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RADIO  
WORLD  
EBOOK

## Trends in Digital Radio 2021

FUTURE

JULY 2021

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• DRM

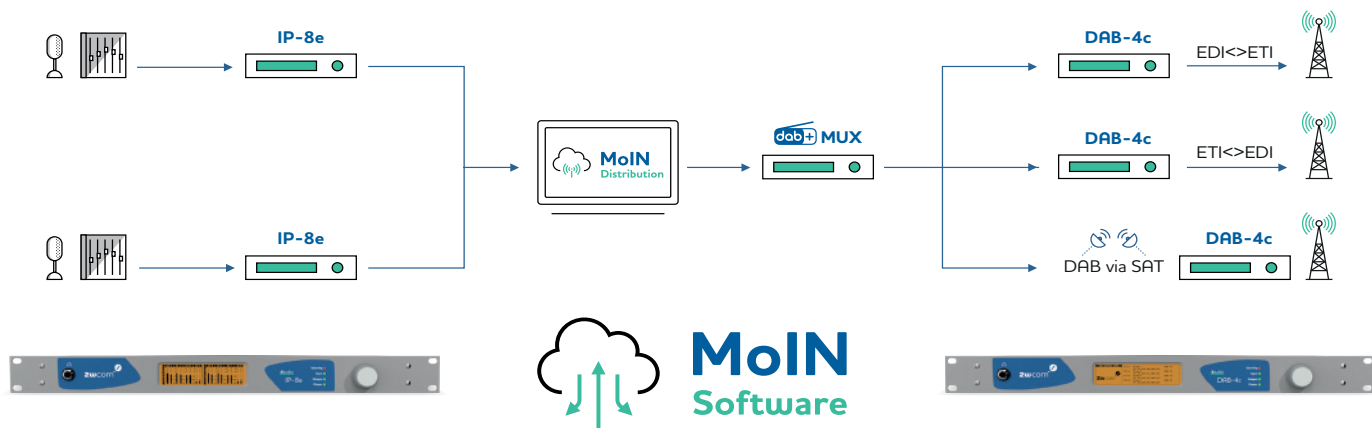
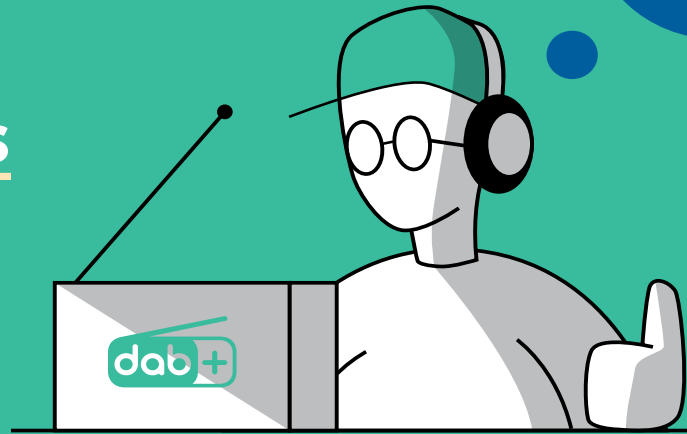
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# 2wcom's new 4audio series guarantee flexibility in operation of mixed networks

Solved

Your audio. Our solution.



## IP-8e eight-channel Audio over IP Encoder

Separating the audio part from the DAB multiplexing system provides independence for all studio sites and forwards the received station programs to the MoIN Server. The device supports all main standards or protocols for Audio over IP interoperability as well as all qualities of audio algorithms. In addition, an outstanding transmission robustness ensures 24/7 broadcast operation, especially in WAN networks.



**MoIN**  
Software

## Multimedia over IP Network

The server software can run on hardware, VMs or in the cloud. It receives the forwarded station programs and offers easy protocol transforming as well as multi-format transcoding. Thus, the server solution allows signal adaption depending on which source is used for the distribution to the transmitter, regardless of whether it is DAB, IP or Satellite.



## DAB-4c high density EDI<->ETI converter

As the device is an expert in dealing with challenges, it provides helpful features. Besides its core function, the device allows to transmit the DAB signals via SAT or ASI to optimize coverage and distribute programs to regions that are still lacking broadband IP. Moreover, the solution offers optionally a dual tuner for monitoring. The frequencies to be monitored can be easily set and thresholds for alarms can be configured for both tuners. The overview page displays all relevant parameters in real-time.

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# Trends in Digital Radio 2021



Paul McLane  
Editor in Chief

The landscape for global digital radio services has been moving quickly. This Radio World ebook provides a snapshot of how major players view their rollouts, with an emphasis on platforms DAB+, HD Radio and Digital Radio Mondiale. Grab a cup of joe and a comfy chair, we have a lot of info to share!

We asked the proponents of those technologies to update us on where digital is moving ahead and what they see as the next most important benchmarks or trends. We also invited radio technology thought leaders at the European Broadcasting Union, the Asia-Pacific Broadcasting Union, NAB PILOT, RadioDNS, Commercial Radio Australia, Digital Radio UK, Audi, 2wcom, Nautel and others to answer our questions. What crucial trends in car design will affect digital radio? What are the implications of Android Automotive? What is the impact of the regulation that requires new car radios in the EU to be capable of receiving digital terrestrial radio? What is the status of digital trials for FM in India? Will there ever be such a thing as a "world radio"?

The ebook explores these questions and more.

As always I welcome your comments on this ebook or any other Radio World content at [radioworld@futurenet.com](mailto:radioworld@futurenet.com). That email address comes right to me.



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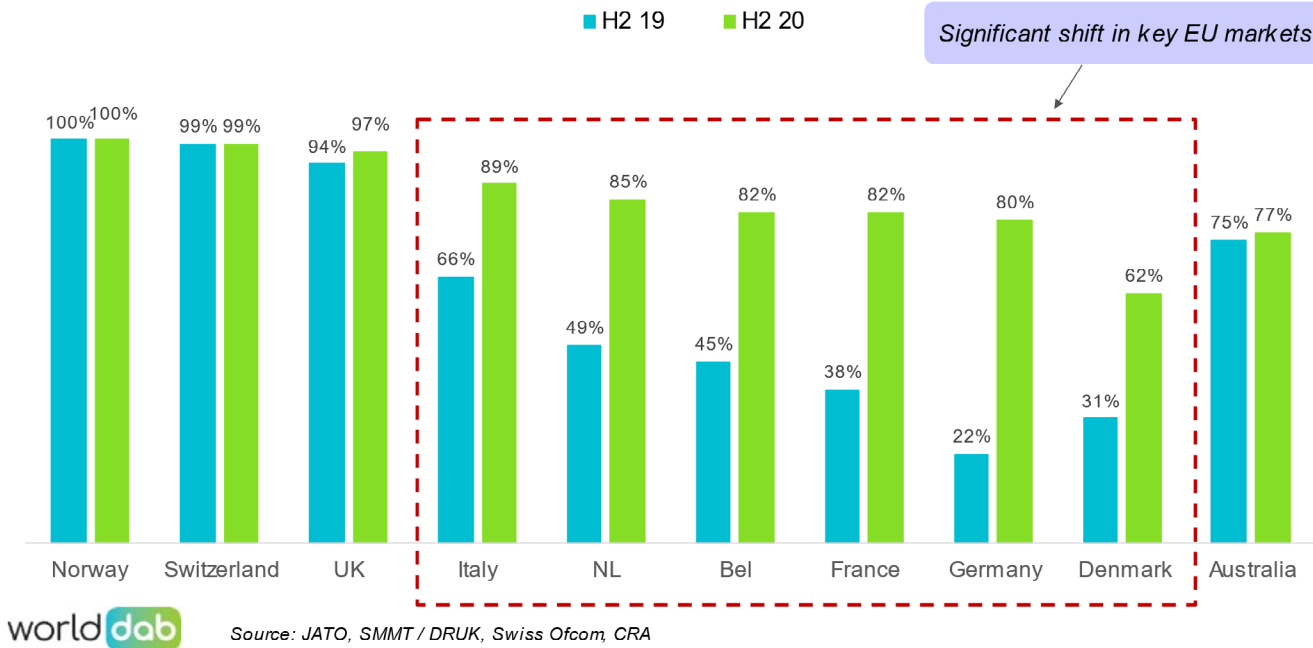
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**Automotive: DAB+ in over 80% of new cars in key European markets**

New cars with DAB+ as standard



4

**EECC Gives WorldDAB a Tailwind**

O'Neill urges radio to pursue a multiplatform strategy with DAB+ as its digital backbone

**Top** Thanks to a mandate in the European Electronic Communications Code and the continued expansion of DAB+ services in several countries, O'Neill says DAB+ is now in over 80% of new cars in key European markets.

**B**ernie O'Neill is project director of [WorldDAB](#), the global industry forum responsible for defining and promoting DAB digital radio. Members represent 33 countries and include broadcasters, regulatory bodies, network providers and manufacturers of receivers, chips and automobiles.

**RW** **WorldDAB held an automotive conference recently. One of its themes was that broadcasters must both collaborate and compete with tech platforms like Apple Car Play or Android Automotive. Can you expand on that?**

**Bernie O'Neill:** Radio has been a central part of the driving experience since the first car radios, and still today radio remains ahead thanks to radio's core strengths — easy to use, reliable and front and center of the dash. Specifically, the position of DAB+ in the car has never been more solid thanks to the European Electronic Communications Code requiring all new car radios to have digital terrestrial radio since December 2020. In the second half of 2020, over 80% of new cars in Germany, the U.K., France and Italy had DAB+ as standard.

Technology is evolving and changing, however. Radio broadcasters cannot stay as traditional broadcasters and as Big Tech moves into the car, broadcasters realize that their audio competitors in the car are now not only other radio broadcasters, but include online audio streaming services such as Spotify etc.

The foundation for radio in-car must be free-to-air broadcast radio, with IP providing richer content, metadata and interactivity.

The focus for WorldDAB is on bringing together broadcasters and automakers to work with the tech companies on optimizing the in-car radio experience. This collaboration is best done at scale through industry associations such as WorldDAB, because united and with one strong voice, broadcasters can participate in global efforts to make sure that as connected cars roll out, radio is prominent, and the user experience meets and exceeds what listeners expect.

**RW** **The Android Automotive platform has generated a lot of attention. What do you expect its impact to be?**

**O'Neill:** Android Automotive is the next big step —

Google's integrated operating system for new cars. It is imperative for broadcasters to work closely with car manufacturers and Google to make sure radio remains prominent in the new car app ecosystem and continues to be easily found on the display.

WorldDAB's Automotive Group is chaired by VW's head of Entertainment and Car Functions, Martin Koch. At the recent WorldDAB conference he explained how WorldDAB is working with broadcasters and manufacturers from around the world to collectively identify and feed through to Google those specific areas where they can offer support so that all DAB+ features are included in future versions of the Android Automotive app.

Google's Android Automotive lead, Guru Nagarajan, also spoke at our conference and emphasized that Google is listening to broadcasters, and wants to hear their constructive feedback. Android Automotive would like to develop and innovate to help broadcasters provide the best radio services to our users.

Martin Koch warned that the huge number of apps now available in the car could endanger the unique position of radio. However, broadcasters can turn this to their advantage by developing their own Android Automotive App, and consider providing it through the relevant app stores for the car dash — and that means not just the Google Store, but stores specific to the automotive industry such as the Harman Ignite store.



## In which countries has DAB+ advanced the most, where do you feel you've been most successful?

**O'Neill:** DAB+ is firmly established as the core future platform for radio in Europe, as witnessed by recent significant developments taking place in several markets.

Germany launched a second national multiplex in October 2020, bringing up to 16 new services to a potential audience of 67 million people. France has 10 cities and regions already on air, and two national DAB+ multiplexes carrying 25 services will launch later this year, in October 2021.

Italy launched DAB+ in 2014 and now has three national and numerous local DAB+ multiplexes on air, covering over 83% of the population. Italy was also the first country to introduce national regulation mandating digital radio in all new receivers.

The U.K. has had digital radio for over 20 years, with three national multiplexes helping to drive audience

growth — nearly 60% of all listening is on a digital platform — and advertising revenues, up 30% between 2013 and 2019.

We are seeing solid growth for DAB+ in Australia, with 52% DAB+ household receiver penetration, 94% of first-level road coverage, and 77% of new cars sold with DAB+ fitted as standard, up from 60% in 2018.



## Which countries or markets should we be watching, to see who will adopt digital standard(s) next?

**O'Neill:** Beyond the core European markets, we now see more launches of DAB+ taking place in Eastern Europe and the Balkan region.

Austria has regular DAB+ services covering 83% of the population, Czech Republic likewise with 95%

population coverage, and Slovenia has regular DAB+ services reaching 85% coverage. Greece has regular DAB+ services on air in Athens, Thessaloniki and Patras regions. DAB+ trial services are on air in Croatia, Montenegro, Montenegro, Romania, Serbia, and Slovakia.

Looking beyond Europe, in South Africa the media regulator in April published the new framework for a phased approach to licensing digital radio, with existing licensees able to simulcast programs on analog and digital. There are DAB+ services on air across several of the Arab States, where most radio listening happens in the car, and therefore the

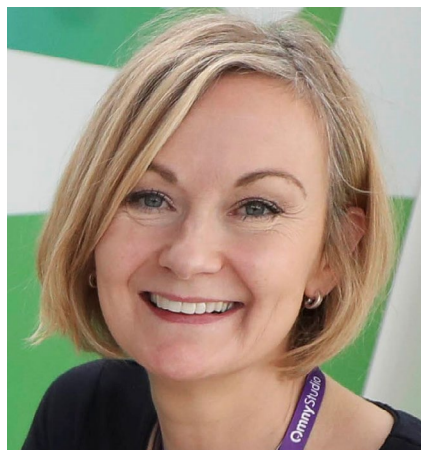
emphasis is on making sure DAB+ is available in vehicles.

In the APAC region, in response to the need for information and support on implementing DAB+, WorldDAB launched a new Technical Support Group in 2020, dedicated to assisting the broadcast industry in the APAC region implement DAB+. Countries with DAB+ trials in the region include Thailand, Indonesia and Vietnam, with interest registered in several other countries.



## How many receivers are out there, and what percentage of new cars have DAB?

**O'Neill:** By the end of Q4 2020, nearly 100 million consumer and automotive DAB/DAB+ receivers had been sold in Europe and Asia Pacific, up from 92 million six months year earlier. DAB+ is now in over 80% of new cars in key European markets, driven by that impact of the EECC, which came into force at the end of 2020, as well as the expansion of DAB+ in key markets such as Germany, France and Switzerland where preparations are ongoing to switch off FM in 2022–2023.



Above Bernie O'Neill



a positive digital radio experience for drivers. The Guidelines give broadcasters advice on how to use information they already have, in the form of metadata, to provide a richer experience for the driver.

WorldDAB is currently updating these User Experience guidelines for automakers and broadcasters, and voice controls are now a key component of that work.

We really cannot emphasize enough how vital it is that broadcasters prioritize metadata for car manufacturers to ensure their station information is clearly and correctly shown on dashboards. It's metadata that enables the visual information, text and graphics — station name and logo, presenter, song title and album artwork — to be displayed on the

dashboard while a specific station is playing, as well as the development of a good hybrid radio user experience.

Car manufacturers need the confidence that broadcasters are going to provide metadata; that in turn will ensure that they prioritize the radio user experience in their cars. As car dashboard screens get even bigger, that radio station metadata will be even more important to power a rich user experience.

**Above** A slide from WorldDAB. "We really cannot emphasize enough how vital it is that broadcasters prioritize metadata for car manufacturers to ensure their station information is clearly and correctly shown on dashboards," O'Neill said.

The EECC requires all new car radios in the EU to be capable of receiving digital terrestrial radio. U.K., Switzerland and Norway have 97 to 100% DAB+ as standard, and in Italy, The Netherlands, Belgium, France and Germany over 80% of new cars sold have DAB+ fitted as standard. We are seeing solid growth for DAB+ in Australia, with 52% of the population having access to a DAB+ digital radio at home, at work or in the car, 94% of 1st level road coverage, and 77% of new cars sold with DAB+ fitted as standard (up from 60% in 2018).

**RW** Your organization has guidelines in place to try to nourish the development of hybrid radios that include FM, DAB+ and IP. When should we expect widespread availability of such radios?

**O'Neill:** New research by WorldDAB focused on the DAB and hybrid radio features that are supported in vehicles on the road today shows the high level of engagement all auto brands questioned have for DAB digital radio, and radio in general.

The majority of car receivers can show visual information provided by radio stations. Many car receivers will show radio station logos, from a variety of sources, and almost all receivers can show information about the current item on-air in a structured way, using DL+, where the radio station can transmit artist, title, album, etc. as individual elements.

Our WorldDAB Automotive Working Group is focused on helping auto manufacturers and broadcasters create more intuitive user interfaces, offering more attractive visuals and leveraging the respective benefits of DAB+ and IP for smart (or hybrid) radio.

The WorldDAB [User Experience guidelines](#) help broadcasters use their visual assets to keep digital radio prominent in car dashboards, through explaining the important role visual information now plays in providing

**RW** Norway switched off FM in favor of DAB+; but Finland rejected DAB and is focused on IP distribution; and Sweden is slowly moving forward with DAB and online radio. What can we learn from those differing approaches by neighboring countries?

**O'Neill:** The radio industry landscape and topography is unique to each country, with decisions on radio distribution driven by criteria unique to each country.

Nonetheless, looking at countries that have successfully launch DAB+, we can see that the uptake of DAB+ across Europe has been driven by clear benefits for all stakeholders: listeners, broadcasters and society.

DAB+ offers two key benefits for listeners: greater choice — allowing as many as six times as many national stations compared to FM, and clearer, more consistent audio quality — particularly when FM is overcrowded, or listeners are on the move.

In addition, the expansion of DAB+ across Europe has meant that DAB+ receivers are much more accessible than in the past. Not only is DAB+ available in all new car radios from the end of 2020, but consumer DAB+ receivers are more affordable now, with low-cost receivers now available for less than 20 Euros.

From a broadcaster's perspective, there is an urgent need for radio to innovate. The digital giants such as Amazon, Apple and Spotify are invading radio's space and FM spectrum is full. The additional capacity

provided by DAB+ gives broadcasters the opportunity to strengthen their offer to listeners. DAB+ offers broadcasters a robust, anonymous — in other words, not monitored — free-to air platform, with lower distribution costs and no reliance on third-party gatekeepers.

Successful launches in established markets have shown that DAB+ allows broadcasters the opportunity to expand their geographic coverage, launch new services, extend brands and grow audiences, with a corresponding growth in revenue.

In short, radio needs a multiplatform strategy — DAB+, hybrid, [Radioplayer](#) and apps, podcasts and smart speakers — with DAB+ as the digital backbone.

DAB+ delivers benefits for society: reliability in emergencies, media plurality, energy and spectrum efficiency, lower costs and emissions and enhanced traffic information that is broadcast free to air.

DAB+ has not been on air in Finland since 2005, there appears to be no current appetite from broadcasters to broadcast via DAB+, and they continue to watch developments on radio consumption in other neighboring markets. The EECC, requiring all new car radios sold in the EU to be able to receive digital terrestrial radio from the end of 2020, applies equally to Finland; and so drivers from Finland who have a DAB+ radio in the car will be able to listen to DAB+ in neighboring Sweden and Norway.

DAB+ transmissions in Sweden started in 1995, and today population coverage stands at 43%, with services from public service broadcaster Swedish Radio (SR) and commercial radio Bauer Media and Nordic Entertainment Group (NENT).

Bauer Media's DAB+ services now cover 40% of the population and are expected to reach 50% by the end of 2021.

the number of free-to-air national services available to the Norwegian population from five to 32 stations, greatly extending the choice available to listeners across all geographic and demographic groups.

Today the latest market survey shows that radio listening in Norway is now back to the same levels achieved prior to the digital switchover: 100% of listening to national radio is digital, 73% of all Norwegians have one or several DAB+ radios at home, and 71% of all Norwegians have DAB+ radio in the car.

The next country to switch off FM will be Switzerland, where [FM switch-off](#) will take place in two stages between August 2022, for public broadcaster SRG-SSR, and January 2023 for private stations. DAB+ is now the most widely used radio distribution channel in Switzerland.

While every market is unique and digital radio consists of many platforms, Switzerland and other countries are now able to benefit from the key lessons learned from Norway's switchoff. The key learning for broadcasters is to "collaborate on cost, compete on content." People love more content — listeners prefer more choice. Radio must offer more to everyone given the increased competition with more rivals.

Another key learning from Norway was that a switchoff plan speeds up the conversion from analog to digital. Also, Norway's phased switchoff worked well; the public service broadcaster NRK with a robust license income switched off first, followed by the commercial broadcasters.

Norway also found that there was a big need for information, as DAB+ is a little different from FM. DAB+ in cars was especially demanding. Listeners are loyal, but they do need time to upgrade all radios. Finally, a national rollout body representing one voice was necessary and successful.

