automotive brands currently offering Sirius radios in select new car models as a dealer option include BMW, MINI, Chrysler, Dodge, Jeep, Nissan, Infiniti and Mazda. Automotive brands that have announced plans to offer Sirius include Ford, Lincoln, Mercury, Mercedes-Benz, Jaguar, Volvo, Audi, Volkswagen, Land Rover and Aston Martin.

Germany

Regular digital radio operations began in Germany in 1999, with Sachsen Anhalt being the first State to launch services.

Germany has adopted the Eureka 147 technology for digital radio. At the 1995 digital radio planning conference in Wiesbaden the frequency band 223-230 MHz (VHF Band III, channel 12, blocks 12A-12D) was allocated for digital radio. As spectrum allocation could not be achieved in all German States, digital radio blocks are also being used in VHF channels 5, 6, 7, 8, and 11, and in the L-band. Sources have indicated that additional spectrum in the VHF Band may be allocated to digital radio once analog television transmitters are switched off.

The 'Landesensembles' or nation-wide services are generally in the VHF Band and the local services are in the L-Band.

The Frequency Assignment Ordinance (2001) stipulates that all analog frequency allocations will be revoked by 2010 for analog television, and by 2015 for AM and FM radio.

Regulation

Germany has a two-tier Government, Federal and State, which is reflected in the country's broadcasting legislation. The German Federal Constitution stipulates that the sole responsibility for broadcasting rests with the States as part of their 'cultural sovereignty'. Thus, while the Federal Government regulates frequency and spectrum issues, the States develop and regulate their own broadcasting policy.

The legal framework is set out in the *Telecommunications Act*, the *Information and Communication Services Act*, the Interstate Agreement on Broadcasting, the Interstate Agreement on Media Services, and the individual State laws on media and broadcasting.

Federal regulation

Although broadcasting is a State responsibility radio corporations whose main function it is to provide foreign countries with information, such as Deutschlandfunk and Deutsche Welle, are regulated at the Federal level.

The organisational and legal structure of all other broadcasting corporations is defined by State laws and, if more than one State is involved, in agreements between several or all States.

In addition, there are a number of Federal agreements that impact on broadcasting:

- In 1987, the Federal Government decided to licence commercial radio corporations in addition to national radio and thus created a dual broadcasting system. To assist this development each of the States created a broadcasting authority called 'Landesanstalt Fur Rundfunk'. A national framework of regulations was laid down in an agreement between all the States enabling these authorities to issue broadcasting licences and to regulate program content.

- In 1991, a Federal agreement was reached safeguarding the future of national broadcasting by dealing with the access and use of radio frequency spectrum.
- In 1997, the Digital Broadcasting Initiative was established in Germany. It was created by the Federal Ministry of Economics and Labour. The Initiative has Federal and State representatives as well as representatives from program and multi-media providers, network operators, equipment industry, traders, crafts and consumer associations. The Initiative discusses developments in media policy; represents the interests of broadcasters at a national and international level; and deals with common issues in the context of programming, legislation, regulation, technical development and funding.
- In 2001, the 6th Interstate Agreement on Broadcasting was adopted. Section 52(a) entitles certain radio services (including ARD, ZDF and Deutschlandradio) to gradually cease analog services and move to digital transmission. To encourage this process, the national broadcasters receive €0.06 per month per household to establish digital services.
- In 2001, the Third Ordinance Amending the Frequency Fee Ordinance put in place an incentive for a rapid conversion to digital broadcasting in the form of a temporary reduction in the fees to be paid by the multiplex operators.

There appears to be general agreement in Germany that analog radio will be switched off. The Government recognises that simulcasting is expensive, as it requires broadcasters to pay for transmission and costs of both an analog and a digital service. Consequently, the relevant legislation aims to decrease the length and expense of the simulcasting period.

