

digital radio

Digital Radio, also known as Digital Audio Broadcasting (DAB), has now been with us for some years. The BBC network has been on air since 1995 and a new Independent National multiplex will be launched on October 1st this year. Local multiplexes are currently being licensed to carry both Independent Local Radio stations as well as BBC local services. An important step in the evolution of Digital Radio has been the development of chip sets – which are now ready for volume production. This has now enabled receiver manufacturers to launch products at competitive prices.

As you can see from the services described inside, Digital Radio will offer many new and exciting types of service – but what are the basic principles that make DAB Digital Radio the best way to secure the future of Radio?

DAB Digital Radio uses a “spread spectrum” technique known as COFDM to deliver large amounts of digital information to radio receivers. COFDM allows mobile receivers, such as car radios, to reliably pick up the signal, and also means that the same frequency can be used for all transmitters in a network without causing interference. Using one frequency for a network covering the entire country means that there will be no need to re-tune car radios as they move from one transmitter’s coverage area to another’s.

But the benefits of Digital Radio are not confined to car radios. The amount of digital information delivered by a Digital Radio signal is sufficient to support a number of audio services (about seven), known as a multiplex. This, in combination with the Single Frequency Network (SFN), makes Digital Radio much more spectrum efficient (more services/kHz) than conventional analogue broadcasting. Because Digital Radio uses a digital representation of sound there is no interference and it is possible to deliver audio of the highest quality. Also, it is possible to dynamically change the number of services in the multiplex, which means that new channels can be created to cover special events, such as football matches. Another important feature is the ability to deliver simple text messages along with the audio, allowing both presentation information and other useful information (such as news, sports, etc) to be provided.

Digital Radio can clearly offer **more services** with **better quality** – but that is only half the story. The flexible multiplexing and the ability to deliver new types of service ranging from simple (yet highly effective) text messages through to full blown multimedia and Traffic and Travel Information services make Digital Radio a new medium for the future of Radio.



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new services, new radio

Digital Radio is now a mature and established technology for delivering high quality audio services to all types of radio receiver, from car radios through to hi-fi tuners. Thanks to continuing research in this area, however, Digital Radio now offers much more than simply “better radio”. New types of service are being developed that make use of Digital Radio as a pure “data” channel which will take Radio into the multimedia age.

Inside you can learn about some of the developments that BBC Research & Development has been leading, including work on the EBU TPEG project for delivering Traffic and Travel Information as well as new multimedia services using the ubiquitous HTML as a content format.



With the recent advances in navigation systems, the provision of reliable Traffic and Travel Information has become an important component in the development of Intelligent Transportation Systems. TPEG is an openly specified, bearer independent protocol for carrying such traffic and travel data and can be combined with navigation aids and positioning systems to answer the important question:

"How do I get from where I am to where I want to be, avoiding any problems en route?"

THE TRANSPORT PROTOCOL EXPERTS GROUP (TPEG)

The TPEG protocol, developed by the Transport Protocol Experts Group, is a simple byte-stream protocol that can carry a range of data to support Intelligent Transportation Systems (ITS). It can easily be carried on most digital bearers and is particularly suited to Digital Radio as it is important to be able to deliver Traffic and Travel Information to in-car systems. For road traffic information the Road Traffic Messages (RTM) application has been defined. A single RTM contains various fixed data fields, such as event severity and message generation time, together with a number of RTM Components. RTM Components describe the features of an event – such

as accidents, locations (i.e. longitude and latitude) and road works – and have a hierarchical structure that makes it easy to describe events to an appropriate level of detail. Because the protocol is designed to be "machine readable" it is easy for the receiver to present the information to the user in a range of different ways, and in any language.

Because TPEG is an open specification, it is a key development that will create a truly open market for Traffic and Travel Information. This competitive market will ensure that the public will always have access to the highest quality information.

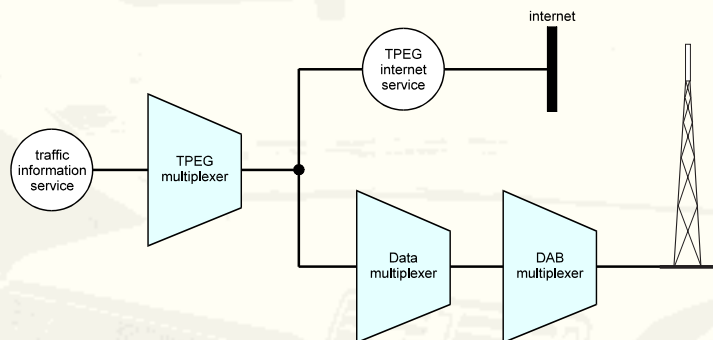
BBC TPEG PILOT SERVICE

A pilot service was set up at the beginning of 1999 by the BBC to transmit a TPEG service on Digital Radio.

Playout: Traffic and travel content is provided by the BBC Travel Unit from a custom Windows application that creates a file of current Road Traffic Messages (RTMs). This file is then sent to the TPEG playout computer over the BBC Intranet, the playout software uses the file to create a database of RTMs to be broadcast. These RTMs are encoded and multiplexed into a TPEG byte stream, which is cyclically spooled into a data channel in the BBC

Digital Radio ensemble. An Internet service is also provided which makes the TPEG stream available directly from an Internet "socket".

Receiver: The BBC has developed a demonstration TPEG receiver as a Java 'applet' which allows it to be used to decode data from both DAB and the Internet. The TPEG receiver decodes the RTMs from the TPEG stream and stores them in a local database. The RTMs are then filtered (using criteria such as location or severity) and displayed to the user as text messages or indications on a map.



BBC TPEG Pilot System Architecture

HOW IT WORKS

The key to broadcasting HTML content is being able to deliver a set of files using the broadcast signal – this can easily be achieved by using the concept of a "data carousel". In a data carousel, the information for a set of files is broadcast cyclically – hence the name – which means that a receiver can always get the data for a given file by waiting for the next time the data is broadcast in the cycle. In order to manage the files carried in the carousel, a special "directory" file is also broadcast which allows receivers to easily detect any changes to the carousel.

Having established a mechanism for delivering a set of files using Digital Radio, the next step is to do something with them. Because HTML is a content format that was developed for use on the Internet, it is worth having a quick look at how the World Wide Web works. On the Internet, web browsers are used to access web sites that are created using web servers. Web browsers identify content by using a Uniform Resource Locator (URL) that identifies both the web server that is "hosting" the site, and which particular content from within the site is required. The content for each web site is basically a set of HTML files for each web page that contain URL links to other web pages. When a web browser requests a web page from a web server, the server looks in the set of HTML files for the web site in order to find the HTML file for the requested web page.



As web sites are usually just a set of HTML files that reside on a web server, it is now easy to see how we can use the data carousel to create a service with HTML. We call it a "Broadcast Web Site" because, rather than having a browser request specific information from a remote web server, the files for the whole web site are broadcast in the carousel. On a PC based Digital Radio receiver a special web server is used to create a web site from the carousel rather than from a set of files – a standard web browser (e.g. Netscape) can then be used to view the service. On an integrated receiver, native software can be written to allow the data carousel to be browsed directly.