**Below**  
O'Neill said good implementation of metadata will help in the development of a positive hybrid radio user experience. Shown is a hybrid receiver in an Audi vehicle.

## Which countries have put plans in place to turn off analog FM, and what can we learn from the experience of those that have tried?

**O'Neill:** Norway switched off national FM services in December 2017, becoming the first country to do so. Switzerland will be the next country to switch off FM in 2022–2023.

We are starting to see the gradual shutdown of FM transmitters where DAB+ coverage and receiver penetration permits, such as in Germany, Italy, Belgium.

The main reasons Norwegian radio broadcasters wanted a digital switchover were to provide a better radio offering to listeners and have a stronger position in the competition with other media and online services. DAB made it possible to increase



Courtesy Audi

# DRM Highlights Extra Benefits for Users

Themes include content choice, emergency warning, power saving and radio schooling

**Right**  
Ruxandra Obreja

**T**he DRM Consortium held its latest General Assembly in April, reporting “excellent progress” for Digital Radio Mondiale in countries such as India, South Africa and Hungary. Presentations also discussed projects to roll out DRM in Indonesia and Pakistan, a trial of DRM on FM in Russia, and another on shortwave in Brazil.

A presentation about India, where DRM is one of the systems that have been trialled for the FM band, noted that there are 3 million “line fit” DRM receivers in Indian cars, and that a trial featured head unit radios with DRM AM and DRM FM integrated and working in cars.

Separately, [Starwaves](#) and [Fraunhofer IIS](#) recently announced an Android app that allows reception of Digital Radio Mondiale transmissions on mobile devices, when used in conjunction with an RF dongle.

And Fraunhofer IIS is involved in a project to test the [DRM framework within the ATSC 3.0 TV platform](#), which would give access to DRM content on radios and TVs as well as mobiles and cars.

Ruxandra Obreja chairs the DRM Consortium.



**In which countries has DRM advanced the most — where do you feel you’ve been most successful?**

**Ruxandra Obreja:** As the only open, truly global, all-frequency-bands digital audio broadcasting standard, DRM has been tested, rolled out and adopted on all continents, with their different levels of economic and social development.

There is a tendency for technological developments to focus primarily on the developed world and cities. We discuss 5G technologies and Internet of Things, but 80% of the world’s population remains without even basic analog FM-quality radio coverage (and only 65% of the population is presumed to have an internet connection, according to Internet World Statistics).

In large parts of Africa, Asia and South America, infrastructure for electricity is unreliable. Therefore, one of



DRM’s key aims is to provide better-quality radio services to the poorest and most vulnerable people, building from the bottom up, rather than the top down.

As DRM works in all bands, it is used in-country as a domestic standard, with the biggest success and uptake in the Asia-Pacific region. Key DRM countries are in this respect India — where about 800 million people are covered by an AM simulcast or pure DRM transmission of the public broadcaster AIR — Indonesia, China and Pakistan, with interest from Bangladesh and Nepal.

The decision taken by the South African government in July 2020 to recommend DRM (and DAB+) standards for its radio digitization has been followed in 2021 by progress to create a licensing framework for the whole digital radio ecosystem.

South Africa will be the catalyst for the whole Southern Africa region, whose 15 [Southern Africa Development Community countries](#) have also recommended the same dual digital solution.

In Latin America there were recent and successful tests in DRM shortwave for domestic coverage. We hope that Brazil will adopt DRM in shortwave and be also a catalyst on their continent, in the same way in which India is for southeast Asia, where neighboring countries like Nepal, Bangladesh and Pakistan are considering DRM for their digital transition.

DRM is the only digital radio system delivering in the SW

band for very large, even continental coverage. There are [DRM transmissions on the air](#) from broadcasters in Europe (U.K, Romania, Germany and France), Africa (Nigeria), Middle East (Kuwait) etc.

Using the current analog channelization in both AM and FM, upgrading existing infrastructure, and delivering three times more programs and data using the same spectrum or less — only half in the case of DRM on FM — is what has attracted large countries that cannot afford very local solutions or multiply them at great cost over large areas.

DRM is also flexible, delivering audio and data services at low bitrates while being able to calibrate the balance between coverage and audio and satisfy the need for extensive coverage and good audio without compromises. It is the only digital audio sound broadcasting system using the advanced, super-efficient xHE-AAC audio codec, thus aligning it with the cellphone industry and use.

The reasons for DRM successes so far are its excellent, advanced technical DNA and its ability to share the same audio superiority, spectrum efficiency and extra services — emergency warning functionality, data delivery — in all the bands at significantly reduced transmission costs.



## What do you consider the most important or promising emerging markets for DRM?

**Obreja:** After the excellent test in DRM for FM carried out in India in the spring of 2021, we are very hopeful that the Indian government will appreciate the excellent results achieved and extend the use of DRM, already rolled out in AM, and recommend DRM also for the FM band for both the public and private sector.

This will deliver the same advantages to the whole country and at all levels — local, national, international.

We are also impressed with the commitment of Pakistan to the full DRM standard, its judicious rollout plan and the recently resumed tests in DRM for FM in Islamabad.

DRM on FM is also on the air in St. Petersburg on a long-term trial conducted by a commercial broadcaster. Russia is also committed to DRM, the standard of choice, and after test transmissions there are plans for extensive DRM coverage for the eastern part of the country.

We are also aware of sustained interest in DRM in Australia and other parts of Asia-Pacific, like Thailand, Vietnam, Malaysia and Papua New Guinea, Iran, and Middle eastern and north African countries.



## How many receivers are in the marketplace that can receive DRM signals, and what percentage of new cars is shipping with DRM? What is the source of those data points?

**Obreja:** It is time to give up quoting receivers manufactured or displayed on shelves as a sign of success. Manufactured receivers do not equate audience. The digital receivers of today are in cars, mobiles, PCs, TVs, speakers as well as, but not primarily, in kitchens.

We mentioned more than 3 million line-fit receivers in new cars on the Indian roads. This was achieved in just over two years, a success not seen even in long-established automotive markets. Our car figures are based on industry sources and cumulative analysis.

No car manufacturer or even household receiver manufacturer will openly distribute real and current sales figures because these are often commercially sensitive data.

We cannot give reliable figures for standalone DRM receivers, as their number is for now probably quite low. And we do not know how many laptops and tablets have DRM software reception. The mobile/cell dongles have just become available on the Apple Store and Google Play, with more stores to come. They give access to full-featured DRM reception on Android cellphones (not Apple iPhone yet) or

### Below

This medium-wave transmitter site in Vizag in the state of Andhra Pradesh serves All India Radio. The station broadcasts with analog power of 100 kW and DRM of 40 kW; it is using "pure" DRM as well.





**Above** Starwaves and Fraunhofer IIS recently introduced an Android app that allows reception of DRM transmissions on mobile devices when used with an RF dongle.

tablets simply by connecting an external RF dongle to the USB port of your device. This supports DRM digital radio services both in the AM and FM/VHF bands, depending on RF dongle capabilities.

The dongle gives access, through DRM's advanced text feature called Journaline, to text content with the latest news, sports and weather updates, program background information and schedules, radio schooling, and travel information; and it supports Emergency Warning Functionality in case of disasters.

**RW** WorldDAB states that "DAB+ is firmly established as the core future platform for radio in Europe." Please comment.

**Obreja:** It all depends on the assessment of Europe, a complex and diverse continent with different radio experiences and levels of digitization.

Despite this complexity, we should unreservedly acknowledge the success of DAB/DAB+, achieved with assiduity over many years. This is the oldest digital radio standard developed for the requirements of large European public broadcasters with lots of services, while individual local and commercial radio services, AM/FM band/transmission compatibility and economic large-area coverage scenarios were not a requirement at the time.

As DAB/DAB+ has no shortwave/mediumwave broadcasting offering, this is where DRM could shine even in Europe as a complement.

DRM could thus extend universal coverage to a country or continent while adding its efficient and robust/emergency-ready data distribution. With DRM, whether in Europe or elsewhere, all bands are covered, allowing them

to use the long-range properties of these techniques to provide FM-like quality using AM transmitters.

This is primarily useful for coverage of areas with less well-developed infrastructure, and perhaps lower population densities; but even in European countries like the U.K., AM, in a pared-down version, is maintained as a primary or as an excellent backup option.

In the European context, DRM might be useful for audio broadcasting but be even more attractive for other novel, non-audio broadcasting applications using the available spectrum resources — see the German navy using DRM for audio and internet distribution to ships all over the world.

The not-for-profit DRM Consortium has as its primary goal to make the open, non-proprietary DRM standard in all bands understood, recognized and used as widely as possible, on its own or in conjunction with other open standards.

Our hope and position, shared with any good-faith digital radio proponent, is one of cooperation for the success of digital radio worldwide.

**RW** Recently you've emphasized power savings as a benefit of DRM, including the release of an online calculator. How substantial are these savings?

**Obreja:** DRM saves energy while offering superior, more diverse and better-quality services. By using DRM, "new revenue" can be generated through more services on the same bandwidth, and additional features such as Journaline.

In addition, as demonstrated in India, broadcasters can save significant costs by combining multiple separate FM networks into a single digital one, thus reducing and sharing the power of a single transmitter.

There is also the possibility of reducing the one-time equipment cost or cap-ex by modernizing an existing transmitter with DRM equipment. This will be cheaper than installing another analog FM transmitter or transmitter network.

But the obvious and real cost saving is in the operating costs or op-ex — the ongoing savings for every transmitter of the network and every year of operation.

These costs include maintenance, cooling, space, etc., but mostly transmission power — and this is where our recent [efficiency energy calculator](#) can help broadcasters to calculate their individual savings potential by migrating their medium-wave, shortwave or FM networks to DRM.

With shortwave transmissions, energy savings of up to 45% are expected, while medium-wave transmissions might be more than 55%. Considering that these transmitters typically output RF for regional and international broadcasting and have electricity bills of

hundreds of thousands of dollars per year, the savings are significant!

FM transmitters are typically lower-power but achieve the greatest percentages of saving of up to 90%, compared to analog power for same coverage — while providing up to three services and data/Journaline.

DRM is super-efficient, as on one current frequency a broadcaster can carry up to three programs and one data channel. But as the new multi-DRM approach was showcased and thoroughly tested in Delhi — six FM's or 18 audio and six data DRM channels from one transmitter — it was clear that up to six individual FM stations can stay in full control of creating and configuring their own DRM signal, while multiple of those DRM signals are transmitted from a single FM transmitter for maximum spectrum/site-space/cost efficiency.

This ensures a perfect combination of full broadcaster control over their signal, with efficiency and savings of a wide-multiplex-based approach.



## What impact will the Android Automotive platform have?

**Obreja:** Android Automotive and other recent automotive developments are of high relevance as cars are essential in driving the digital radio uptake.

This is an important development for digital radio, as it allows you to easily combine the best of both worlds: free-to-air broadcast (DRM) with IP-based streaming services, where available, for audio, multimedia and metadata content.

But while true for the developed world, big cities, it cannot meet the universal access needs of all citizens, even in the U.S. or U.K., for information, education, entertainment. This does not apply to most of the world or emerging markets.

Also, since Android is simply an operating system like Windows or Linux, it doesn't really make much difference to DRM. As an open standard, DRM is available for anybody programming receiving apps or software to use.

Several apps, including the recently released Starwaves app, have been developed. However, as with all digital receivers, specific hardware is required to receive and decode the signals; so, while Android Automotive makes rollout easier, the necessary chipsets must be provided to facilitate DRM reception. There are already multi-standard

chipsets and solutions, and DRM is at the forefront of software updating so that hardware can be used for both digital AM and FM.

The great advantage of DRM is that it does not use specific IP and has the internet metadata fully integrated. DRM is fully prepared for hybrid radio applications by sharing RadioDNS, SPI/EPG integration and other related tools with DAB+.

From the outset, DRM has a hybrid-friendly profile, including the advanced Journaline interactive service, which really stands out on connected devices such as on the Android Auto platform, by combining broadcaster-specific free-to-air content with individual return channel interaction per listener, and location-based services.

Another important feature is its Emergency Warning Functionality, or EWF, an up-to-the minute service available to the listener even if IP connectivity and mobile networks are down.

DRM is also part of RadioDNS and provides service discovery, service logos etc. on the local screen, as there is no extra effort required for full integration.



## You've written about hybrid radio, raising "caveats and questions." What is the biggest potential obstacle?

**Obreja:** Hybrid radio is much hyped now, but even its critics admit that it is here to stay and be used, at least in western capitals with excellent mobile network coverage.

Hybrid does not work in all scenarios. The greatest hurdle remains the IP availability and its cost, both for listeners' access (data plans) and broadcasters' broadband. After all, the penetration of internet connectivity is about 65% on average in the world and under 50% in Africa, as I have written in a [recent Radio World opinion piece](#).

By mixing the "one-for-all solution" of terrestrial broadcasting with the "one-to-one" option of IP, some might say you are patching up, at cost, something that can, and should, be universally available, if the advantages of large, continuous, universal coverage of radio — provided by DRM — were exploited fully and without prejudice.

There are also other considerations to do with making broadcasters' valuable furniture — their URLs — available to third operating parties and allowing the involvement of yet another go-between primarily interested in maximizing profits.

“One of DRM's key aims is to provide better-quality radio service to the poorest and most vulnerable people, building from the bottom up, rather than the top down.”

**Right**  
A slide from the  
DRM Consortium  
highlights receiver  
models.

## Portable And Car DRM Receivers

Manufacturers in **China, Germany, India, South Korea, UK** are planning and already producing portable receivers.



DRM is fully prepared for hybrid radio applications by sharing RadioDNS, SPI/EPG integration and other related tools with DAB+. DRM has a hybrid-friendly profile already, including the Journaline interactive service.

Continuous and easy availability is a must for digital radio, without which the big leap — from 6 billion analog receivers, to millions and billions of digital receivers and receiving platforms — will not happen. DRM can do it in a hybrid scenario or on its own.

**RW** What is the status of the supply chain for integrated digital radio chip technologies that could support all radio formats? Will we ever see a true “world radio”?

**Obreja:** These world radio chipset solutions exist, even if the chipset supply is now in crisis.

OEMs and car manufacturers are the true drivers of all standards into one chipset module. Depending on request and market demand, some stakeholders in the automotive industry are already requesting the preferential standard or standards required in a particular market or country.

Using one standard for all bands and needs will always be cheaper and easier than combining standards, and combining open standards will always be cheaper and less cumbersome than an open standard mixed with a proprietary one.

Software updating is also a more modern and user-friendly option, as we saw in India, where car and standalone receivers manufactured for DRM AM decoding could be upgraded, sometimes within a couple of hours or less, to DRM for FM, ready for our test.

The world radio is not a technological challenge. It is a political and economic decision, and in some cases a vanity and personal project, too.

**RW** What other initiatives or trends may bring further change to the landscape?

**Obreja:** The DRM standard is advanced and stable. We feel now is the time to evaluate and focus on some its extra features. At the technical level, this is about broadcasting — DRM in FM — over a dozen individual audio and data channels from one single transmitter owned and be administered by one broadcaster. Or one transmitter allows for several independent broadcasters to advantageously share energy and operating costs, so much lower than in analog.

We are also trying to support and promote using DRM or DRM-like digital broadcasting for pure data carriage. Imagine being able to broadcast software updates to advertising screens to all the bus stops in an entire country from a single shortwave or mediumwave transmitter.

The link to the IP world is something we cannot ignore, and we are part of the hybrid landscape, no matter location or device.

The availability of internet content to people without internet can be baffling. We would like prove how full countries and continents can have access to the latest information, education, emergency warnings even without IP connections. A new [video on our website](#) highlights the user experience.

Distance learning through DRM is a most exciting current project and the existing work group is ready to welcome other interested entities.

We are also encouraged to see that broadcasters, regulators and governments are more engaged in exploring the digital audio broadcasting options. They understand that a digital standard is just a platform, and that it is up to them to choose the most appropriate and useful standard or standards for their needs.

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# Dashboard Trends Raise “Clear ROI Opportunities” for HD Radio

Xperi's Joe D'Angelo says it's easier and more affordable than ever for stations to deliver a richer listener experience

**Right**  
Joe D'Angelo

It's been more than 15 years since HD Radio became available in a U.S. vehicle. In 2005 the digital radio technology arrived as an option in BMW 2006 7 Series and 6 Series models.

Xperi notes that today, HD Radio is standard in all BMW models in the United States in addition to many other makes and models. It says the technology is available in 75 million to 80 million automobiles worldwide.

Joe D'Angelo is senior vice president, radio.



**Why do you think the station percentage isn't higher?**

**D'Angelo:** A combination of things. There's been complexity of choice over 10 years in which broadcasters have focused their technology strategies – looking at apps, desktop/web players, aggregator platforms or investing in their own broadcast infrastructure. They've looked closely at where to spend cap-ex dollars to deliver a new service or reach customers differently.

Also, the mobile phone market has matured much faster than the automotive digital broadcast market.

Google and Apple built their app stores and deployed hundreds of millions of devices in a much shorter time than we were able to deploy cars with HD Radio technology. The cost of entry for broadcasters in the app space was much lower; they could do something in that space much more quickly and less expensively.

That said, we now have a significant installed base of vehicles, making it more compelling for small and medium broadcasters to invest in digital radio and know that their audience is going to benefit. The cost profile is such that they can do it quickly and affordably.



**Looking at its overall development, where are we in the story of HD Radio?**

**Joe D'Angelo:** I'd say we're about at a mid-point.

HD Radio really got going with BMW's support and the support of the U.S. broadcasters with the HD Radio Alliance — a real commitment from big groups as well as public radio to roll out a significant number of stations. That started the ball rolling with infrastructure and introduction of the first cars.

An executive from Apple once told us, “You guys are attempting an infrastructure transformation, and those take time and the patience of everyone in the ecosystem.”

We now have 2,500 stations on air broadcasting millions of hours of digital audio services, as well as close to 80 million radios sold to date.

There are a number of radio stations in the U.S. that are still considering the technology and the investment. We think there are 6,000 to 8,000 licensed radio stations that in the near term are reasonable candidates based on audience size and economic profile.

On the automotive side, we're in about 55% of new vehicles. We'd love to see that get closer to 80 or 90%.

It's easier and more cost-effective than ever for a broadcaster to convert to digital; and on the automotive side, we have sophisticated yet simplified designs that make it easier for a Tier One manufacturer to integrate the technology to drive a fantastic user experience.



**But in context, there's a massive number of old-school AM/FM radios still out there. Do you expect a similar scale eventually, or is the consumer electronics market just too different now?**

**D'Angelo:** We view the market as consisting of home, mobile and car. The opportunity for listeners to consume broadcast content in each of those environments has changed dramatically over 15 years.

In the early days of HD Radio each home had about seven analog radios, so over a billion devices in use, in the USA alone, including clock radios, transistors, cars, home stereo, hi-fi units, all that.

Since then we've seen in-home audio consumption shift to smart speakers, which have replaced the radio in the home. And mobile phones have clearly replaced the transistor radio and boom box.

We don't believe that consumer behavior is going to change back, putting antennas in devices in the home to pull listening back from smart speakers. In fact, we're leaning into that with the industry and developing technologies that make smart speakers and mobile devices that much richer.

But the car is still a solid foundation for broadcast consumption, so that's where we focused most of our development energy.

Eighty million car receivers on the road is substantial. There are about 250 million passenger vehicles in the U.S. So we've got a very good footprint. We were averaging about 10 million new cars a year prior to COVID, which is a very good adoption rate, and we expect to see a return to those levels.

I've been watching the Olympics. Ford is running commercials to "build your Ford your way." Right in the middle of one is an HD Radio receiver on TV. It's reassuring to see that kind of support from car companies.



## In which countries has HD Radio had the most success?

**D'Angelo:** Clearly they're in North America. The United States is by far our largest market, and Mexico is our second. We just celebrated our [10th anniversary there](#).

Canada has been a bit of a slow go; we have about 40 stations on, mainly in major markets. They're working through a regulatory process that we hope will come to some closure in the next 12 to 18 months.

The Philippines has embraced HD Radio, and we have the Dominican Republic and Panama. But our stronghold in North America is what's driving the automakers' commitment to the technology.

In all cases, these countries are using the hybrid mode of HD Radio, except for the new handful of all-digital AM stations that have just come on in the U.S.

We're also encouraged by the [reception we've received in India](#). It has not made a decision on digital radio to date. They've made a significant investment in analog over 10 or 15 years, with commercial licensing. There seems to be a strong appetite to leverage the ecosystem that we've built around HD Radio and bring that into the market; but that is still developing.



## How would you characterize the success of RadioDNS?

**D'Angelo:** I was involved with RadioDNS from the beginning and was on the board for four years; and we're founding members. Its objective at the outset was to make it easier for mobile phones to take advantage of broadcast and IP technology. Over time, the focus shifted to the vehicle.