State regulation

Each State has the capacity to develop its own policy for digital broadcasting services, and their introduction. Accordingly, each State has adopted individual and varied digital radio introduction scenarios. For example, since 2002 Bavaria and Sachsen Anhalt are not licensing any new analog FM transmitters, and in other States licences for new services are only granted for digital transmission.

Each State has a regulatory authority responsible for licensing and monitoring the further development of private sector broadcasting in that State. Responsibilities of the State authorities include regulating taste and decency, sponsorships, advertising, and simulcasting. Although policies vary somewhat between States, the rules generally reflect current analog practice.

Licensing

In Germany, separate licences are required for multiplex operation and actual program services. Multiplex operators include Deutsche Telekom AG, national broadcasters and new joint venture companies. While the Federal government assigns frequencies, the State media authorities licence content service distribution. Multiplex licences are granted for 15 years, while content licences run for between four and eight years. The cost of a licence is based on the population of the transmission coverage area.

Multiplex licence conditions include that:

- 80 per cent of the State population is to be covered within three years of the licence issue.
- 90 per cent of listeners in the coverage area will be able to receive services in digital radio mode by 2005.
- Multiplex operators must promote digital radio.

Data transmission is permitted through multiplexes, but there are no defined rules. Up to 20 per cent of total multiplex capacity is the norm.

Agencies

All broadcasting corporations are governed by an independent Broadcasting Council (Rundfunkrat), whose representatives are supposed to reflect the "socially relevant groups" in society, according to a Federal Constitutional Court's ruling. These delegates are either elected in parliament or are selected and sent from the various groups, including parties, business and labour organisations.

Alongside the Digital Radio Broadcasting Initiative outlined above, the German consumer electronics manufacturers' association established the 'Initiative Marketing Digital Radio' (IMDR) in 2001. IMDR aims to improve receiver penetration through co-operation with broadcasters and the automobile industry. It is funded for 3 years by the network operators and a number of major receiver manufacturers.

Implementation

Chancellor Gerhard Schröder has announced that analog radio will be phased out between 2010 and 2015. The Federal Government recognises that simulcasting is expensive, as it requires broadcasters to pay for transmission and costs of both an analog and a digital service. Accordingly, regulation appears to provide for a voluntary analog switch-off and, therefore, contains no simulcast requirements. In fact in some areas new licences are only being issued in digital form.

There are several agreements in place to aid the conversion process, including the 6th Interstate Agreement on Broadcasting (2001), which allows certain radio stations to gradually cease analog services to make room for the expansion and allocation of digital transmission capacities, and the Third Ordinance Amending the Frequency Fee Ordinance (2001), which temporarily reduced the fees to be paid by the multiplex operators.

Services

By late 2002 there were about 150 services on air. In any one major city, there are between 15-25 services available. Around 60 per cent of these are simulcast, meaning that 40 per cent are exclusively digital. Commercial services make up just over half of these, with the remainder provided by the national broadcasters.

There is a push for commercial services to digitise. In analog the national broadcasters have access to 'better' spectrum as they have been operating for a longer period of time. However, once radio is converted to digital both the national and commercial services will have access to equivalent quality spectrum. However, some commercial services are reluctant to convert because they envisage new competitors in the market and additional cost but no extra revenue. Some parts of Germany (especially Bavaria), are now "forced" to digitise on a 'use it or lose it' basis.

Overall, the commercial services are of general appeal with a few niche services. Some of these niche commercial services include: Radio Augsburg (an information and culture service); Oldie Radio RT2 (an 'oldies' service); Smart Radio (a jazz service); Radio Regenbogen (an adult contemporary service); Radio L-Fun (a literature and classical music service); n-tv Video (streaming of n-tv TV news); Train Information (a train information service); Radio Riverside (a country music service); Radio Melodie (a 'Volksmusik' service); Domradio (a religious radio service); Pirate Radio (a techno and house music service); Vil Radio (a jazz and modern music service); and Die Neue 107.7 (a service for 'oldies' & hits for people 25 & over).