## HD RADIO BY THE NUMBERS



### HIGHEST HD RADIO AUTO PENETRATION DMAS

Geography Measured	Total # HDEC* In DMA	Total % HDEC* In DMA
Miami DMA	1,668,780	52.7%
New York DMA	6,225,094	51.3%
West Palm Beach DMA	736,826	49.1%
Los Angeles DMA	5,229,783	47.8%
Ft. Myers DMA	386,538	40.5%
Burlington DMA	299,822	40.2%
Orlando DMA	1,174,680	38.3%
Odessa DMA	138,056	38.0%
Syracuse DMA	251,014	35.3%
San Diego DMA	850,354	35.1%

Through July 2021. \*HDEC = HD Radio-equipped cars.



The objective of making stations discoverable and providing an open platform for stations to identify themselves was laudable. It's like the Yellow Pages of radio, an open platform for stations to describe themselves, to put their logos out there and get certain basic information out to new receivers.

They've had something of a spotty track record. There isn't great geographical consistent coverage, and I think some stations have been a little reluctant to support it.

As the competitive landscape for digital services has matured, broadcasters have to be cognizant of who they allow to access their digital services, and how that access is protected and governed. RadioDNS does not, in my opinion, have that sorted out just yet.

Broadcasters have been very protective of their streaming services. For instance we've seen Audacy and others come off TuneIn so they can build and deploy their own digital radio/IP strategies.

Making your streams available on RadioDNS presents a potential vulnerability to that control and independence of your digital strategy. It's an interesting standard with laudable goals, but now we're in a much more dynamic, competitive landscape, where broadcasters need to maintain control, ensure content protection and exploit opportunities for monetization. The real threat right now is Big Tech, and the industry needs to understand what they're up against and determine how best to respond.



## It brings us to Xperi's DTS AutoStage system. If I'm a broadcaster, should I view you and RadioDNS as competitors?

**D'Angelo:** Remember that RadioDNS is not a service, it is a publishing standard. It's like the Dewey Decimal System — it provides a structure to help find information and services. The availability of those is at the discretion of the station and can vary widely. Some may offer rich services; some may offer basic ones. Others don't

## HD RADIO BY THE NUMBERS



### TOP 10 RADIO MARKETS - HD RADIO AUTO PENETRATION DMAS

Geography Measured	Total # HDEC* In DMA	Total % HDEC* In DMA
New York DMA	6,225,094	51.3%
Los Angeles DMA	5,299,783	47.8%
Chicago DMA	2,196,864	30.6%
Philadelphia DMA	2,078,874	32.7%
Dallas-Ft. Worth DMA	1,878,582	33.3%
San Francisco DMA	2,104,808	42.9%
Atlanta DMA	1,335,230	24.9%
Houston DMA	1,761,105	36.7%
Washington DC DMA	1,676,719	33.0%
Boston DMA	1,991,322	40.6%

Through July 2021. \*HDEC = HD Radio-equipped cars.

**XPERI.**

participate at all. This all leads to an inconsistent and incomplete data set.

In developing DTS AutoStage we have undertaken to build the library, compete with all the information, content and services necessary to support a global, automotive user experience — not only to aggregate information about services but to ensure that those services are consistently available to car companies.

Where RadioDNS may stop at one level of information with metadata about a station and its social links, for example, or about their programming, we go a step further to ensure that the metadata is consistent, that the streams are consistently available, that they have the right quality and bit rate, even the right level of security. That's a big issue, ensuring security and availability to the car companies.

We do this under contractual obligations between broadcasters, aggregators and car companies. We get rights to provide content on behalf of stations to car companies, under specific terms and conditions, and we're obligated to maintain those. We not only ensure consistent service and coverage in, now, over 60 countries, but we provide protection and operational security, to both broadcasters and car companies. We are a service provider where RadioDNS is a publishing standard.

Further, some companies, like Audi, have chosen to use RadioDNS as an ingredient in a service that they build. They can use it as an ingredient — we do too in some cases — but it provides just that, an ingredient.

**RW** If I'm Audacy or Salem and I want to know what that future looks like in hybrid radio, am I precluding one system by choosing another?

**D'Angelo:** No. Absolutely not. There's nothing exclusive about being on our platform and there's nothing exclusive about being on RadioDNS. We believe that DTS AutoStage offers unique and compelling capabilities to broadcasters

and is the best long-term solution for the industry.

Broadcasters should be everywhere, taking advantage of all digital technologies that are commercially viable and add value.

For example, Audi has chosen to bring their in-house hybrid radio solution to the United States. A portion of that is dependent on RadioDNS; so we see broadcasters who are on RadioDNS to support Audi's solution in the States. Then we have broadcasters who have direct integrations with us — Cumulus, Audacy, Salem and many others that have not been made public. There's nothing restrictive or exclusive about being on our system.

For example in Europe you have Radioplayer, which has built a regional service that arguably is similar in some ways to what we deliver.

Companies like the BBC are supporting RadioDNS, they're supporting Radioplayer, and they're supporting us — real-world broadcasters supporting multiple platforms, supporting hybrid radio options and making sure automakers have the flexibility to get the content the way they want to.

**RW** Recently General Motors said it would omit HD Radio from certain pickup models because of the global chip shortage. Separately in recent years we've read stories about whether future cars won't have AM reception or even radios at all. How solid do you feel the presence of HD Radio is in the car?

**D'Angelo:** We believe we have a very good future for digital radio in the car. We get good insight because of the long-term planning cycles of the car industry. There are vehicles' receivers that we're certifying now that we know will go into production and have a three- to five- to seven-year run rate in those platforms. A number of manufacturers have gone standard with the technology and that number is increasing. About 300 different vehicle models now have the technology as standard or as part of a package.

The GM news was brought on largely by the chip crisis, which we expect to abate in the next quarter, based on what we're hearing from TSMC and other large manufacturers.

I think the bigger issue is their public commitment to Android Automotive, and the fact that the Android Open Source Project or AOSP currently doesn't make the implementation of either HD Radio or DAB radio easy for a Tier One or an OEM.

Our efforts with the NAB PILOT Android Automotive initiative include a group of global broadcasters and have been focused on providing an accelerated solution to

Google, to ensure that Android Automotive does support HD Radio and DAB in its Open Source project — this will make it much easier for GM or any other car company that is committed to AOSP to do a robust implementation of HD Radio or DAB.

That platform by the way will enable annual field upgrades — once you've deployed a software infrastructure, you'll be able to add services to the vehicle in the field. That's new for car companies. Tesla has been doing it for a while but they have a customized platform; this will almost be like doing it on a mobile phone. That will provide a great opportunity for broadcasters. And this field upgrade ability will not be limited to Android platforms only.



## What's your timeframe for delivering your proposed system to Google?

**D'Angelo:** We started this project publicly in November of 2020. Behind the scenes, Xperi had been working with Google and five Tier Ones for the better part of 24 months. We did demonstrations at CES 2019 of Android Automotive platforms running not only HD Radio but with DTS AutoStage as well. We worked with Hyundai Mobis, Visteon, Alpine, Panasonic and others to create a rich robust HD Radio and DTS AutoStage implementation.

In November 2020, we expanded the scope to include DAB and input from broadcasters. HMI, Human Machine Interface, will be part of this deliverable.

We believe this project will wrap up in the August timeframe and that we will have certified global software to deliver to Google around September for their engineers to begin to look at and to start to integrate with AOSP.

I've spoken in public events recently with Guru Nagarajan, the head of Android Automotive. He has continually expressed Android's acknowledgement of the importance of broadcast radio, their support of our effort and their willingness to take the input and include it in what he likes to refer to as "our 75 million lines of code behind Android Automotive."

The fact that Google knows this is coming from a project that has engineers that have developed and deployed software in more than 80 million cars is critical. The core group of developers in our Android Automotive project is led by Xperi's SVP of Engineering Gene Parella and has included direct input from carmakers like Ford and the VW Group. It's critical that the software that comes from this effort is of OEM-grade.



## Android Automotive feels like an important juncture in the development of the in-car experience and how radio shows up in it.

**D'Angelo:** Absolutely.

The auto industry is split. Some are enthusiastically embracing Android Automotive and everything that it offers. What sits above it is GAS, [Google Automotive](#)

[Services](#), which is like the application layer on top of the operating system. Some are embracing the operating system but doing their own applications on top of it. Then there are still other car companies that say, "Google is asking for a little too much control over my user experience in the dash; I'm going to take a more independent route and build my own suite of services."

It's not like Android is going to run the cockpit on every car; but they will, I believe, have a significant percentage of vehicles in the next five to seven years.



## You mentioned all-digital stations on the AM band in the United States. Any update?

**D'Angelo:** We have issued close to 40 AM all-digital licenses to broadcasters, so there's significant interest. We have, I believe, four stations on the air, and we've received very good anecdotal information from the broadcasters about the [performance of the signals](#) and even the increase in listenership.



## What else should we know about trends in digital radio?

**D'Angelo:** The installed base of HD Radio is substantial. For broadcasters in the United States, don't be surprised if 35 to 50 percent of your audience is listening to HD Radio in their cars. It's a base big enough for you to really pay attention to and begin to exploit. We'll have the data and will be sharing it in the coming weeks.

Also it's more affordable than ever to convert to HD Radio, so if you are looking at upgrading a transmitter or antenna, I strongly encourage you to look at adding HD Radio at that time.

And there are significant changes in the advertising community, its expectations and ability to exploit what's going on in the dash; so there is clearly a potential return on investment, an ROI now for a broadcaster to monetize HD Radio.

We're seeing it with [Quu Interactive](#), who, I believe, has close to 1,000 radio stations now that leverage their service to enhance the product they're delivering to advertisers. The agencies are starting to expect this kind of service from broadcast radio.

Very soon you'll see insertion orders come in that require digital services; if you're not on in HD, you will be precluded from bidding on those opportunities.

And every platform that radio competes against is a multimedia visual platform with interactivity. Every single one of them. So if you think about how dashboards are being designed — with multiple screens, multiple controls and the expected visualization of audio services — HD Radio gives you a very cost-effective, foundational opportunity to compete in that. When you layer DTS AutoStage, you get even more; but HD Radio in and of itself is going to give you the visual opportunities other platforms have.

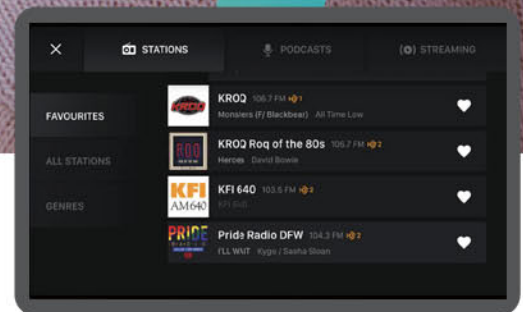
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# Radio, a Natural Point of Discovery

Ben Poor says strategies differ but the goal is always to provide audiences the content they want

**T**he [European Broadcasting Union](#) is an alliance of public service media organizations. It follows trends in digital radio closely. Ben Poor is radio project manager.



**What is the most important trend or pressing issue right now?**

**Ben Poor:** This has to be around “radio in automotive” — it is certainly something we hear as a focus from our members.

Most radio consumption happens in cars in some countries, and it is a very important component in many others. Radio has had a comfortable place on the dashboard in the past, but this is gradually receding, and the prime place on the tuner has given way to a radio button, now giving way to a media button or even a general pot of media through a voice-controlled interface.

It shouldn't be viewed purely as an issue to be tackled, though. Radio listening is still hugely strong, and audiences still expect radio content to be available in cars.

It is a positive thing for audiences that more cars implement “Single Service Lists” to allow a listener to get to their stations regardless of whether it is FM, DAB or IP. “Service Following” allows a listener to keep listening to their radio station as they drive, even if the device moves between FM, DAB and IP based on the local reception.

Having the live radio service augmented with visuals, text information, links to on-demand content will help keep

radio fresh for the future.

Radio is also perfectly placed to be a central part of a personalized media experience. It can be the first point of discovery for new content, backed up by on-demand, archives and podcast material produced over many years. News and information is also still crucial to audiences, and radio provides a stream of local, national and international content to satisfy this.

What we should be doing in the radio industry right now is being more confident in terms of the radio “product” and pushing ourselves with innovation and new user experiences, alongside automotive manufacturers as a more direct relationship. While there are third parties that can be complementary to this, the radio industry should take more of a role itself rather than relying on others.



**Is there an EBU report listing the status of digital radio rollouts in various countries?**

**Poor:** My colleagues in Media Intelligence Services have done some great work in compiling what our members and others are doing with digital radio ([find resources here; an EBU login is free to create](#)).

In particular, there is information on [Radio Distribution Networks](#), which shows what is happening across the entire EBU area, i.e. all EBU member countries with public service media and commercial included.

As can be expected, there is diversity across countries and even within the same country. The majority of existing radio services are still analog, but those countries that are embracing digital are creating new services that are reaching new audiences. The majority of digital stations are commercial, and one-third offer exclusive services, not based on a simulcast from analog.

The EBU does not have a scorecard listing the status of digital radio per se. This acknowledges that digital radio is only part of a larger picture of distribution.

Digital radio itself offers many advantages to listeners, including increased choice and the possibilities for an enhanced user experience over broadcast (or when combined with the internet, the possibilities of what hybrid radio has to offer). The EBU recommends to its members to [implement digital radio broadcast services](#) but not that analog needs to be switched off — this is an individual decision for each member.

It should be said that over recent years, there has been a large push to implement digital radio in France — an



**Right**  
Benjamin Poor

example of how things can happen if there is alignment between broadcasters, government, regulators and others. This perhaps mirrors the work done in Norway, Switzerland, the U.K. and other countries who have mature DAB environments.

**RW** The EBU held a digital radio seminar in February, exploring aspects of digital audio including but not limited to over-the-air. What do you think was the main lesson?

**Poor:** One of the goals of the [Digital Radio Summit](#) is to highlight what the hot topics in radio are at different levels — not just technical but distribution, strategy, content.

It was clear that some broadcasters are embracing a multi-platform strategy with live as the core — using the live broadcast as a brand vehicle that can then drive other, related content consumption.

The [keynote by John Vermeer of iHeartMedia](#) in the U.S. was revealing in that their strategy was to use their live broadcast as a free-to-air and universally available “shop window” to other revenue-generating interactions: on-demand, podcast, short-form, non-audio, etc. The live broadcast is the start of a user journey, complemented by a much larger service offering based on the same brand. Deeper interactions can then be done by other connected applications: Smart TV, smart speaker, mobile/connected car, etc.

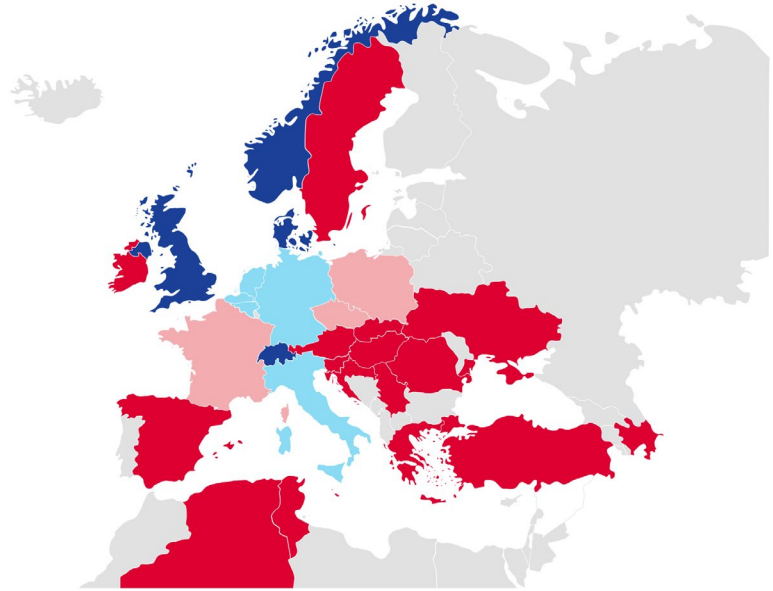
**RW** It was noted that while Norway switched off FM in favor of DAB+, Finland rejected DAB and is focused on IP distribution, and Sweden is slowly moving forward with DAB and online radio. What can be learned by comparing the decisions being made in countries like that?

**Poor:** The main learning was that even with countries that are geographically close and somewhat close in their cultural outlook, different paths are being taken.

The destination is the same in all cases: providing audiences the content they want. Increasingly this is the content that they want, when they want it.

Whether that is digital radio delivered over broadcast or the internet, or a combination of both, it was clear that all three countries were working to the same goals — and in the case of our members from these three countries, working together to do this.

Investing in a broadcast network is necessarily a large investment over many years. It can be seen that, with the support of government and other parties, this can provide the confidence to do it. Without this explicit support, some broadcasters may feel that the risk is too great. In other countries, particularly in the commercial sector, many broadcasters have seen that digital broadcast is an open market waiting for services and have benefited from being the first movers.



**Above** This is from a 2020 EBU Market Intelligence Service report on the state of DAB/ DAB+. Dark blue countries are “digital leaders,” with extensive coverage and new services. Light blue are “digital embracers,” where DAB+ has launched nationally and with at least some digital-only services. Light red are “digital newbies,” with recently launched services but limited coverage or commitment. Dark red are “wait and see,” where regular services or trials are available but there is “nearly no market” due to lack of receivers or commitment. As of early last year there were in total 1,697 digital stations, of which 1,133 were commercial, 393 public and 171 other. About 80% of stations targeted regional or local areas rather than national. About two-thirds of digital stations are also heard on an analog service.

**RW** Is 5G an existential threat to over-the-air radio?

**Poor:** Although 5G comes with some differences that mean it's not just a “bigger pipe,” this does not by default mean it will be an existential threat. At least, it will not present any new existential threats.

Existing broadcast networks provide a space in which audiences can discover and consume radio content: free-to-air, direct, regulated, trusted. The current situation with internet connectivity, especially when supported by a third-party platform, tends more towards a more complicated value chain: platform provider, aggregator, device manufacturer, metadata service provider. All of these contribute to the eventual user experience, such that the broadcaster's influence on this may lessen.

This process began many years ago and will likely be with us for the immediate future. It is something that the radio industry must resolve, or they will just be a provider of content for others to offer. In this case 5G will not change anything, but will reinforce these threats and perhaps accelerate its progress.

Again, it could provide broadcasters with opportunities to provide audiences with experiences beyond live — moving from live, recommended, on-demand and back again, better analytics on consumption, multi-lingual content and live transcription and translation. However, this can only be done when broadcasters directly work together — as EBU members do — and develop a shared voice.

# A Campaign to Encourage Upgrades

Digital Radio UK educates listeners about the benefits of a DAB+ radio

**Right**  
Digital Radio UK  
promotional image

**D**igital Radio UK was founded by broadcasters to work with the supply chain, the automotive industry, the regulator and government to develop and promote digital radio and “help deliver U.K. radio’s digital future.”

Ford Ennals is CEO of Digital Radio UK.

**RW** How would you characterize the U.K.’s digital rollout?

**Ford Ennals:** Advanced and extremely successful. The majority of radio listening is now on a digital platform, with digital listening accounting for nearly 60% of all listening when it was last formally measured by RAJAR in Q1 2020, before the pandemic.

Digital radio has significantly improved consumer choice of radio stations, enabling the launch of a wide range of new stations offering diverse musical genres, news, talk and sport. There are over 400 stations broadcasting on DAB or DAB+ in the U.K., with 54 national stations, 200 local stations and 150 ultra-local stations on small-scale DAB. The regulator Ofcom is expanding the number of areas with ultra-local stations to 200, which could see an additional 1,000 to 2,000 stations being launched on small-scale technology, most of them on DAB+.

There are 25 million DAB domestic receivers in the market plus 15 million cars on the road fitted with DAB and DAB+.

**RW** What’s the goal of your recently launched campaign about the benefits of DAB+?

**Ennals:** We have now reached a critical mass for DAB+ in the U.K., with 26 national digital stations broadcasting on DAB+, which is nearly half the total, and in some major U.K. cities such as London, Birmingham, Manchester and Glasgow there are more than 50 DAB+ stations.

We see DAB+ as critical to the future of digital radio in the U.K. As spectrum is nearly fully utilized and DAB+ allows more stations than DAB to be broadcast in the same capacity, we can expect most future new stations, nationally and locally, to be launched on DAB+.

While most new DAB radios sold are DAB+



compliant, the majority of legacy digital radios in the home don't receive DAB+ stations. Listeners in the U.K. don't understand what DAB+ is or how to receive it, and we judged that now is the time to explain to listeners that in order to receive all the great digital stations currently available to them, they need to upgrade to a DAB+ radio.

**RW** How effective is the Tick Mark, and what are the obstacles to broader use of it?

**Ennals:** The [Digital Tick Mark](#) has been very effective in the U.K. and is supported by the majority of technology providers, radio manufacturers and retailers. Seven hundred technologies and products have been tested and approved, which has helped raise the standard and efficiency of digital radios sold in the U.K.

While the majority of digital radio manufacturers operating in the U.K. support the Tick Mark, it is a voluntary scheme rather than a requirement, so not all do. To receive the Tick Mark, digital radios must be DAB+ enabled, which not all digital radios in the U.K. are currently. We would expect this to change over time.

**RW** What are the biggest obstacles to further success for DAB+ in the United Kingdom?

**Ennals:** The lack of consumer understanding and why they should upgrade their existing digital radio at home to receive DAB+ stations.

The U.K.’s DAB+ station offering is now excellent, and new stations are launching all the time. In order for U.K. digital radio to continue to grow and to launch new and innovative services, it will ultimately require more national spectrum to utilize DAB+, alongside all new digital radios sold in the U.K. to be DAB+ compliant and for listeners to decide to upgrade their existing digital radio at home to DAB+.

**Below**  
Ford Ennals



## ● **New DRM Energy Efficiency Calculator** ***“Savings at Your Fingertips”***

The DRM tool for instant savings calculations and reports

Request access:  
[energyefficiency.drm.org](http://energyefficiency.drm.org)



## ● **DRM Benefits for All** ***“A User’s Experience”***

A new video illustrating advanced digital radio services through DRM

Clear sound, Journaline Multimedia:  
Education, Emergency warnings,  
Additional revenue sources

To watch visit: [videos.drm.org](http://videos.drm.org)



## ● **Digitising the FM band with DRM**

Cost savings, plus more programmes and advertising revenues per broadcaster, as recently demonstrated in India

Read more in  
ABU TechnicalReview issue Q2/2021



# The Dashboard Just Keeps Evolving

WorldDAB automotive conference highlights aspects of digital's progress

## James Careless

A longtime Radio World contributor, James has written about digital radio, shortwave, consumer electronics and other related topics.

**T**he online WorldDAB Automotive 2021 Conference in June provided looks at various aspects of digital radio in the car environment. Here's a sampling of presentations, all viewable on [WorldDAB's YouTube channel](#).

### Extra displays

"Co-driver" displays — those targeting the front-seat passenger — are among "mega trends" dominating the European automotive industry. Another is Android Automotive.

Radio has to act fast to respond to both of these trends, said Martin Koch, head of development entertainment & car functions at Volkswagen CARIAD, during his talk "What's Driving the Automotive Industry?"

He said such displays are turning up now in high-end cars, and their arrival is spurring a demand for high-quality visuals, which can include sophisticated slideshows, full-motion videos, games and multimedia tied to "browsing through the latest releases of your favorite artists," he said.

Unfortunately, only about only 20 radio stations in the world currently support online slideshows, he said.

"This is not enough to really talk about providing a brilliant visual experience to drivers and co-drivers. So my recommendation for the broadcast industry is to make use of the technologies we already have in place

and to develop concepts for attractive visual content to accompany their audio programming," Koch said.

"And it's not only the station logo or weather information: It can be so much more that attracts your customers and keeps them listening to your station and not switching to another media source or other content."

Further, Android Automotive will compete with DAB+ in the space and could undermine broadcast radio if these apps do not incorporate DAB+ features. Koch's advice is for radio stations to build their own apps on the Android Automotive platform and "provide them, through the relevant app stores, to the dash of the car."

### Android Automotive

During the presentation "Global, Open and Available: A Broadcaster-Led Initiative for Radio on Android Automotive," Joe D'Angelo, Xperi's senior vice president of broadcast radio, asked Guru Nagarajan, Google's engineering manager with Android Automotive OS, about the progress being made to bring that OS into the world's cars, and about broadcast radio's place in it.

"The first cars with the Android Automotive OS were launched this past year, and they were on Volvo Polestars," Nagarajan said. "We've been very pleased with the user feedback and the feedback that we're getting from our partners."

Through efforts like the one led by NAB PILOT, radio broadcasters are working to be present in Android

Automotive, in order to preserve their traditional prominence in car/truck entertainment systems. Fortunately, Google seems enthusiastic about radio's place in this new app-driven environment.

"We continue to be very excited about broadcast radio," said Nagarajan. "We think we can bring in a lot more capabilities for broadcasters and provide a platform that allows partners like Xperi and others to innovate and bring in the best from a user experience perspective."

He added that Google is developing an Android Automotive application programming interface, or API, that will allow radio stations to localize their content on the app,

**Below** This image shows a passenger display on the MBUX Hyperscreen, introduced by Mercedes-Benz in January. Martin Koch of Volkswagen CARIAD said the arrival of such "co-driver" displays will increase the demand for high-quality visual content in the dash.

## MBUX Hyperscreen: Co-driver display



and to generally enhance the platform to work better for broadcast radio.

"We would like to continue working with the broadcast ecosystem in both developing as well as innovating in the [Android Automotive] platform, and helping you all accelerate what you are really good at, which is providing the best of services to our users," Nagarajan said.

## France moves ahead

At present, about 30% of France's population can receive DAB+ over the air. By the end of 2022, that should hit 50%, and roadway multiplexes will play a big part in helping them listen in the car.

These points were raised by Jean-Marc Dubreuil during his presentation "France: Automakers and Broadcasters' Preparations for National DAB+."

Dubreuil is WorldDAB's manager for France and a member of the French joint broadcaster/vehicle manufacturer working group.

According to Dubreuil, 25 of France's national radio services will be available in DAB+ on the country's roadways by this fall. This is no small feat: "That means almost 12,000 kilometers of highways and a little more than 10,000 kilometers of main roads to cover," he said. "It's quite a lot."

While this work is proceeding, challenges remain in coordinating the DAB+ rollout between broadcasters and car manufacturers. Specifically, carmakers and radio companies don't necessarily understand their respective business models, said Dubreuil, nor the need to ensure that in-car digital radios are kept up to date.

For instance, he said, "Radio stations were surprised not to see their logos on the dashboard of cars because the logos are sometimes burned into the receiver and often obsolete — because those radios were designed in 2014," he said.

"Since then life has moved on. The logo has changed."

Meanwhile, the complexity of the French radio landscape, with its more than 1,000 FM stations and "a few hundreds of DAB+ services," can make coordinating seamless coverage difficult. This is why it is important for all players in the French DAB+ ecosystem to work together, said Dubreuil.

## Radioplayer hybrid app

WorldDAB has produced a set of User Experience guidelines for automotive manufacturers and broadcasters to help them offer provide the best digital radio interfaces for motorists.

In the presentation "From Principle to Product: Bringing the WorldDAB UX Guidelines to Life in a Hybrid Radio App," Radioplayer's Caroline Grazé and Laurence Harrison described using these guidelines to guide the design and development of their hybrid radio app for the Android Automotive platform.



Grazé is managing director of Radioplayer Germany, Harrison is director of automotive partnerships at Radioplayer Worldwide.

"One of our main aims in building the app was to learn about Android Automotive and work with Google and others to improve the standard radio experience and make sure that it becomes hybrid," said Harrison. When thinking about the user interface, "the foundation of our design principles were taken from the WorldDAB UX guidelines."

Ease of use is fundamental to the Radioplayer hybrid app design, Grazé said.

"The goal that is the most important one for the listener is 'What am I listening to?' I need to know. (And) I need to navigate simply through the UX." The app's tuning database also has to be able to decode listener voice commands, including requests for stations that don't use official call signs.

At an early stage in the user interface design, Radioplayer tested it on the road with consumers. By doing so, "you learn a huge amount about how intuitive the design is and also about the different positions of certain icons, and the features that people really value," said Harrison.

The Radioplayer app now provides a "great hybrid radio experience," he added, and "is being made available to car manufacturers to use on their Android Automotive platforms."

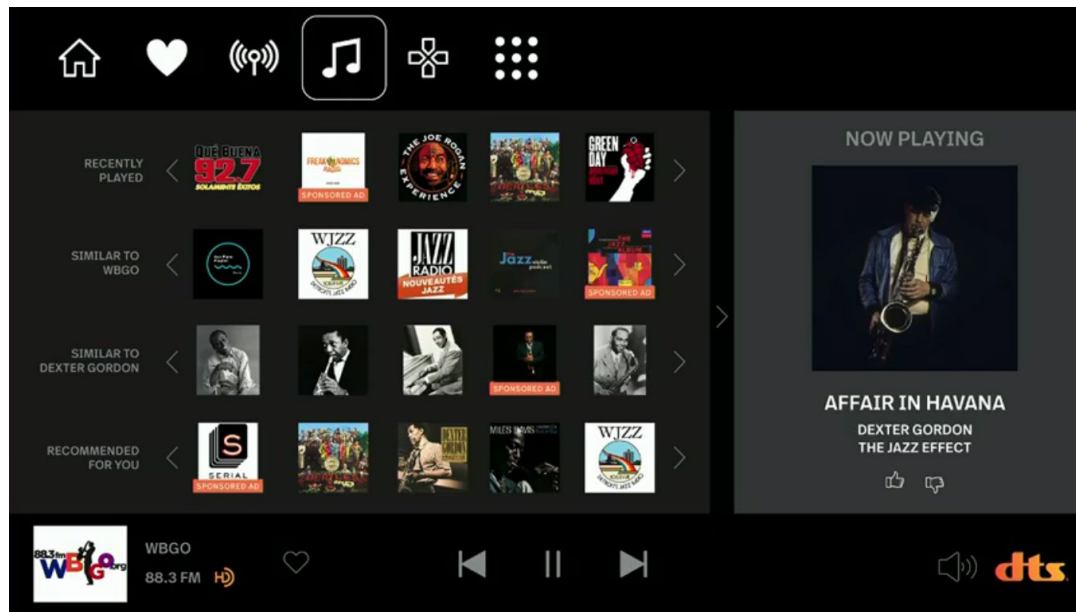
## Swiss DAB+ Retrofits

Switzerland's plan to turn off FM by 2023 is driving DAB+ car radio retrofits, according to the presentation "Case Study: Switzerland, Getting Ready for FM Switchoff With the Auto Supply Chain."

Speaking with host Ernst Werder of Weer GmbH, Jeremy Arzmann of Exclusive Car HiFi and Hans-Peter Saar of Robert Bosch AG described strong consumer demand for DAB+ adaptors to work with existing analog radios, as well as full DAB+ system replacements.

To ensure that Swiss motorists are satisfied with their

**Above** An image from Radioplayer's hybrid radio app that combines DAB+ and FM broadcast radio with online streams in the Android Automotive Operating System. It was developed with Panasonic Automotive Systems Europe. Radioplayer said the app "has a single, multi-platform station list that hides the platform from the user and allows them to select a radio station from the strongest available signal, prioritizing DAB+, then FM, followed by streaming, and automatically switching between platforms if the car moves out of coverage to ensure the best user experience."



about using DAB+ to localize and personalize content to improve listener experiences, and to keep them listening longer.

In Belgium, RTBF, the country's French-speaking public radio-TV broadcaster, is using DAB+'s localization capability to provide enhanced program choice to its VivaCité regional radio audiences.

For instance, this capability allows RTBF to provide seven different radio feeds, historically carried on seven separate FM stations, over four DAB+ regional multiplexes.

"Thanks to DAB+, listeners can choose to listen two different regional morning programs," said Goffin. "This is impossible in FM,

where they can only listen to the morning show that is available in their region."

Localization is also allowing VivaCité to give listeners choices between live sports and non-sports programming over DAB+, which is not possible on FM.

RTBF and the private radio networks in the Belgian French-speaking digital radio alliance [maRadio.be](https://www.madradio.be/) are looking at offering personalized radio programs to listeners using IP feeds triggered by inaudible tones in over-the-air DAB+ broadcasts. This platform could include "addressable radio advertising, just like the addressable TV advertising that started in Belgium last year," Goffin said. It would do so using some kind of DAB+/IP hybrid platform that has yet to be developed by a new working group of RadioDNS, the hybrid radio open standard proponent.

Picking up on the personalization thread, TiVo's Chris Ambrozic spoke about applying the TiVo TV "carousel" model of program choice, using titled images of actual TV programs, to in-car DAB+ to boost listener engagement and loyalty.

"When personalization is utilized, we see very significant changes in viewer behavior," Ambrozic said. "We see people watching about 25% more content on the video side. We see people churning away from their suppliers of content to the tune of about three times less."

TiVo hopes to achieve the same results on DAB+ vehicle displays. "We're taking that concept over into the car and to deliver a series of carousels, algorithmically driven with an understanding of what the person enjoys listening to," he said.

A DAB+ content provider who takes this approach to in-car listening "is going to be able to monetize and deliver the right type of experience, not only from what to listen to, but also from an advertisement point of view."

**Above** TiVo's Chris Ambrozic spoke about applying the TiVo TV "carousel" model of program choice, using titled images of actual TV programs, to in-car DAB+ to boost listener engagement and loyalty.

DAB+ radio upgrades, Executive Car HiFi road-tests products before selling them to consumers.

"Since most larger auto importers are our customers, it's usually very easy for us to get our hands on vehicles where we can test the products in order to ensure that the product is good and fine," said Arzmann.

"Our company has been focusing on DAB+ for quite a long time, and we offer workshops with our partners so that all this technical know-how has grown continuously."

Robert Bosch AG has been working with aftermarket partners such as Executive Car HiFi to meet the demand for DAB+ radio retrofits, said Hans-Peter Saar. In Switzerland, this market is geared towards higher-quality vehicles whose drivers don't want to see adaptors and other devices detracting from original interior decors.

"The end user wants to use the OEM radio like he's used to, and he wants his buttons on the steering wheel to work as he is used to," said Saar. At the same time, they want to see song titles and other graphics, "on their regular radio screen and not on the small adaptor screen."

Finally, some DAB+ equipment upgrades have been tailored for tasteful installations in older vehicles, including those that have achieved "vintage" status, built in 1991 or earlier.

"We have developed a solution where you can mount or install the DAB+ radio in a way that the vehicle doesn't lose its vintage status or its historic status," said Arzmann.

## Localization and personalization

In the final WorldDAB Automotive 2021 presentation, "In-Vehicle Localization and Personalization: What They Mean for Radio Today and in the Future," Swedish Radio Head of Digital Partnerships Tomas Granryd spoke with Francis Goffin, special adviser to the CEO of RTBF in Belgium, and Chris Ambrozic, TiVo's VP of discovery,



# In Australia, DAB+ and RadioApp Extend Radio's Reach

Our conversation with Joan Warner of Commercial Radio Australia

**A**ustralia's DAB+ digital-only radio stations attracted a weekly audience of 2.35 million in 2020, an increase of 15% from 2019, according to GfK data from industry body [Commercial Radio Australia](#). The country's weekly audience for all DAB+ stations, including AMs and FM stations that simulcast on DAB+, reached 4 million.

DAB+ is [on the air](#) in the country's five major metro markets plus several other cities. CRA Chief Executive Officer Joan Warner has said, "DAB+ audiences have grown as a result of broadcasters enhancing their digital radio formats and car manufacturers continuing to add DAB+ radios to their vehicle ranges." GfK data indicates that 2.8 million DAB+ receivers have been sold to date.

In 2016, CRA led an initiative that developed [RadioApp](#),

which makes the country's commercial AM, FM and DAB+ digital radio stations as well as government broadcast entities, available for streaming from one app.

Commercial Radio Australia also recently joined a working group led by the National Association of Broadcasters in the United States that is investigating the use of broadcast radio, internet and voice technology to optimize the radio experience in cars with the Android Automotive operating system, which is being adopted by several major carmakers.

We spoke about these and other topics with Joan Warner.



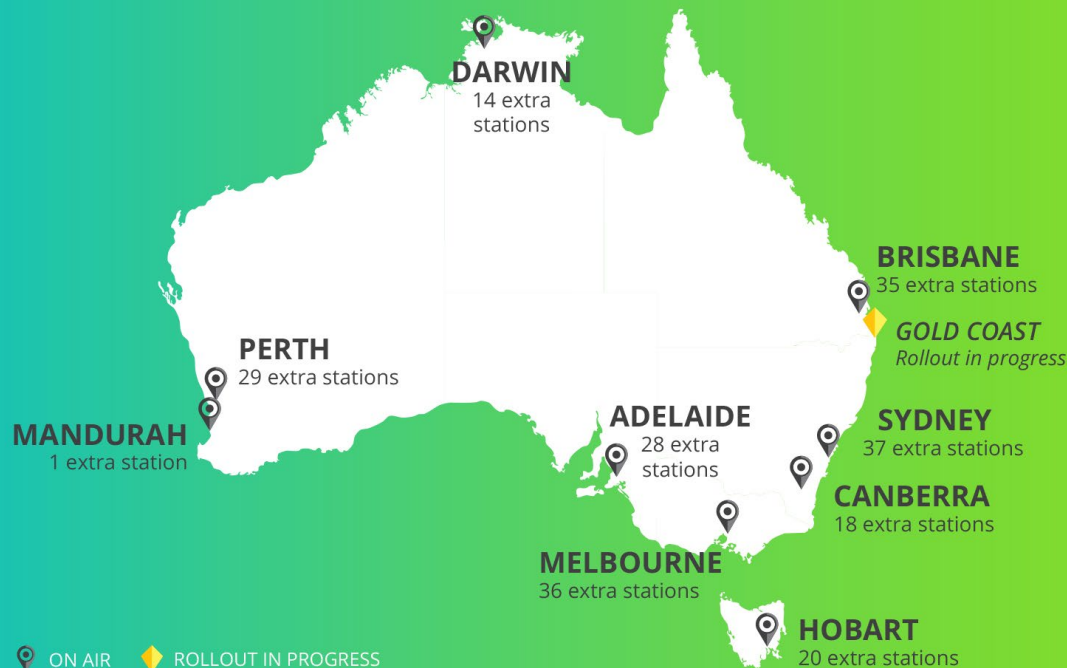
**Can you give us a snapshot of digital radio in Australia?**

**Joan Warner:** In the markets in which it's been rolled

## Above

A promotional image for DAB+ broadcasts in Australia.

## DAB+ POTENTIAL REACH OF 15.1M LISTENERS ACROSS 9 MARKETS



28

**Above** The map shows the nine cities where DAB+ is on air in Australia, covering a population of 15.1 million. "Extra" stations are DAB+ only, in addition to AM and FM services that also broadcast in digital.

out, the five capital city markets and three major regional markets, it's well established.

Consumers have benefited from the establishment of DAB+ because they're getting more radio formats, more variety, more diversity free-to-air.

Broadcasters have benefited from new partnerships. For example one of our networks has set up a special station called Chemist Warehouse, a DAB station played throughout all the Chemist Warehouses, a chain of pharmacies throughout Australia.

Another has formed a partnership with a large retail supermarket chain, one of our biggest, called Coles Radio; it's a station that you can hear on DAB+ generally. It gets a very high audience because the music they play is very popular, and it is filled with Coles — the supermarket and ads for the products on special.

DAB has allowed our members to expand their offerings outside of that one narrow FM or AM frequency.

Of course, all of these stations, AM, FM and DAB+, are streamed as well. And we'll talk about RadioApp.



**How would you characterize consumer acceptance?**

**Warner:** We've got nearly 30% of people listening to DAB+ at some stage during the week in the markets in which it's offered. Fifty-one percent of households have access to a



**Right**  
Joan Warner



DAB radio. Nearly 4 million vehicles on the road are fitted with DAB, nearly 80% of all new cars come into Australia with DAB+ as standard. We've got 30 extra stations in every capital city, which are DAB-generated, and all DAB stations are also available on RadioApp.

**RW** Many broadcasters ask whether they should invest in an over-the-air digital format when there's so many other digital tools available for them as distribution channels.

**Warner:** They need to be a bit more strategic. We know that no mobile network can carry all of radio listening traffic live and local. If everybody tried to do all of their radio listening over a mobile network, the network would crash. We'd break the internet.

And I'm talking about live radio. Podcasting has yet to be proven to be the river of gold we think it will be. I mean, podcast listening is increasing in Australia and in the U.S., but it's still a relatively small part of audio listening. And we need to work out how we monetize it. But even telcos will say, "Yes, we don't want all radio listening on our mobile network, because there'd be no room for anything else." So broadcasters have to step back and take a strategic look and say, "All right, where do we want to be?"

And our answer is, we want to be everywhere. We want to be, as broadcasters, accessible on every single platform we can be. That will be AM and FM in the medium term.

It could be the case in the future that people go, well, "Fifty percent of listening is on streaming, 40% is via DAB, so

maybe it's time to think about an AM and FM turnoff." But that's not on the radar at the moment. Not until we've got digital out into the regions.

So don't pick a winner. You can't afford to.

One of our broadcasters who had the same doubts about digital 10 years ago said, "We're looking at this as defensive spending as well. If we don't do it, someone else will jump in and grab that spectrum and offer a product that we could be offering."