Some of the uniquely digital commercial channels include Radio Galaxy (a youth channel), Rock Antenne (a Rock music station), and Rockland Sachsen (a Rock music, news and traffic channel).

Digital radio in Germany is also being used to deliver a range of data services with the focus on news and traffic information. For example, in Northrhine-Westphalia, Vera provides regularly up-dated traffic information, and WDR Info, provides news in data form.

Some national broadcasters have embraced the technology with ARD presenting a paper in 2002 that focused on the need to provide additional content in digital radio. However, despite some Government support, other national broadcasters such as Hessischer Rundfunk prefer to avoid the initial cost of set up and have adopted a wait-and-see approach.

Some of the national services include Deutschlandfunk (a nationwide information and culture service); DeutschlandRadio (a nationwide information and culture service); DASDING (a uniquely digital youth service); BR-Business (a business service); BR Wetter (a weather service); Bayern 4 Klassik (a classical music service); Bayern Mobil (a traffic information service); and SWR4 (a 'Volksmusik' service).

Rollout

Seventy eight percent of the German population is currently covered by digital radio and this is expected to rise to 85 per cent by the end of 2004, and 90 per cent by the end of 2005, with all autobahns having digital radio coverage by 2004.

Digital radio services have commenced in most of the 16 German Federal States. The following table shows coverage and forecasts for each of the States.

Coverage and forecast statistics – German States

	2002	2003	2004	2005
Baden-Wurtemberg (Commenced in Nov 1999)	57%	64%	89%	90%
Bayern	83%	83%	83%	83%
Berlin (Commenced in Nov 2001)	100%	100%	100%	100%
Brandenburg (Commenced in Nov 2001)	89%	93%	93%	93%
Bremen	0%	100%	100%	100%
Hamburg (Commenced in Jan 2003)	0%	100%	100%	100%
Hessen ³ (Commenced in Aug 2001)	77%	77%	96%	96%
Mecklenb. Vorpomm. (Commenced in Jan 2003)	0%	34%	66%	88%
Niedersachsen	39%	61%	77%	82%
Nordrhein – Westfalen (Commenced in May 2000)	91%	93%	93%	93%
Rheinland – Pfalz (Commenced in Dec 2001)	73%	95%	95%	95%
Saarland ⁴ (Commenced in Nov 2000)	94%	97%	97%	97%
Sachsen (Commenced in Jan 2000)	83%	85%	88%	92%
Sachsen – Anhalt ⁵ (Commenced in Apr 1999)	89%	89%	89%	95%
Schleswig – Holstein	0%	51%	73%	84%
Thuringen (Commenced in Jan 2000)	85%	96%	96%	96%
Total	70%	81%	88%	90%

Source: Initiative Digitaler Rundfunk, *Status Report, Digital Radio in Germany, Current Situation, outlook and need for action*, 14 June 2002, www.bayerndigitalradio.de

Products

Before the establishment of the IMDR there was a limited number of digital radio receivers on the market. By the end of 2001 only 50,000 receivers had been sold in Germany. Since then the IMDR has made significant progress in increasing public

³ Hessen extended its coverage from 32% to 78% in December 2001.

⁴ Since July 2001, Saarland has had 95% coverage of its population.

⁵ More than 95% of the area and virtually all of the 2.7 million inhabitants were covered from the start.

awareness with the sale of 80,000 receivers in 2002. By 2010, it is predicted that more digital than analog radios will be sold each year.

Manufacturers of portable receivers include: Etheraction, Maycom, Perstel, VideoLogic and Zoopad.

Manufacturers of hi-fi receivers include: ARCAM, Audionet, Cymbol, E-Lead, Electronic Communication Magdeburg, Grundig Autoradio, Panasonic Deutschland GmbH, RFT, Sony Deutschland, TAG McLaren Audio GmbH, TerraTec Electronic GmbH, TMC, and VideoLogic.