Now it's, "Okay, how can we be more offensive with our DAB+? What are the benefits?" Incremental audience, extra revenue. We've got new stations — and we're able to put all of these stations, including AM and FM, onto our industry RadioApp. Now we've got 400 available on one app, where normally we have only 11 commercial stations in a city in Australia.

**RW** It sounds like the app is an important part of this conversation for you.

**Warner:** It's important. I mean, listening on the internet still is at fairly low levels everywhere. Our research shows us, on average, about 15% of all listeners will listen to radio online, either via an app or on their PC, whatever they're using.

But they are not only solely listening online, they're listening sometimes to broadcast in the car or at home. There's a common misperception, people will look at that 15% and go, "Oh, okay, 15% of all listening is done online." No. It's that 15% of listeners will listen at some stage online, but that's not exclusive listening. Sometimes they're also

**Above** This image from Commercial Radio Australia highlights that stations are available on Google Nest, the national RadioApp, broadcast radios including DAB+, laptops and mobile phones. Joan Warner said, "Broadcasters have to step back and take a strategic look and say, 'All right, where do we want to be?' And our answer is, we want to be everywhere."

listening on their car radio or on a DAB radio at home.

The app has provided us an introduction into organizations like Google and Amazon to get all of Australian radio working properly on their speakers, first time, every time.

Prior to us having RadioApp, the accuracy on smart speakers when asking for an Australian radio station on Amazon was 23%. The accuracy on Google was 40%. As [speakers] became more popular, people got them out of the box and said, "Oh, please play Hit Radio Sydney for me," and what they were coming up with was New York or Los Angeles, or nothing.

That's a missed opportunity for radio to be back where it may not have been for a while, back in the bedroom or the living area.

So we saw it as a strategic play. It was easy to say to Google and Amazon, "You only need to deal with one organization here." Now because of RadioApp, we've got 400 stations on those speakers including every AM and FM and DAB station in Australia, commercial plus the ABC plus SBS and all of their DAB stations. Four hundred radio stations. And there are 3,865 ways to ask for them — by saying the frequency, by saying the name of the station, by saying the name of the station and the town.

**RW** I hear radio people say, "We can't let Big Tech dictate what's going to happen in the dashboard and define our future existence."

**Warner:** When we approached Google and about their smart speakers and said, "We've got a problem, can we work together to fix it for Australia," we gave them some free marketing for their speakers. We'll promote your smart speakers, and you can now find radio easily on a Google or Amazon speaker. They said, "Right, that sounds good to us."

But it can't be defensive. It's got to be, "You've got a problem that you don't know about. You may not get as much usage out of these speakers as you could get, because people put them back in their box or use them just to play Spotify."

[Similarly] with the Android Automotive Group, it's the broadcasters — and now car manufacturers have joined that group — going to Google and saying, "There is a problem here." And car manufacturers are now saying a bit

more loudly, "We need not only streamed radio in the car, but we need broadcast radio, because for emergencies, we can't trust them over a network."

Yes, the connected car, it's all very sexy. But we can't have broadcast non-discoverable. It's got to be easy to discover in times of disaster, in police incidents, terrorist attacks, emergencies — for us, in bush fires and floods. People have got to be able to get to their radio, because the mobile network often goes down.

By having RadioApp, from this streaming perspective, it gets you a foot in the door. "Oh and by the way, how do we work on making broadcast also easily discoverable?"

**RW** You've spoken publicly on the importance of "voice."

**Warner:** Voice tech's not there yet. We're about to release a study on Australian consumers' attitude to using voice, we'd like to know why they're not making more use of it and whether they would interact with a brand, for example, on a car radio or on a smart speaker. Would they trust that to do a transaction with a brand.

I think we'll find there's some hesitation, that people go, "Oh, is Big Brother watching? Are my financial details going to be safe through voice?" Even though people will go online and they give out their credit card numbers.

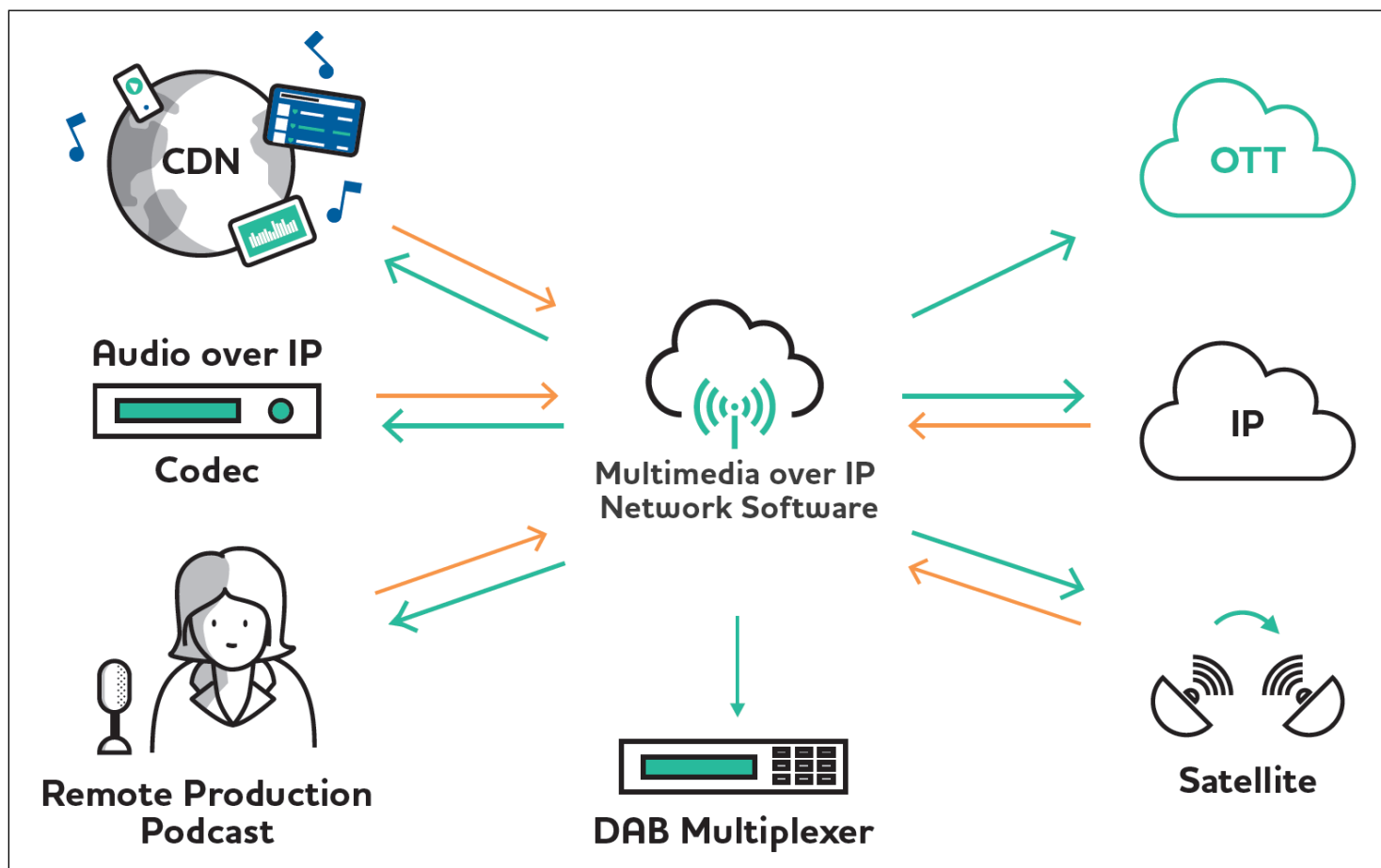
Voice will overcome a lot of problems with finding radio in the car, because as long as you've got the right technology in there, it will be a matter of saying, "Play Triple M Sydney" and the voice instruction. But you've got to have that set up. So I think voice will help with radio discoverability in car, but it's a little way away yet.

**RW** What other countries do you think are farthest along in terms of deploying digital radio?

**Warner:** Countries like Norway, who switched off FM. That's a big step. They are now saying they had a dip in radio listening in their first year and now radio listening has come up higher than before, which should be a heartening story for anyone who might be thinking, "AM and FM is costing me a fortune, digital would be cheaper. Is it time to start a transition?"

Other countries in the world are doing well. The U.K. has done well with it; and I think countries like Germany and Italy are starting to show the benefits of DAB.

**“Because of RadioApp, we've got 400 stations on those [smart] speakers including every AM and FM and DAB station in Australia ... and there are 3,865 ways to ask for them.”**



# Protect the Elements of Your DAB+ Network

There are benefits in keeping your studios, headend multiplexing and distribution network independent

Anke Schneider

The author of this commentary is sales and marketing manager for 2wcom.

**T**he Digital Audio Broadcasting standard has become an integral part of our broadcast world. Australia completed its DAB+ rollout in June. The Bayerische Rundfunk in Germany plans to expand its network to 77 additional stations. In France, the next step of national

DAB+ deployment shall happen in the autumn of this year.

The speed at which DAB is implemented depends mostly on a country's government. National broadcasters must then follow the call for digital switchover where it has been decided.

No one can say today how sustainable DAB+

technology is, or if 5G will be the rising star, or that any other technology is the future for audio broadcast.

Considering this, it makes sense to plan a system that is economical in budget and rack space, one that offers exchangeability of equipment and 365/24/7 transmission robustness.

This can be achieved by a "non-locked-in arrangement" that keeps studio networks, headend multiplexing and the distribution network independent. Such a solution should also be adaptable to future technologies in order to enable a changeover from DAB to the next distribution standard by means of an update. [2wcom's products](#) support such an approach.

**Above** Multimedia over IP network software allows the modern digital network to do much more.

**“In addition to the ability to replace various parts as necessary, there are many advantages to separating the audio portion from your DAB distribution system.”**

### Local studio contribution networks

In addition to the ability to replace various parts as necessary, there are many advantages to separating the audio portion from your DAB distribution system.

All studios of a network can fall back on a unified solution and retain their flexibility. Connection configuration allows for independent selection of the most suitable audio codec. From a budgetary view, such an approach allows all studios in a network to rely on existing audio over IP systems. Or, if existing equipment is at its end of its life, broadcasters have the opportunity to modernize their studio networks.

On the studio side, the AoIP encoder should be adaptable to upcoming broadcast standards. The device should provide multiple channels to save rack space and energy costs, and it should support all audio formats normally in use at the studios.

For example, this allows choosing audio codecs that have a positive impact on bandwidth economies, such as E-aptX, MPEG Layer, or AAC profiles. By providing common protocols and standards for internet interoperability, this assures compatibility between networks.

Absolute stability when operating in wide-area networks is mandatory; this can be attained with features for transmission robustness, like two internal or external power supplies and software redundancy mechanisms. In this respect, the new forward error correction mechanisms SRT (Secure Reliable Transport) and RIST (Reliable Internet

Streaming) offer advantages like bandwidth or latency savings in comparison to Dual Streaming (SMPTE 2022-7) or Pro-MPEG FEC.

### Coordinating studio streams at the headend

At the headend, a Linux-based multimedia over IP network server software is recommended, because it supports the future-proven approach to be expandable for new audio and video broadcast standards. It gives operators flexibility in system design, because the installation can be done on a hardware server or a virtual machine or as a service in the cloud.

The 2wcom solution consists of containers that can be run separately and isolated to achieve good scalability and reliability of the system. Further, Kubernetes can be used as an orchestrator to manage and monitor the containers.

From a budgetary point of view, the transcoding facilities of the software solution not only support the distribution via DAB but also via IP or satellite, or to feed CDNs, OTT services and cable networks. For this purpose, the solution provides protocols and standards for solid network conditions for unicast, multicast and multiple unicast, such as AES67 (and related standards), EBU Tech 3326 or SMPTE ST 2110.

Moreover, due to its channel scalability, it provides the advantage of high density. In interaction with the DAB Ensemble Multiplexer, the multimedia over IP network software has the following tasks:

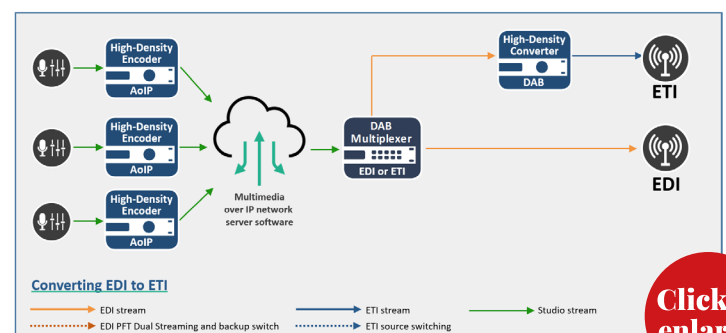
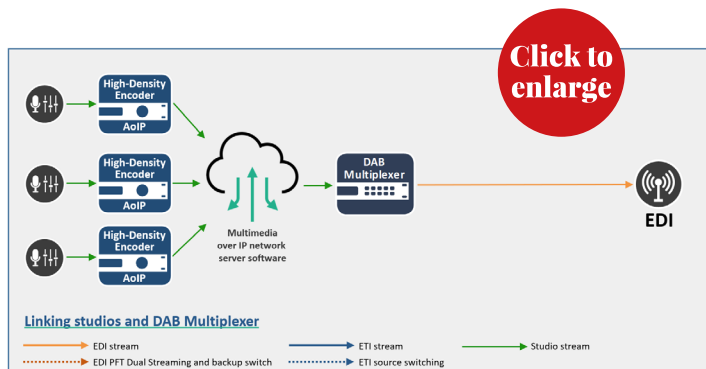
- Transcoding to linear PCM / AES67 of any codec or protocol that the studio forwards.
- Routing to coordinate the incoming streams and available interfaces.
- Clock synchronization via NTP. Because DAB is GPS-tagged, the software solution must adjust the clock of the incoming streams accordingly.
- To forward the station programs via an internal interface to the Ensemble Multiplexer for DAB+ signal assembling.

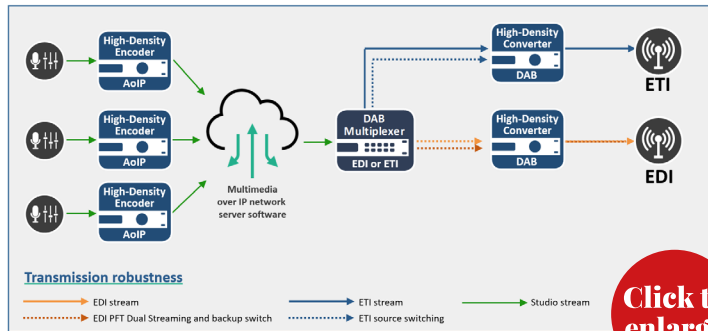
### Headend to transmitter sites

It is obvious that broadcasters have to deal with certain challenges, such as operating DAB in networks—including

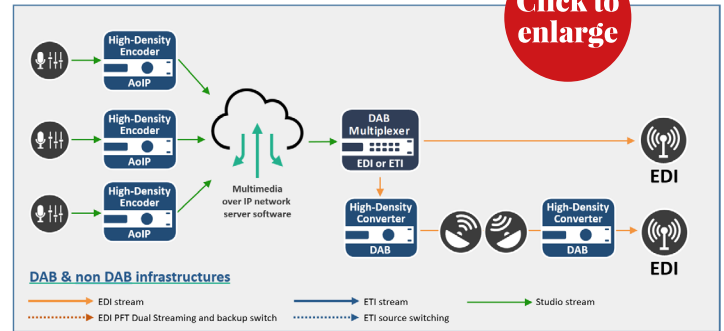
**Below Left** Studio sites can be kept on the existing infrastructure, and all sites are independently interchangeable.

**Below Right** Operating legacy ETI and EDI transmitters in parallel.





Click to enlarge



Click to enlarge

EDI and ETI multiplexers, or legacy ETI and EDI transmitters in parallel — as well as using infrastructures not originally intended for DAB, such as DVB-S/S2 or ASI.

To cope, operators need solutions that enable them to use new and existing infrastructures in parallel.

For example, a high-density DAB+ converter allows reception of the DAB+ stream from legacy ETI and EDI multiplexers and converts the signals accordingly to ingest them into the EDI/ETI transmitters in the field.

As high-density solutions, the devices offer multiple EDI and ETI in/outputs. In addition, bidirectional ETI interfaces (in/out) are desirable to increase the number of ETI outputs if ETI mirroring is needed.

Moreover, the equipment needs to provide a sufficient number of Ethernet data interfaces in and out. Furthermore, an optional satellite tuner and ASI interfaces enable integration into cost-efficient, existing satellite distribution systems or ASI networks to optimize coverage and distribute programs to regions still lacking broadband IP.

For synchronization of all sites, the 2wcom solution provides PTPv2 or an external 10 MHz signal. In case of failure, an internal recovery from the EDI stream by jitter removal assures an ongoing synchronized transmission.

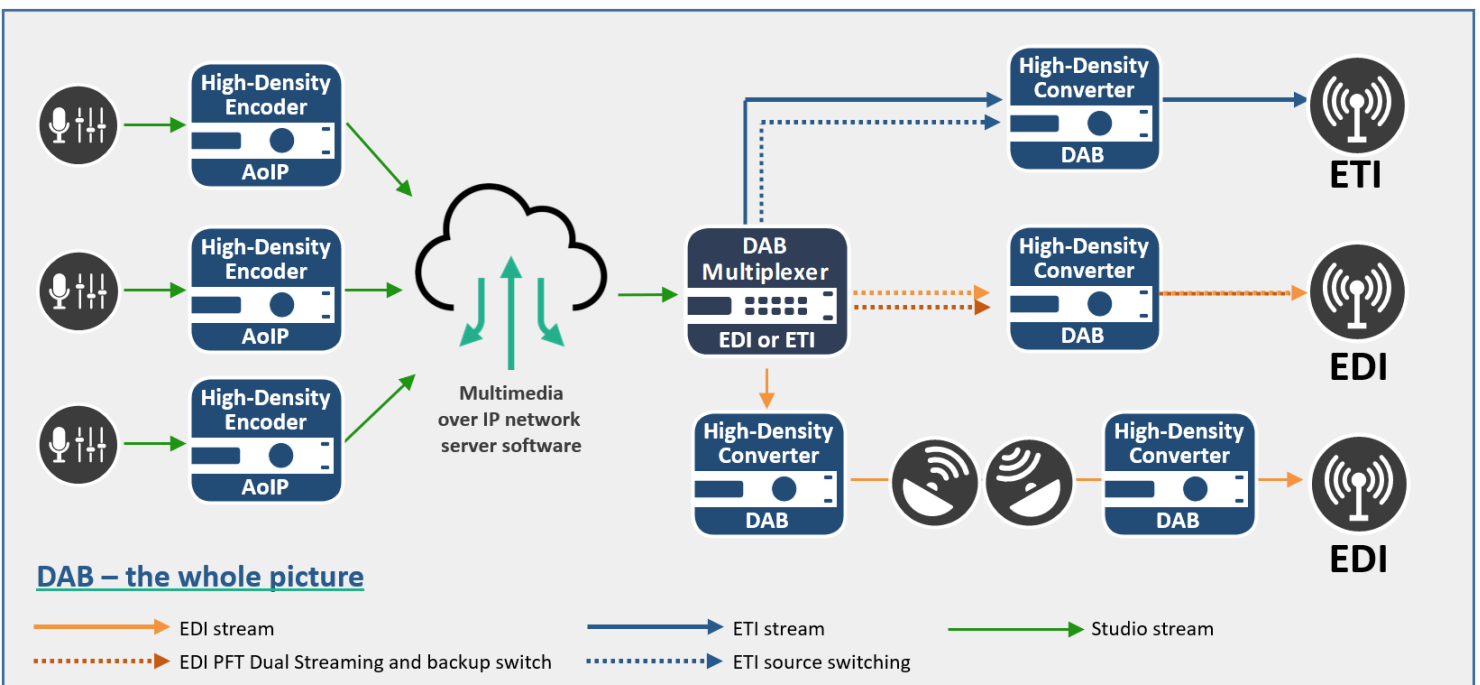
Some legacy ETI transmitter types make it necessary to provide a clock recovery so that the E1 output clock does not change too much in terms of the frequency. This is achieved by repeatedly restoring the GPS reference value using an algorithm calculation.

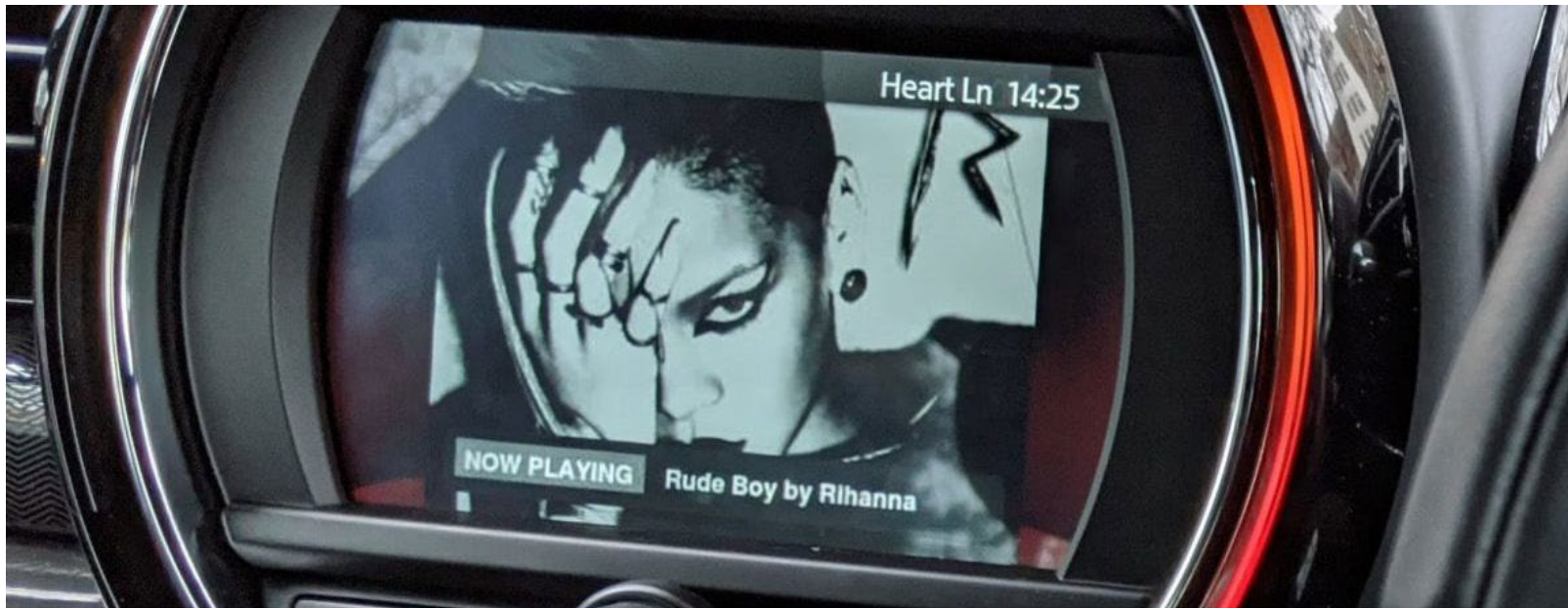
For redundancy, the solution provides PFT Dual Streaming. The ensemble multiplexers can send the streams to the two different data interfaces of the converter. Behind the interfaces, these streams are merged to recover lost packets. If bandwidth is not an issue, two networks can be set up and operated in parallel. To make full use of the dual streaming concept, it makes sense that the equipment not only combines the streams classically. If a stream fails on one data interface, it must be possible to check on the second data interface whether the stream can be received.

**Above Left**  
Reliable distribution of EDI and ETI streams.

**Above Right**  
Distributing DAB+ via ASI or DVB-s/S2 enables use of existing infrastructures and reaching regions still lacking IP.

**Below**  
An economical and robust solution for IP networks that increases the coverage for DAB+ distribution.





# RadioDNS Seeks Consensus on Implementing Hybrid Radio

34

"Our success at encouraging participation is quiet, confident and persistent"

## Above

An image from the RadioDNS website highlights the impact of metadata and visual components in the presentation of radio content.

**R**adioDNS is a not-for-profit membership organization that promotes hybrid radio globally, and creates open technical standards for using internet protocol technology alongside broadcast radio platforms FM, DAB and HD Radio.

Hybrid radio is designed to be a seamless combination of broadcast radio and internet technologies. [RadioDNS](#) provides the DNS lookup that enables additional services and applications to be built; it promotes a set of open standards to enhance the listening experience.

Launched in the Audi A8 in Europe in 2017, RadioDNS functionality is now supported in Audi, VW, Porsche and BMW vehicles in Europe and North America.

Nick Piggott is RadioDNS project director.



**Broadly speaking, how would you characterize the state of digital radio?**

**Nick Piggott:** I think the adoption of digital radio mirrors the adoption of the FM radio that preceded it — somewhat inconsistent across the world.

In the European context, AM is obsolete and FM switch-off is a reality that's starting to roll. That would be considered a bizarre and ridiculous situation in other parts of the world. We don't all move with the same rhythm and incentives.

What we can see, empirically, is that digital radio implemented with conviction is successful for both broadcasters and audiences. The technology is appropriate, and stable, which is a huge benefit when you're considering investing in it.

A substantial amount of the world's digital radio is now hybrid (broadcast + IP), using the RadioDNS standards. It's an inexpensive incremental investment that creates a whole new set of listener experiences and business opportunities around radio listening. Almost all digital radio, and a majority of analog radio listening in major markets will be hybrid within a few years.



**What is the most pressing technical challenge or notable trend within digital radio that industry professionals should be aware of?**

**Piggott:** IP infrastructure is evolving very rapidly, so you really have to be confident at articulating the specific reasons why broadcast (digital) radio has absolutely unique attributes.

There are many, many more product managers and technologists who have an "IP-first" belief, often because they don't have the detail about alternatives, so your voice has to be confident and clear. Organizations like WorldDAB, the EBU and NAB have great research resources to help inform that case.



One of the benefits of hybrid radio is that it can make broadcast radio a useful contributor to a business plan that has been built on a set of “IP-only” assumptions. If you can legitimately bring the scale of broadcast into a conversation about IP, it can change people’s understanding of both technologies.

## And how would you describe the success of the RadioDNS initiative at developing registration and publishing standards for hybrid radio?

**Piggott:** That RadioDNS is the only organization globally creating and promoting open standards for hybrid radio probably suggests we’re succeeding in our mission to find consensus in the global radio community of broadcasters, manufacturers and technology providers on how to implement hybrid radio.

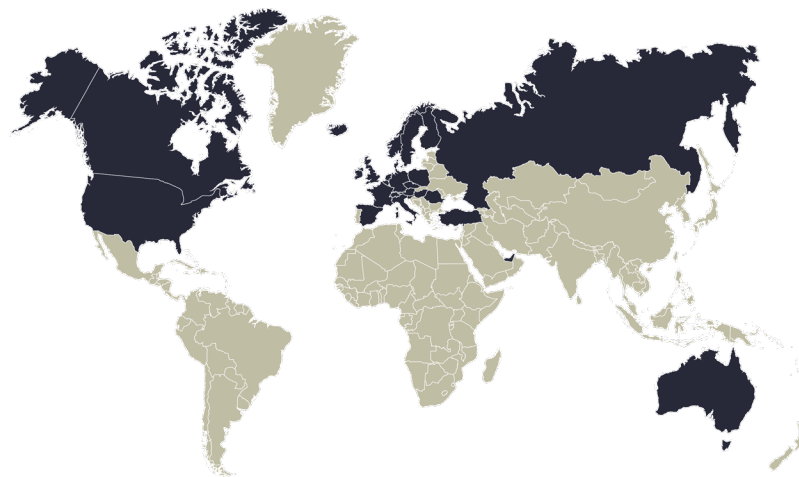
Our success at encouraging participation is quiet, confident and persistent. As a not-for-profit member-owned organization we exist to grow hybrid radio, not own hybrid radio. We ask people implementing RadioDNS if they’ll talk about it, as it reassures other people that our numbers are strengthening, and that grows the “network effect.”

## WorldDAB and RadioDNS organize Automotive Workshops several times a year to talk about implementation issues and identify gaps in functionality. Which issues are the focus as you try to improve the interface between broadcasters and manufacturers?

**Piggott:** The aim of the workshops is to identify places where broadcasters and manufacturers are not properly aligned and are wasting implementation resources, rather than define new functionality and standards. We need to allow people freedom to implement radio in a

## Hybrid Radio Coverage

RadioDNS has a page on its website that provides the updated status and schedule of coverage by broadcasters and manufacturers. It includes a list of broadcasters by country who are providing or intending to provide Project Logo metadata. See <https://radiodns.org/coverage>.



way that allows for differentiation, but not to the extent that functionality doesn’t work properly.

We continue to talk a lot about getting the flow of metadata right. Some car manufacturers have been sold solutions that they now find aren’t appropriate (and even of questionable legality), and want to work out how to fix those. We’d like to get to the right balance between consistency and differentiation when it comes to navigating and presenting radio stations.

In our recent research into receivers, we also identified some manufacturers with functionality that diverged substantially from the norms — such as using a database to create listings of receivable stations rather than scanning the dial — and we want to find out what drove those kinds of decisions.

We’ll be doing a similar research project into broadcasters implementation of functionality, and holding workshops to review the results of both in autumn/fall 2021.

## Which major countries or markets are you watching to see who will adopt which digital standard(s) next?

**Piggott:** DAB+ will certainly continue to grow in Europe, as the rollout becomes more consistent. HD Radio will be the dominant format in the Americas.

Africa and Asia are huge continents without digital radio. Asia is tentatively exploring DAB+, with active trials, and it

would be good for those countries to reach conclusions and commit to rollout. As in many other countries, digitalization with CDR may be what expands the radio industry in China, although in a country that doesn't currently have heavy radio listening, it will be interesting to see the speed of rollout.



**What impact do you expect on the digital radio marketplace from Google's aspirations for Android Automotive?**

**Piggott:** Our highest risk from Android Automotive is that we fail to give ourselves the tools to create a world-class, seamless, app experience in the vehicle.

We need to make sure that OEMs provide radio apps with their cars that at least replicate and preferably surpass the best dashboard experiences of media today, which relies on the radio stations providing their metadata via open standards to power that experience.

Beyond that, it's critical that broadcast radio functionality can be implemented into broadcasters' own apps. For example the iHeartRadio app, or the BBC Sounds App, or the SWR app, should prefer to use broadcast radio (where available) over streaming, and position that as a listener benefit. ("You're using our radio mode — no data use, no buffering.")

It's important that Google has an understanding of all the use cases that would make retaining broadcast radio hardware in the vehicle exceptional and valuable.

If that's achieved, I'm confident that radio will remain a top-level media item in the Android Automotive experience,

**“Almost all digital radio and a majority of analog radio listening in major markets will be hybrid within a few years.”**

and its ease and consistency of use will be valued by drivers.



**What else should we know about current or pending activities by RadioDNS?**

**Piggott:** We continue to develop new functionality on the foundation of open hybrid radio. Our members are looking at open standards for measuring broadcast radio listening, to improve recognition and reproduction of stations via voice assistants, to allow transfer of marked-up metadata from broadcasters to receivers, and to enable personalized and targeted audio to be seamlessly inserted into broadcast radio. It's a fantastic set of ideas built on our standards.

As an organization, we're stepping up our support for people wanting to implement our standards — broadcasters, manufacturers and technology providers. It's more tools, more documentation, more source code and more personal support. With a record 35 members, from across all sectors and parts of the world, the organization has never been stronger.



**An Xperi white paper about hybrid radio states that it “believes that the self-assembly approach that Audi has taken is extremely challenging for other OEMs to replicate, and that the way to scale the opportunity is to create an integrated unified platform.” Please comment on that.**

**Piggott:** Open standards allow each participant to decide how they want to approach implementation. Some participants have decided to build their own platforms, which might be absolutely right for their strategy. Some participants may want to buy in a solution, and have it managed for them.

Either approach is absolutely fine, as long as everyone is using the same open standards, which guarantee interoperability between systems, and means there's no single point of control or failure. A good question to ask a supplier that doesn't want to use the open standards is “Why not?”



**Left**  
Nick Piggott

# Schmid: We Could Unlock New Digital Channels

Nautel CTO also thinks broadcasters must rethink what the definition of a “station” is

India is working to decide how to deploy digital radio on its FM band, and [Nautel](#) has been playing a role in that process.

Digital Radio Mondiale and HD Radio are being evaluated in tests there; and All India Radio, operated by Prasar Bharati, has been testing methods of broadcasting multiple digital signals from one FM transmitter in order to provide a wider range of services.

Nautel says its Digital Multiplexing technology allows a user to combine multiple digital neighboring channels in the FM band, for reception on existing digital receivers. “Nautel transmitters using digital multiplexing allow broadcasters to operate multiple channel allocations out of one transmitter, one antenna and one location, which reduces their equipment needs,” CTO Philipp Schmid said [in April](#).

Nautel said the tests “have successfully demonstrated the viability of combining multiple separate digital channel allocations from one transmitter, each of which carries multiple HD Radio or DRM services. Each channel can be operated independently, allowing several broadcasters to use the same transmitter while maintaining control over their content and distribution.”

Schmid said this concept is a suitable solution for nationwide rollouts of digital broadcasting, “especially in applications where multilingual services are required,” and that the technology is applicable to single-frequency networks, with some of the content remaining local or regional while other channels are sent nationwide.

We spoke to Philipp Schmid about India’s tests and about digital radio’s progress in general.



## How do you view the digital rollout in the U.S.?

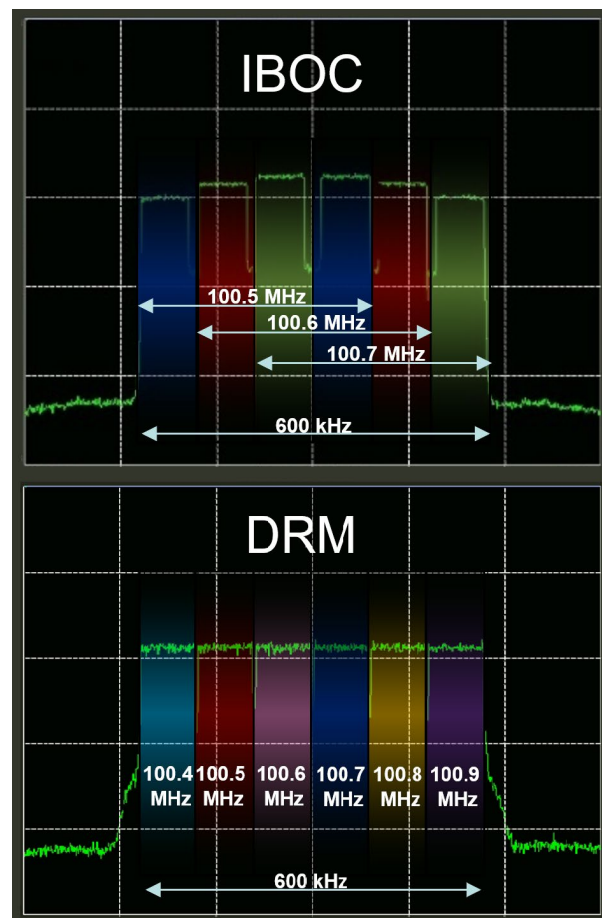
**Schmid:** It is different from the DAB rollout in Europe, where FM sunsets are discussed and in progress.

HD Radio is gaining a lot of momentum in the United States as it builds upon the existing FM broadcasts. In key markets, we are getting close to 50 percent receiver penetration for HD Radio receivers, that’s very impressive. But it will be difficult to sunset FM in the United States unless we can provide an alternative to broadcasters that works with today’s receivers.

While all-digital modes have been part of the IBOC

standard, they have not been fully implemented in receivers; and new all-digital modes are being proposed for inclusion into the standard. To the broadcaster this means turning off the FM provides no additional listeners, i.e. revenue — neither for the old not-implemented modes, nor the new not-fielded modes.

Nautel has developed a solution in which, if a broadcaster is able to license one additional first-adjacent FM allocation to either side of their existing analog FM allocation, they can triple their HD Radio service offering by broadcasting three independently modulated IBOC channel allocations from a single transmitter (see Fig. 1). In this case, by turning off the single FM channel, the broadcaster can gain eight to 10 new digital audio services. Now the all-digital conversion



**Right Fig. 1:** Nautel can combine multiple neighboring all-digital FM channel allocations within a single transmitter broadcast from a single antenna. In the case of IBOC HD Radio, Schmid said Nautel can combine three allocations with four or even five audio services each, for a maximum of 15 services within 600 kHz of bandwidth. “In the case of DRM we can combine six allocations with three audio services each for a maximum of 18 audio services within 600 kHz of bandwidth.”

**“The success or failure of digital standards doesn’t really hinge on the broadcast, it’s receiver availability, which very much depends on regulators providing clear direction to kick-start mass production.”**

becomes a function of how many existing receiver sets are in the market.

We already see precedent for this in the United States on several stations that have turned off their analog AM broadcast in favor of an all-digital IBOC signal, in the MA1 mode. All reported a significant increase in listenership despite now only being receivable on digital HD Radio receiver sets.

In other countries that are not adopting DAB, digitization of the FM band is in its infancy. With our multi-channel transmission capability, Nautel hopes to provide a roadmap from analog FM, to a mix of analog and digital broadcasts towards an eventual all-digital future for those countries.

**RW** You mention the all-digital MA1 mode for HD Radio. There are a few stations in the U.S. that have opted to turn off their analog AM signal in favor of this all-digital mode. What is your experience with MA1?

**Schmid:** Since the FCC has allowed this mode, we now have three prominent stations on air in this mode, with another one coming on shortly. They all report a massive increase in coverage area for a comparable amount of transmitted power down beyond the 0.5 mV/m contour, doubling or even tripling potential listeners to the station.

In markets with a high digital receiver penetration, that can result in a net gain of listenership, especially with the improved audio quality over analog AM.

If you can triple population coverage and if digital receiver penetration is greater than 33% and increasing in your market, you stand to gain listeners despite losing your analog only listeners. The improved audio quality also seems to help ratings measurements as it can better preserve the watermarking signals within the audio.

All-digital MA1 also seems to benefit analog AM stations as it is drawing listeners back to the AM band, exploring what other stations they can find on AM. This shows that MA1 is helping with AM revitalization as intended.

The MA1 proof point is that if we can provide an all-digital technical solution that also makes business sense, then there is a natural tipping point for all-digital conversion that is tied to digital receiver penetration. Starting with hybrid analog and digital broadcasting is a good way to establish this initial receiver base, which is well underway in the U.S. with over 60 million HD Radio receivers.

MA1 proves the U.S is ready today for an all-digital conversion in both the AM and FM band, provided we can utilize the same receivers for an all-digital solution. A digital radio conversion roadmap needs to factor in digital receiver availability in the U.S. and internationally.



#### Where else do you see the action in digital?

**Philipp Schmid:** Nautel has been involved in the digital AM rollout in India. We’ve installed 33 digital AM transmitters for DRM; many started on analog AM but more and more are either simulcasting DRM along with the analog AM or are operating in pure DRM for day parts.

The next step is to move into the FM space. In 2018 the national regulator gave a go-ahead for digitization but they have not specified any standard. So a committee was established to investigate which standard to choose. They selected a Nautel VS2.5 transmitter with a VSHD exciter, to be able to do both HD Radio and DRM modulation on the same transmitter.

The initial tests were in Delhi, at All India Radio’s headquarters. They had a broadcast tower with an antenna and were able to house a transmitter. We worked with both Xperi and the DRM Consortium to equally demonstrate the respective standards on the VS2.5 transmitter. You could broadcast a 1,000-watt FM signal with 120 watts of HD. And then the same with DRM, with various combinations of digital signals.

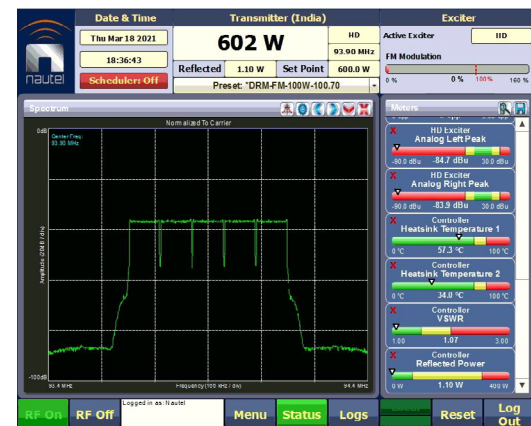
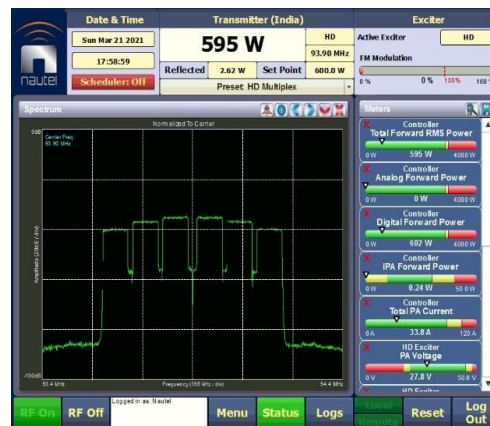
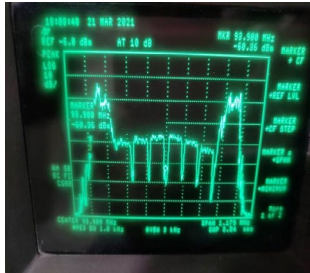
In early 2020 we’d just finished the first set of HD Radio tests when COVID hit. We did not resume until early 2021.