Manufacturers of car radio receivers include: Blaupunkt, Clarion Europa, Electronic Communication Magdeburg, Grundig Autoradio, JVC Deutschland GmbH, Kenwood Electronic Deutschland, Pioneer, Panasonic Deutschland GmbH, Sony Deutschland, TerraTec Electronic GmbH, TMC, and VDO Car Communication Germany.

Canada

Canada has had a formal policy governing the introduction of digital radio since 1995. The official launch of digital radio in Canada took place during the Canadian Association of Broadcasters Convention in Montreal on 1 November 1999. Services in Toronto, Montreal and Vancouver have been operating since early 1999 and in Windsor, Ontario since early 2000.

Canada has adopted the Eureka 147 technology and has allocated 23 channels in the L-band (1452-1492 MHz) to provide for both satellite and terrestrial digital radio broadcasting. Canada has an agreement with the US regarding the use of the L-band for digital radio as the US currently uses 1435-1525 MHz for aeronautical telemetry.

Although the Canadian Government remains committed to Eureka 147, the public broadcaster, the Canadian Broadcasting Corporation (CBC) has recently indicated that it now believes that Eureka 147 'may or may not be the future [for Canada]'

Regulation

The regulatory framework for digital radio in Canada is set out across a range of legislation:

- The overarching legislation is the *Broadcasting Act 1991*. This Act outlines the objectives of broadcasting in Canada and establishes the CBC.
- The *Canadian Radio-television and Telecommunications Commission (CRTC) Act 1985* establishes the commission whose role is to issue licences and regulate licensees.
- The *Radiocommunication Act 1985* regulates radio (ie. sound broadcasting) in Canada but does not specifically address digital radio.

In 1992, the Canadian Communications Minister announced the formation of a task force on the introduction of digital radio. The task force included public and private radio broadcasters and representatives of the then Department of Communications. The task force presented a report to the Canadian Heritage Minister and the Canadian Industry Minister in 1994.

This report led the CRTC in 1995 to propose a two staged approach for the introduction of digital radio:

- the initial issue of Transitional Digital Radio licences under certain terms and conditions; then
- a second phase which would see digital radio move from a transitional stage to an independent platform. This stage would be initiated at an appropriate time, after a public consultation process was undertaken, which would consider all of the long term policy aspects governing digital radio broadcasting.

The CRTC initiated the transitional digital radio phase in 1999, with the second phase delayed 'until sufficient information is available to consider fully all of the questions that may arise'.

Over the next year and a half the CRTC are planning on reviewing its commercial radio policy in the context of its policy on digital radio.

Agencies

The CRTC is responsible for implementing the objectives of the media legislation and hence has responsibility for digital radio in Canada, including issuing licences and regulating licensees.

Industry Canada is responsible for spectrum management, as well as allocating frequencies and broadcasting certificates (which certify that radio or terminal equipment complies with the appropriate standards).

DRRI was originally formed in 1992 as Digital Radio Research Inc (DRRI) with the support of the Canadian Government, to undertake the research required for the introduction of digital radio in Canada. The name was changed in 1997 to Digital Radio Roll-Out Inc (DRRI) and it now manages the marketing of digital radio. DRRI is a non profit joint initiative of major private broadcasters (Astral Radio Inc, CHUM Ltd, Corus Entertainment Inc, Rogers Media and Standard Radio Inc) and a number of smaller private broadcasters and public broadcasters (CBC and Radio Canada). It was established by government and industry with government funding of \$CDN 1 million which was subsequently matched by industry.

Licensing

CRTC is currently only issuing Transitional Digital Radio Licences. These licences take two forms: licences for existing analog licensees to broadcast digitally, and licences for new services, which are considered on a case by case basis.

Applications for these licences must meet certain minimum criteria in the areas of ownership, financial capacity, technical capacity and program content requirements. A market study may be required to confirm the demand for the proposed service and to show how it will increase diversity in the market. A market study must also address the effect the new service would have on existing broadcasters.

All existing AM and FM radio licensees who would broadcast a service which is primarily a simulcast of their existing analog service in digital form automatically qualify for these licences.

Applications for Transitional Digital Radio licences from parties who don't currently operate an existing AM or FM radio service are considered on a case by case basis.

Licence conditions

Some of the restrictions on Transitional Digital Radio Licences are:

- For a transitional digital radio service operated by an existing AM or FM radio licensee, all programming would be a simulcast of the programming broadcast on the associated analog service, with the exception of up to 14 hours per week of separate programming.
 - CRTC considers that this simulcast requirement is consistent with the general principle that digital radio should eventually replace, rather than supplement, existing AM and FM radio services, while ensuring that transitional digital radio providers have sufficient flexibility to conduct useful market trials.
- In order to ensure sufficient digital channel capacity, each licensee is restricted to use no more than 20 per cent of the digital capacity of the 1.5 MHz channel specified for use by the geographic grouping of broadcasters to which the licensee belongs under the Industry Canada allotment plan.
- Transitional Digital Radio licence holders are prohibited from using the ancillary capacity of the spectrum allotted to them to provide a programming service.
 - CRTC is concerned that the use of ancillary capacity for programming services could result in competition between main programming services and ancillary programming services.
 - Transitional Digital Radio licence holders are not prevented from using ancillary capacity for experimental, non-programming purposes.
- The digital coverage area of a group consisting exclusively of low power, unprotected stations (such as community stations and not for profit services) will be limited to the lesser of either the largest analog coverage area of the stations in the group, or the digital coverage area assigned to the group under the Industry Canada allotment plan.
- Transitional Digital Radio licences are issued for a term of three years, allowing the CRTC to establish and introduce a permanent licensing regime for digital radio.
- Transitional Digital Radio licensees are not required to own and operate their own transmitters.
 - This is intended to provide flexibility for licensees and owners of digital radio transmission facilities (multiplexes) to experiment with different kinds of ownership arrangements and structures in the short term.
- The CRTC considers that the owners of digital radio multiplexes have a clear obligation to provide fair and equitable access to their facilities.
 - Consequently, an owner of a digital radio multiplex must provide access to the transmission facilities by another licensed entity, should the necessary capacity be available. Access to a multiplex must be on terms that are fair, equitable, and non-discriminatory, and should be guaranteed to all licensed broadcasters.

Transitional Digital Radio licensees are not subject to the CRTC's long-standing policy that generally prohibits the common ownership of two undertakings of the

same class serving the same market in the same language. A licensee is permitted to operate one transitional digital radio service for each existing conventional radio service it currently operates.

In April 2003, the Canadian Senate Communications Committee commenced a study on a range of media issues, including concentration of ownership, convergence and the media's rights and responsibilities. There are concerns that Canada has the 'highest media [ownership] concentration in a western democracy' and it is hoped that the Committee will address some of these issues.

Over the years, the CRTC's policy framework for radio has reflected a number of principles based on broadcasting policy objectives as set out in section 3 of the *Broadcasting Act 1991*. These principles include the maintenance and enhancement of Canadian cultural identity and diversity, encouraging the presence of different editorial voices, ensuring programming is of a high standard and balanced on matters of public concern, and that programming reflects Canada's linguistic duality.

Although corresponding legislation does not yet regulate the digital radio environment, the CRTC considers that, while the principles for radio outlined above should still be applicable to the new environment, the mechanisms currently used to achieve these goals may need to change.

Implementation

A digital radio frequency allotment plan was published by Industry Canada in 1996 giving every FM and AM broadcaster, who plans to provide a simulcast of their existing services, automatic access to the necessary spectrum.

Similarly, all existing FM and AM radio licensees who would broadcast digitally automatically qualify for Transitional Digital Radio licences. Applications for new services are considered on a case by case basis.