We also shown the HD Multiplex signal (Fig. 1) that uses three HD signals, each carrying between four and five audio services. We were able to show 12 audio services being received on every receiver model provided for the tests. And they’ve done some drive tests with it, picked it up at different locations. That all worked really well.

We also tested a single pure DRM signal, as well as simulcast FM plus DRM, and multiple DRM signals all the way up to six individual DRM signals (Fig 2). And there they were able to show 18 audio signals on DRM.

We don’t have the full report at our disposal, that’s with AIR; but as far as we understand it, both standards performed remarkably well and did not cause any interference in their allocations — that unfortunately did not help them make a decision!

# 600 kHz Demo in Jaipur



	HD Radio	DRM-FM
Spot Frequencies	93.8/93.9/94.0 MHz	93.7/93.8/93.9/94.0/94.1 MHz
Audio Services	12-15 audio services	
Data capacity	186.5 kbps - 372.3 kbps	

**nautel**

Making Digital Broadcasting **Work.**



**It seems as though there is an opportunity for additional FM allocations.**

**Schmid:** Initially in Delhi it was a dedicated tower with a single antenna for the tests; we were able to easily play with all the signal combinations. It was strategically placed around the government buildings, and lots of demonstrations were done for officials in Delhi.

But we also took it to a real transmission site. All sites across the country use Common Transmission Infrastructure — almost cookie-cutter installations, with the same channel combiners, the same power levels, all going through one type of antenna. They wanted to make sure that both HD Radio and DRM could be inserted into one of those installations.

A challenge is dealing with the existing massive FM combiners. Of course nobody wants to be off-air for a trial; so they set up a second antenna, essentially space combining the digital signals with the existing analog stations (Fig. 2). The spectrum analyzer on the left of the image shows the existing two FM allocations from the main antenna. We were able to place both HD Radio and DRM in between on a secondary antenna, to show that there was no interference. A digital signal works really well in between 800 kHz spaced FM allocations — particularly since digital radio requires a lot less power.

The rule of thumb is that 10 percent HD gives you comparable coverage to FM. Similar results hold for DRM.

But because digital requires less power, it has less of an interference potential compared to an FM — and you still get the coverage.

So rather than allocating smaller and smaller transmissions to lower-power FM, why not allocate it to digital, pure digital? It would be lower power, minimizing interference, and you're getting all these extra channel capabilities that you would not with an LPFM. And impressive coverage.

So one thing for regulators to think about is: Rather than just giving out more and more smaller frequency licenses, maybe you should think about digital; by the time we give out all the low-power frequencies to LPFM and others, we no longer have the spectrum available to go in a digital direction like that.



**What are the implications on the receiver side if they were to take that direction?**

**Schmid:** The success or failure of digital standards doesn't really hinge on the broadcast, it's the receivers. Combining multiple digital channel allocations, as we have demonstrated, works seamlessly with receivers, as we do not modify the underlying signal standard. Conceptually it is no different than combining signals in a typical channel combiner. The difference is the transmitter can place adjacent signals without the need for frequency separation.

Receiver availability for either standard is the key for a quick digital transition.

**Above** Fig. 2: An image from the HD Radio and DRM-FM trials in India showing the multiple audio service possibilities.

HD Radio has been in operation for almost two decades in the United States, with many HD receiver models in mass production. Xperi has demonstrated a low-cost feature phone with integrated HD Radio receiver, called the Beatboy, manufactured in the Philippines. We were able to demonstrate multi-channel IBOC reception on this receiver model, as well.

Many DRM receiver models have been designed to date and could quickly be mass-produced once approved by the regulator and consumer demand is established. Multi-channel DRM reception was demonstrated to work on all supplied DRM receiver models.

For either radio standard, existing receiver models are suitable for multi-channel reception, allowing for a migration path alongside analog FM transmission toward an all-digital future.

## How many FM stations are in India?

**Schmid:** I believe All India Radio is on the order of about 500 transmissions.

FM is still something of a new entrant in India. AM is the traditional approach to cover the country simply because of the size. All India Radio has built out most the FM infrastructure; they are covering only about 50 or 60 percent of the population. Many of the people in India don't even have a single FM station to listen to.

What is relatively new in the last decade or so is the entrance of private broadcasters. They're starting to build out, and looking for guidance: Which way is digital going to go, is it HD Radio, is it DRM?

Broadcasters are working with the cellular industry to provide radio services; with the population densities in bigger cities, radio simply makes a lot of sense.

One thing different in India is that broadcasters and cellphone providers are working together; the population density makes streaming media very challenging on the cellphone providers. Broadcast really makes sense here.

A lot of the phones [in India] have a built-in FM receiver, and people use them. Even more so with "[feature phones](#)," the ones with an LCD display and push buttons.

Apparently many people in India listen to FM via their cellphones.

## But if it converts to digital transmission, those would not be compatible.

**Schmid:** That's correct in part. To receive a digital signal you need a digital-capable receiver. However, both standards can coexist with the analog FM allocations and provide a value-add to listeners that can be promoted on the existing FM broadcast, creating demand for new digital receiver sets and keeping both analog and digital broadcasts relevant.

## In Delhi, are they looking at all-digital or hybrid?

**Schmid:** They want to look at the pros and cons of all

the standards. So the majority HD Radio tests in Delhi were hybrid, with the FM carrier and the digital. Xperi supplied more than 300 receivers of various makes and models, and they were all demonstrated and tested. We demonstrated multi-channel all-digital IBOC capability of up to 12 audio services on these receiver sets. We can push it to 15, as we've demonstrated at NAB before, but we wanted to stay with the standard four audio services configuration commonly used in North America today.

DRM-FM was also tested in simulcast configurations along with the FM carrier as well as pure-DRM modes. Multi-channel DRM transmission also worked well on all receivers.

Initially digital transmission can coexist with analog FM. The important thing is to demonstrate a viable roadmap toward an all-digital future so we can plan channel allocations for the future.

## What other countries do you see as taking the lead with digital rollouts?

**Schmid:** DAB is certainly a movement, with Europe going into the DAB space, and with Norway having already turned off some of the FM transmissions in the country.

Every single [new] car sold in the EU [has to have a digital receiver now](#). From what I understand it can be either DAB or DRM; the regulation [just] says it has to have a digital receiver; and there are dual tuners that support both — DRM in Band II or Band III, and DAB in Band III.

No doubt, the DAB rollout is happening.

There might still be an opportunity for community stations on the analog FM band; but perhaps even those would benefit from an all-digital DRM transmission.

An interesting thing to note about DRM and DAB: The waveforms are very different, the transmitters are very different and with potentially different bands, FM band versus the DAB band; but the presentation layer, the way data services are defined, is very similar. They use very similar audio codecs and data services. The two standards are very close at the higher level. This makes it easier for a receiver manufacturer to support both.

## You mentioned dual tuners; those are car tuners?

**Schmid:** Yes, but I've also seen tabletops that have both options built in.

With DRM, there are a lot of models available, however very few are mass-produced. The designs exist and they're being demonstrated. In 2019 at IBC, we showed the multi-channel concept that we tested in Delhi on a VS300 transmitter in our booth; manufacturers showed up with dozens of models of DRM receivers, and they all worked with our signal. So DRM receivers exist. But the mass production engine has to get kick-started.

## Where else do you see digital radio of any format getting picked up?

**Schmid:** Pakistan has publicly announced they have [adopted the DRM standard](#), and the focus initially is to build out DRM in medium-wave AM, with plans to move into the FM space. I believe there's also discussion there to legislate that new vehicles coming into the country have to have a digital receiver.


Indonesia is another country looking at DRM. One of the driving factors is an emergency warning system. Lots of volcanoes in the "ring of fire," and they want to build an emergency warning system in the AM and FM bands based on DRM.

Several countries around the world are experimenting with DRM and HD Radio, so we often see requests for trials.

The European Union certainly is leading in digital receiver and digital uptake for DAB — in particular with the mandate in cars — followed very closely with HD Radio in the United States.

Some countries are considering an analog sunset. Norway started that; Switzerland is close to pulling the plug on analog FM. Denmark is talking about it, the U.K. are talking about it.

The writing is on the wall for analog transmission in a lot of these countries.

 **Your multi-channel solution promises many more audio and data services. That's challenging for broadcasters, particularly smaller ones. They are already trying to be on every new platform. Then to contemplate rethinking the entire broadcast infrastructure to offer additional services becomes really daunting.**

**Schmid:** One [approach] that we're spearheading at Nautel is: Can the cloud help manage this content?

Can we come up with a transmitter where you punch in one IP address in the cloud, then we can manage everything from there? To make it easier for a broadcaster from playout to setting up processing, setting up all your data services and all the things that the little stations don't know how to do.

Once we move it into the cloud, it becomes easier for Nautel or a third party to help get that broadcast going.

That brings us to an interesting story. In Delhi, they completed all their tests; then they tell us on Friday afternoon, "Oh we heard about your HD Multiplex, can you set that up next week, Monday? We want to try it."

Well, here was the challenge. It was the middle of COVID. We had a transmitter sitting in Delhi, in a transmitter room that was locked over the weekend. Nobody had access to it. All we had was a 4G modem to get to it.

We could use one air chain that was already set up for the normal tests; there was Orban processing and an ENCO playout system, one complete air chain set up there for testing.

With that 4G modem, we were able to set up two entire HD Radio air chains in Amazon Web Services in the Mumbai center in India, in-country. We were able to deliver all this content from Mumbai to Delhi over that 4G modem. And it was all real-time. We had content being played out, being processed using an Omnia Enterprise 9s into the fourth-generation HD software, over the internet into the transmitter.

With increased content in digital and with new capabilities in data services, with Artist Experience, traffic services, it becomes very challenging for a small broadcaster to do that; but if you move into a cloud, it becomes easier to manage and centralize across all platforms.



## Other thoughts on the topic of digital radio?

**Schmid:** Listeners today are expecting greater diversity in audio programming and multimedia presentation from radio in comparison to other forms of digital media. Analog FM technology is limited in the number of high-quality audio services it can provide across the band and lacks the multimedia presentation layer. Hybrid or simulcast radio is an important stepping-stone on the way to an eventual all-digital future, but will be limited by the analog FM until it is sunset. Multi-channel transmission of either HD Radio or DRM allows for a migration from all-analog today, to hybrid broadcasts, to all-digital in the future based on shared transmission.

To leverage the capabilities of this new technology, broadcasters will need to rethink what a "station" actually means, from a branding, marketing and "making money" point of view. That requires a rethink. Maybe it's an umbrella of stations. Maybe it's event-based audio channels; if you're a sportscaster you could have multiple games on different sub-channels. Multi-lingual applications will certainly benefit from this technology.

At Nautel we believe it is our role to paint a holistic picture from the technology solution to the application area, so broadcasters can shape it to their own needs.

**“Rather than allocating smaller and smaller transmissions to lower-power FM, why not allocate it to digital, pure digital?”**

# Will the History of RDS Repeat Itself for Digital Radio?

The stakes are higher than ever for radio, thanks to the proliferation of mobile broadband

David Layer

The author is VP, Advanced Engineering for the National Association of Broadcasters in the United States.

**B**ack in 1995, the hot radio technology was the Radio Data System (RDS), a digital subcarrier that can be carried by analog FM signals to provide a low-rate (but super-useful and robust) data broadcasting capability.

Eager for its members to sell new radios that support RDS, the Electronic Industries Association (EIA, precursor to the Consumer Technology Association, CTA) launched a [program](#) to provide 500 radio stations across the U.S. with RDS encoders, to seed the market and break the “chicken or egg” dilemma that plagues so many new technologies. In return, EIA asked for \$5,000 in advertising time per station to explain the capabilities of the new technology.

**Below**

A DTS AutoStage hybrid radio display.

Not all broadcasters were willing to make that deal, however; the EIA program stalled at somewhere around 300 encoders, and RDS technology adoption proceeded slowly.

Fast-forward to 2002 and the authorization by the FCC of in-band/on-channel digital radio using the system we know as HD Radio, developed by iBiquity Digital Corp. (now Xperi).

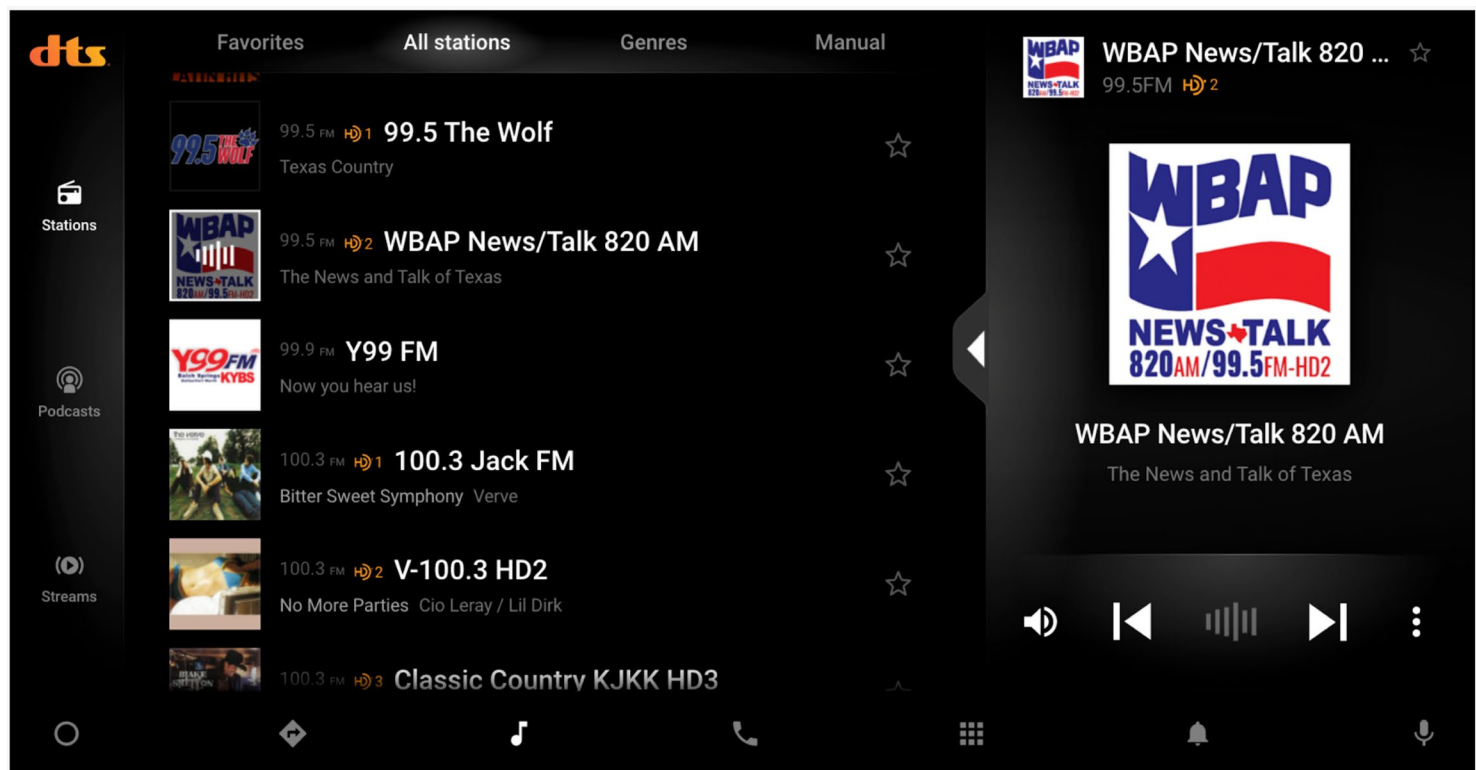
Many broadcasters ultimately embraced digital radio and converted to digital operations, and today digital radio signals are being delivered to the vast majority of US listeners.

My observation back then was that the digital radio revolution had an interesting side effect: It boosted interest in and usage of RDS.

I believe this was driven by two factors: the availability of better, easier-to-use and lower cost broadcast equipment to support data broadcasting, driven by the introduction of digital radio, and broadcasters recognizing that consumer expectations regarding a good radio station was changing to include program-related metadata such as logos, song title and artist.

This second factor was also due to the emergence of satellite radio which, like terrestrial digital radio, can support a richer listener experience than just audio.

It was during this time that broadcasters realized there were hundreds of millions of radios with RDS capability in the marketplace and figured out that a capability of RDS called “scrolling PS” (still in use today) was able to get



listeners the song title and artist metadata they were looking for.

## Unrealized potential

Today, nearly 20 years since digital radio was authorized, and with nearly 80 million HD Radio receivers in automobiles (which still support RDS, by the way), many broadcasters are still not using metadata to its full potential.

In June, NAB released an updated version of the [NAB Digital Dashboard Best Practices report](#), which details some of the problems observed with broadcaster use of metadata and corrective steps that can be taken.

New to this updated report is information on hybrid (over-the-air plus internet) radio which is now starting to appear on car dashboards.

The technologies of hybrid radio and its cousin, audio streaming to computers, smartphones and tablets, stand poised to bring new features and functionality to radio just as digital radio did back in the 2000s. Interactivity, non-linear (on-demand) content and rich metadata are going to be what consumers will learn to expect.

Here is my prediction (and my hope): Just as the introduction of digital radio improved usage of RDS, the introduction of hybrid radio will lead to better usage by broadcasters of digital radio in general, and metadata in particular.

There could be a number of reasons supporting the likelihood of this prediction coming true, for example, newer products and services developed to support hybrid radio will support digital radio as well and broadcasters will take advantage of this dual capability. As has happened before, consumer expectations will once again be raised (this time by hybrid radio) and as broadcasters respond they will again, or maybe for the first time, recognize the value digital radio can bring to their services.



**Above**  
Metadata as seen on an HD Radio display, in this case showing the HD3 channel of WTOP(FM) in Washington.

It's fair to say that the stakes are higher than ever for radio broadcasters, as the proliferation of mobile broadband has greatly increased consumer choice when it comes to audio services.

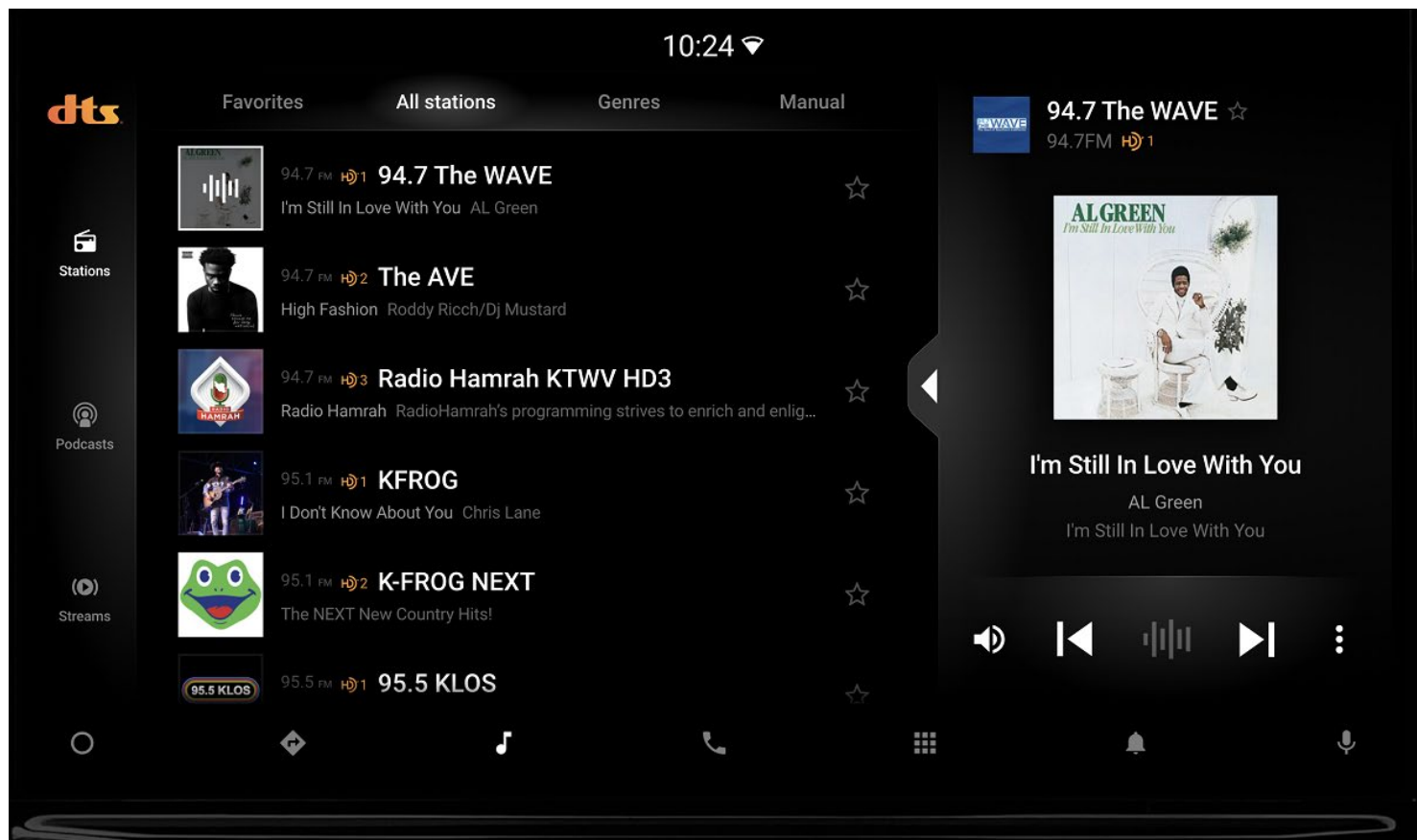
It's important for all broadcasters to embrace the use of metadata so that as consumers scan the terrestrial radio dial, what they see is as useful and compelling as when they scan their favorite streaming audio service or satellite radio. Today that is not the case; but if history repeats itself, the introduction of hybrid radio will result not just in support by broadcasters for hybrid services, but better support for digital radio, too.