This priority access for incumbent broadcasters reflects the Canadian Government's view that digital radio should eventually replace, rather than supplement existing AM and FM radio services. Consequently, most stations currently broadcasting in digital are simulcasting their analog service.

In 1995, the task force on the introduction of digital radio reported that digital radio should be introduced as a replacement to AM and FM services. Accordingly, it was initially believed that 'at some point public policy will have to set a cut off date ...and all transmissions will be digital'.

However, the Canadian Association of Broadcasters has argued that radio in Canada will not become fully digital for many years to come, as current policy provisions have not included a sunset date for analog radio broadcasting.

In addition, there is no time frame for the incumbent broadcasters to launch digital services, although sources report there is an increasing 'use it or lose it' view of rights to the L-band spectrum within both the CRTC and Industry Canada.

Services

Canada has over 70 digital radio stations making services available to 11 million people across the country or about 35 per cent of the population.

Each major city in Canada with digital radio has between three and four public digital radio stations. They are CBC Radio One, CBC Radio Two, R-C Premiere and R-C Culturelle.

Most of the stations offered by the commercial and national stations are of broad appeal. However, Canadian broadcasters also offer a range of services in a number of languages:

- Montreal has 4 commercial French language stations (CFGL-FM, CKMF-FM, CITE-FM and CKAC) and 2 national French language stations (CBF-FM and CBFX-FM);
- Toronto has 2 commercial Portuguese language stations (CIRV and CJMR), one commercial Italian language station (CIAO), one Cantonese language station (CHIN), and 2 national stations broadcasting in French (CJBC and CJBC-FM); and
- Vancouver has one French language national station (CBUF-FM).

In June 2003, the Greater Toronto Area received the first approval for a stand alone digital radio service, Sur Sagar Radio Inc (a foreign language service catering to Toronto's migrant population).

The following table demonstrates the dominance of analog radio, and the concentration of digital services, across the Canadian provinces.

Number of Radio, cable and satellite licences by province, March 2003

	AM & FM	TDR
Newfoundland	110	0
Prince Edward Island	11	0
Nova Scotia	74	0
New Brunswick	86	0
Quebec (includes Montreal)	376	15
Ontario (includes Ottawa, Toronto & Windsor)	402	45
Manitoba	125	0
Saskatchewan	109	0
Alberta	181	0
British Columbia (includes Vancouver)	377	13
Yukon	58	0
Northwest Territories	54	0
Total	1962	73

TDR = Transitional Digital Radio licence
Source: CRTC 2002-03 Statistics

Rollout

A major engineering study by D.E.M. Allen and Associates in 2002 planned for new digital radio stations to serve the major population corridors in Canada. All markets between Toronto - Windsor, Toronto - Ottawa, Toronto - Montreal, Montreal - Quebec City, Calgary - Edmonton, and Vancouver - Greater Fraser Valley will be covered by the new services.

It appears that, at this stage, digital radio listening audiences are limited. The audiences are not measured for ratings purposes and are not factored into any audience demographics for radio, which makes sourcing reliable take up data difficult.

Products

In November 2002, RadioShack Canada became the first major retail chain to carry a full line of digital radio products for the home and portable markets. To promote the availability of digital receivers in its stores, RadioShack offered a range of discounted sets and in certain locations a 'hands on' experience of the technology.

The Perstel 201 and 101 personal portables priced at CDN \$349 and \$249 respectively were the first sets available through RadioShack. Other receivers currently available in Canada include integrated automotive units from Blaupunkt (AM/FM/DAB tuner plus CD and MP3 player, \$CDN 999) and Pioneer. Portable units such as the DAB FM Pocket Radio (\$CDN 250) are also available. Additionally, Modular Tech, Maycom, and Pure Digital are soon to release high quality, low cost receivers, and General Motors has plans to release digital radios in new vehicles in 2003.