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**Below**  
The RDS digital subcarrier system brought useful data broadcasting capability to the U.S. FM dial.



“Just as the introduction of digital radio improved usage of RDS, the introduction of hybrid radio will lead to better usage by broadcasters of digital radio in general, and metadata in particular.”



**Above** An illustration of what an infotainment display could look like in Los Angeles in a car equipped with Android Automotive, if Google accepts recommendations from the NAB PILOT initiative. This shows an enhanced station list for broadcast radio on Android Automotive to ensure station discovery.

# The Critical Role of Android Automotive

PILOT works to have radio fully integrated into that operating system

John Clark

The author is executive director of PILOT at the National Association of Broadcasters.

**F**or radio broadcasters, Android Automotive, Google's automotive operating system, brings together several strands of thinking unlike anything that's come before. For radio broadcasters it creates great opportunity and, of course, challenges.

In vehicles using Android Automotive, we have to think about how the many different pieces individually fit together to create a full consumer experience. Over-the-air radio, hybrid radio, multiple screens throughout the car, open-source software, voice interaction, rich metadata ... and the list of puzzle pieces is continually growing.

First, we must understand that Android Automotive is not Android Auto. The latter is, for the sake of simplicity, the system that mirrors your Android-based phone when you

plug it into a car's dashboard. Android Automotive is the operating system that controls the entire dashboard, no phone required.

However, we can take cues for this in-car environment from the phone ecosystem. The car dashboard is hardware that runs on the Android Automotive operating system much like a phone runs on the Android operating system. The phone has embedded applications as well as applications from various developers. And the hardware components of the phone are exposed (or not) to developers of those applications.

## Seen as well as heard

At PILOT, we're working with a group of radio broadcasters and automotive manufacturers from around the world

# “Broadcasters and developers should be able to access all features of over-the-air broadcasts in their own applications.”

on a project to ensure that the radio tuner and associated hardware components in the car are fully exposed in the operating system to developers.

Broadcasters and developers should be able to access all features of over-the-air broadcasts in their own applications. Additionally, automotive manufacturers should be able to create or supply an “embedded” application for radio broadcasts similar to how an android-based mobile phone offers a “telephone” application.

Broadcast radio is an individual set of features that can then be combined with other features to help create that full consumer experience. Broadcast radio is a necessary requirement for a full hybrid radio experience. Without full broadcast radio support, which includes any and all data, text, images and other metadata being sent with the broadcast, there is a real risk to the consumer experience when an internet connection is not available, unstable or not a purchased service.

These broadcast components take on greater importance considering that radio is more than audio in this environment. Radio is also seen, and that visual experience is an important partner to the audio.

Across multiple screens in the car, consumers expect visuals; they expect to see radio because screens are not made to be blank. If Android Automotive fully supports broadcast radio, developers can use the data from the broadcasts to fill those screens even without an IP connection.

Android Automotive is a powerful and popular operating system, as evidenced by announcements from various automotive manufacturers that will be implementing it in some of their vehicles. Those companies include Ford, VW, GM, Group PSA, Volvo and others. Additionally, ABI Research [forecasts](#) that 36 million vehicles will be shipped with Android Automotive in 2030.

Radio receivers are becoming software — at least, access to radio is becoming software-based. Android Automotive is the critical component in that transition because it is fundamentally open-source software, and developers are the ones creating “knobs” and

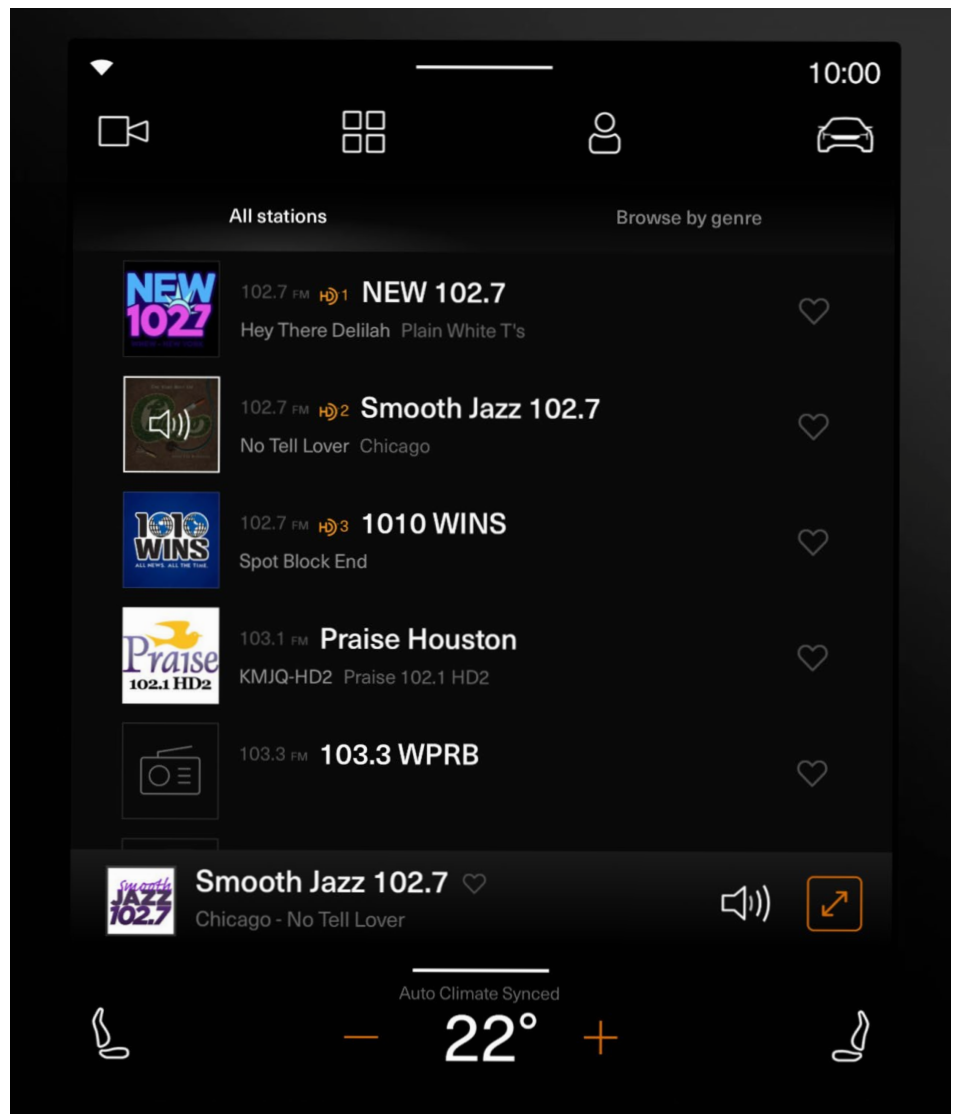
“dials” for the consumer.

It’s critically important to make sure those developers and all broadcasters have access to the full features of broadcast radio.

Companies involved in PILOT’s Android Automotive initiative include Audacy, Bauer Media, the BBC, Beasley Media Group, Commercial Radio Australia, Cox Media Group, Ford, iHeartMedia, New York Public Radio, NPR, Salem Media Group, SWR, TBS Radio and Volkswagen/Audi. Xperi is doing much of the development work.

## Below

Another conceptual image of how a display might look, this one in Chicago.





# Audi Encourages Support for Hybrid Radio

Broadcasters should embrace it to provide metadata via the online connection

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**Above** The interior of an Audi Q5 Sportback, as offered for sale in Europe, is equipped standard with a DAB radio. U.S. models feature an internet-connected hybrid radio.

**C**armaker Audi, a subsidiary of Volkswagen Group, has been active in the realms of digital radio, hybrid radio and metadata. A few months ago, Christian Winter of Volkswagen Group software development subsidiary CARIAD wrote in [Radio World](#) that, three years after the successful launch of hybrid radio in Europe, Audi was now offering that feature in most of its 2021 vehicles, including models available in North America. He also noted that iHeartMedia had started providing RadioDNS support for hybrid radio in Audi cars, and that Radioplayer Canada was supporting Audi with data from more than 350 Canadian radio stations.

For this ebook, Radio World checked in for an update with Anupam “Pom” Malhotra, senior director, Connected Services, at Audi of America.

**RW** What’s the most important digital radio trend right now?

**Pom Malhotra:** Hybrid radio is the newest trend, as more and more cars have a broadband internet connection. Broadcast-only digital radio, like HD Radio for North

America or DAB in Europe and some other countries, is standard in every Audi.

**RW** Audi has been one of the carmakers most engaged with digital radio and hybrid radio. Broadly speaking, how would you characterize the state of digital radio around the world?

**Malhotra:** The standards are very mature, and all new cars come equipped with digital radio in Europe using the DAB standard. Digital radio enables new radio programs because the distribution is cheaper and there is a larger spectrum for new stations. Additionally, digital radio enables nationwide broadcast stations like Deutschlandfunk in Germany or NRK in Norway. More recently, Audi has launched hybrid radio in many of our models both in Europe and in the U.S., which extends FM broadcasts beyond their geographical limitations.

**RW** What can radio entities around the world do to keep broadcast radio prominent in the car?

**Malhotra:** The challenge for broadcast radio is how to compete with the user experience of streaming audio

through an online connection. Using standards like RadioDNS, broadcast radio providers can include metadata like station name, streaming URLs and station logos via the online connection to enrich the listening experience for the customer in the vehicle. In today's vehicles, radio must be visually on par with streaming services and online radio apps in the connected car.

**RW** Which countries do you feel have advanced the most in deploying digital radio, for each of the major platforms?

**Malhotra:** In Europe, DAB is widely used in Norway, Switzerland, the U.K. and Germany. In all European countries, DAB created a new market for new programs and helped channels get better coverage, for example in the Swiss Alps.

Although North America has a rich history in broadcast radio and has innovated significantly with satellite radio and HD Radio, the growth of online streaming through internet radio threatens to make AM and FM radio obsolete over time. This is where hybrid radio can reinvigorate the broadcast industry to appeal to new and younger listeners.

**RW** WorldDAB states that "DAB+ is firmly established as the core future platform for radio in Europe." Please comment.

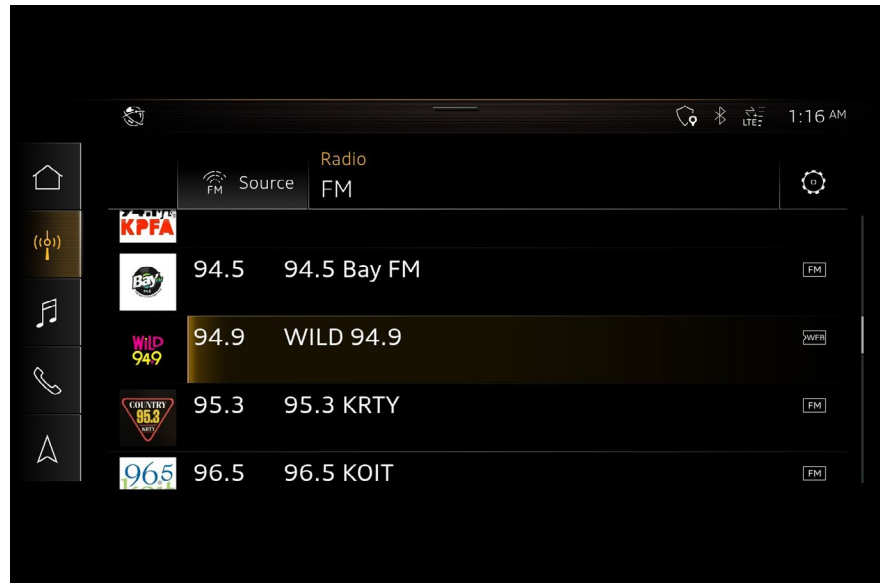
**Malhotra:** From a manufacturer point of view, DAB delivers everything a broadcast radio station needs. With the addition of RadioDNS as the online standard, broadcast radio is ready for the future.

**RW** Which major countries or markets are you watching to see will adopt digital standard(s) next?

**Malhotra:** From Audi's perspective, we have seen all major markets already adopt or are in the process of adopting either HD Radio or DAB as their digital radio standard.



Left Anupam Malhotra



**RW** What impact do you expect on the digital radio marketplace from Google's aspirations for Android Automotive?

**Malhotra:** Android gives listeners the ability to download their preferred internet radio apps via an online store in their vehicle. However, customers will choose their infotainment options based on the attractiveness of content, which means there will always be room for broadcast radio as long as it delivers a competitive listening experience.

**RW** Hybrid radio is part of Audi's MIB 3 infotainment system. What is the status of that rollout, and which media companies are supporting it?

**Malhotra:** Hybrid radio is available now in all MIB 3 vehicles with the high-speed data package for the 2021+ model year — A4, A5, A6, A7, A8, Q3, Q5, Q7, Q8, and e-tron Sportback/SUV. For 2022, that will expand to more models including the all-electric e-tron GT and Q4 e-tron.

Within the North American market, we already have nearly 1,500 FM stations supporting hybrid radio from broadcasters like iHeartRadio, Cumulus, Entercom, Educational Media Foundation, Boise State Radio in Idaho and Radioplayer Canada. More media companies are continuing to grow support for hybrid radio using the RadioDNS standard.

**RW** What else should we know about Audi's current or pending activities in digital radio?

**Malhotra:** Audi continues to play a leadership role in helping to shape the future of broadcast radio. In fact, the chair of the WorldDAB Automotive Group is a senior Audi executive from our CARIAD subsidiary, Martin Koch. Aand Christian Winter, also from CARIAD, represents Audi on the RadioDNS steering board.

**Above**

iHeartRadio announced last fall that it was rolling out hybrid radio compatibility on 600+ stations in North America. Audi said it would offer hybrid radio on certain 2021 vehicles with its new MIB 3 infotainment suite; listeners with an Audi connect PRIME or PLUS subscription can switch between broadcast and digital radio signals when they enter or leave radio signal territories.

# Asia-Pacific Sees Slow Uptake

“The success of any broadcast depends on how many people are able to receive and consume the content”

**A**hmed Nadeem is director, ABU technology at the [Asia-Pacific Broadcasting Union](#). The ABU was established in 1964 as a non-profit, non-governmental, non-political professional association with a mandate to assist development of broadcasting in the region. It promotes the collective interests of radio and TV broadcasters and key industry players, and it seeks to facilitate regional and international media cooperation. Its next annual Digital Broadcasting Symposium begins in February 2022.



**RW** In the regions served by the ABU, how would you characterize the state of digital radio broadcasting?

**Ahmed Nadeem:** ABU as a broadcasting union is technology neutral. I think it best to mention this at the start. We maintain a good and productive relationship with all digital radio and TV proponents.

As a union we work closely with standards bodies to provide information and try to educate our members on the developments, applications, implementation and benefits of all digital standards.

Our members represent a huge region with widely varying geographies, demographics, socioeconomic changes and levels of development. Many of these factors and the individual policies

of our members and the countries in which they are based dictate what technologies and standards work best for them. We are dedicated to help and support them in every way possible.

Now to the question, the uptake of digital radio within the region is very slow. Only a few countries are, at the moment, actively considering a move towards digital radio implementation. There are many factors involved, as I said — not to mention that the move towards digital TV has also been slower than expectations.

We think the biggest reason behind the slow progress of digital radio here is related to business cases and the fast-changing and -developing technology landscape. At the moment, existing operations of AM and FM radio seem to be sufficient to the needs of many countries, so there does not seem to be a strong push from the concerned authorities in this direction.

Also, the changing media consumption habits of audiences and the evolving technologies around media delivery and user devices are strong factors.

**RW** Which countries have adopted digital radio standards and what success have they had with them so far?

**Nadeem:** I think the longest-running digital radio implementation in the region, with notable success, is in Australia with the DAB+ standard.

However, after many years they are yet to announce a switchover date for an analog switchoff in radio; I think this speaks volumes for others who are looking at making the

**Right**  
Ahmed  
Nadeem

“While some countries like Singapore and Hong Kong have stopped long-running trials of digital radio, others like India and Indonesia seem to be taking a huge interest.”

move. Australia is one of the most developed countries in the region and with over a decade of digital radio implementation and rollout. It not being able to complete the switchover has raised questions for others.

But again, there are many factors behind that, some of which are specific to that country and cannot be generalized.

While some countries like Singapore and Hong Kong have stopped long-running trials of digital radio, others like India and Indonesia seem to be taking a huge interest and moving forward with their implementation.

I think the region is looking closely at these two countries and how it develops there.

**RW** In which countries of the region have DAB+ and DRM found the most success?

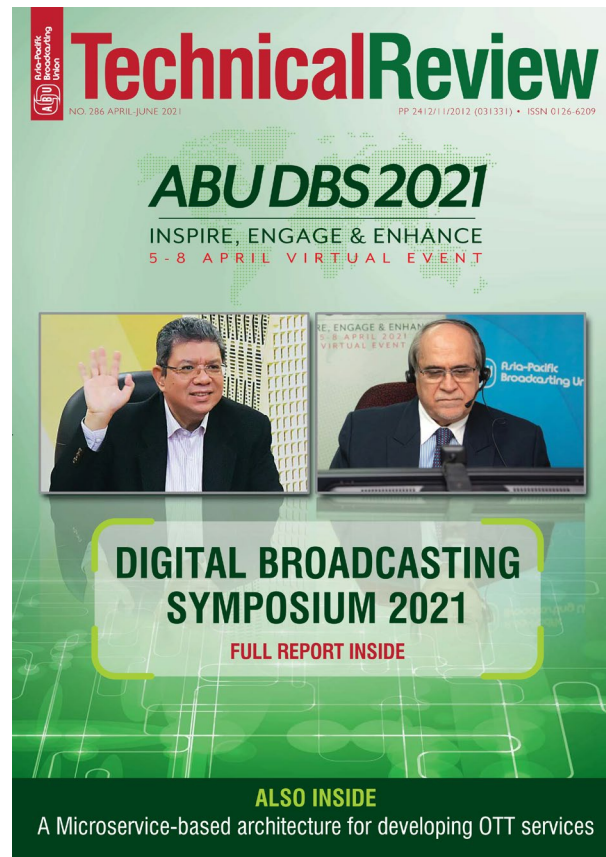
**Nadeem:** For DAB+, at the moment Australia seems to be the most promising with a long-running rollout and a strong foothold in metropolitan cities.

There have been reports that Thailand has also made strong commitments to a DAB+ rollout but these reports are yet to be substantiated. Many countries in the recent past have conducted short trials but none has made a strong move towards a significant rollout strategy or announcement.

For DRM the most promising implementation at the moment is in India and Indonesia. I think these two huge markets could become very significant implementations depending on how far it goes and how successful it proves to be. Many other countries and broadcasters are closely monitoring these developments in India and Indonesia.

**RW** During a recent online event of the European Broadcasting Union, it was noted that Norway switched off FM in favor of DAB+; but Finland rejected DAB and is focused on IP distribution; and Sweden is slowly moving forward with DAB and online radio. What should we conclude from comparing the decisions being made in neighboring countries like that?

**Nadeem:** I think these decisions by close neighbors and economically advanced nations actually shows how the changing consumer habits and evolving technologies play



**Left**  
An issue of the Asia-Pacific Broadcasting Union's Technical Review contains an overview of the latest Digital Broadcasting Symposium; [access it here](#).

a stronger role in such decisions. They also show that what works well for one country may not for another. It depends on many factors.

The success of any broadcast depends on how many people in the population are able to receive and consume the content being delivered. So it is important to study what technologies are available for the public, how they are consuming content, what methods are trending and how much of the existing or planned infrastructure is going to support such trends.

If these are clear, making an informed decision is not going to be very difficult. There is no one specific formula that will work for all, though, as there are many variables at play. It all depends on which variables are the strongest in a given market and developing a formula based on those for a better outcome.