



DAB+ Digital Radio

Lindsay Cornell, Principal Systems Architect, BBC
Chair, WorldDAB Technical Committee



Topics

- 1** The DAB system
- 2** Analogue vs. Digital Topologies
- 3** Emergency Warning System
- 4** Final Words



DAB digital radio - the benefits

- More choice for listeners
- More opportunities for broadcasters
- Consistently good sound quality without interference
- Radios which are easy to use with presentation that keeps radio alive

DAB core

- Designed for rugged mobile reception
- Uses band III (174 to 240 MHz) spectrum
 - Wide bandwidth of 1.536 MHz prevents flat fading
- Delivers up to 1.8 Mbps in a single channel
 - Typically configured for 1.2 Mbps
- Permits up to 64 services in a single channel
 - Typically around 20 radio services and additional multimedia content are provided

Radio services

- DAB has user friendly benefits
 - Select service by name or logo
 - Consistent audio quality
 - Extra information e.g. text services
 - Service following means no need to retune when moving about
 - Multimedia applications to enhance the audio are available
 - SlideShow images
 - Extended service and programme information (SPI)
 - Traffic and travel information

DAB+ audio

- HE-AACv2 audio
- Low and consistent audio delay for all services
- Clean “point-of-failure” characteristic at edge of coverage
- Fully reconfigurable
 - Services can use any bitrate between 24 and 192 kbps providing broadcaster choice
 - Example: UK pop stations using 32 kbps for niche genres
 - Example: Swiss classical music stations using 88 kbps for live concerts
 - Services can vary the capacity they use to allow “pop-up” services to be introduced for special events

Rugged Reception

- Radio is a medium consumed everywhere and especially on the move
- Multipath propagation – the reflection off trees, buildings, hillsides – is a fact of life
- The signal arriving at the receiving antenna is composed of a number of contributions with different delays and magnitudes
- It affects all radio signals whether analogue or digital, terrestrial or satellite, and results in frequency selective fading
- DAB's wide RF bandwidth and digital system design parameters mitigate the effect of multipath

How DAB works

- It uses a wide-band signal to guard against fading
- It uses COFDM
 - Coded Orthogonal Frequency Division Multiplexing
- which means
 - time and frequency interleaving
 - forward error correction
 - multiple carriers

COFDM

- Frequency interleaving
 - distributes the errors due to carrier cancellation throughout the data stream
- Time interleaving
 - distributes the errors due to fast fading across a relatively long period
- Forward-Error Correction (FEC)
 - allows receiver to retrieve lost data by exploiting redundancy in the transmitted signal
- Multiple carriers
 - increases the data rate available

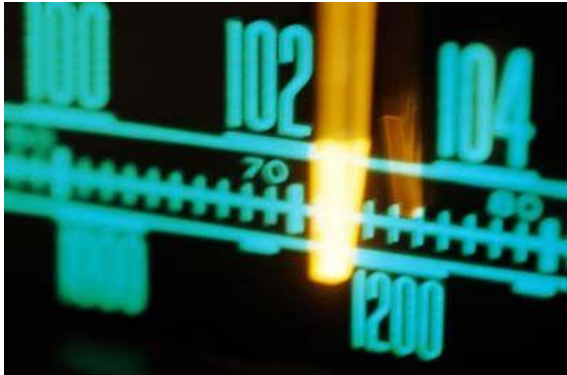
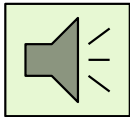
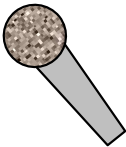
Benefits of COFDM

- Robust reception:
 - tolerates Doppler shift and signal fluctuations
 - tolerates multipath propagation
- Single Frequency Networks (SFN) possible:
 - all transmitters can operate on the same frequency
 - receivers benefit from signals from several transmitters - Network Gain
 - high spectrum efficiency

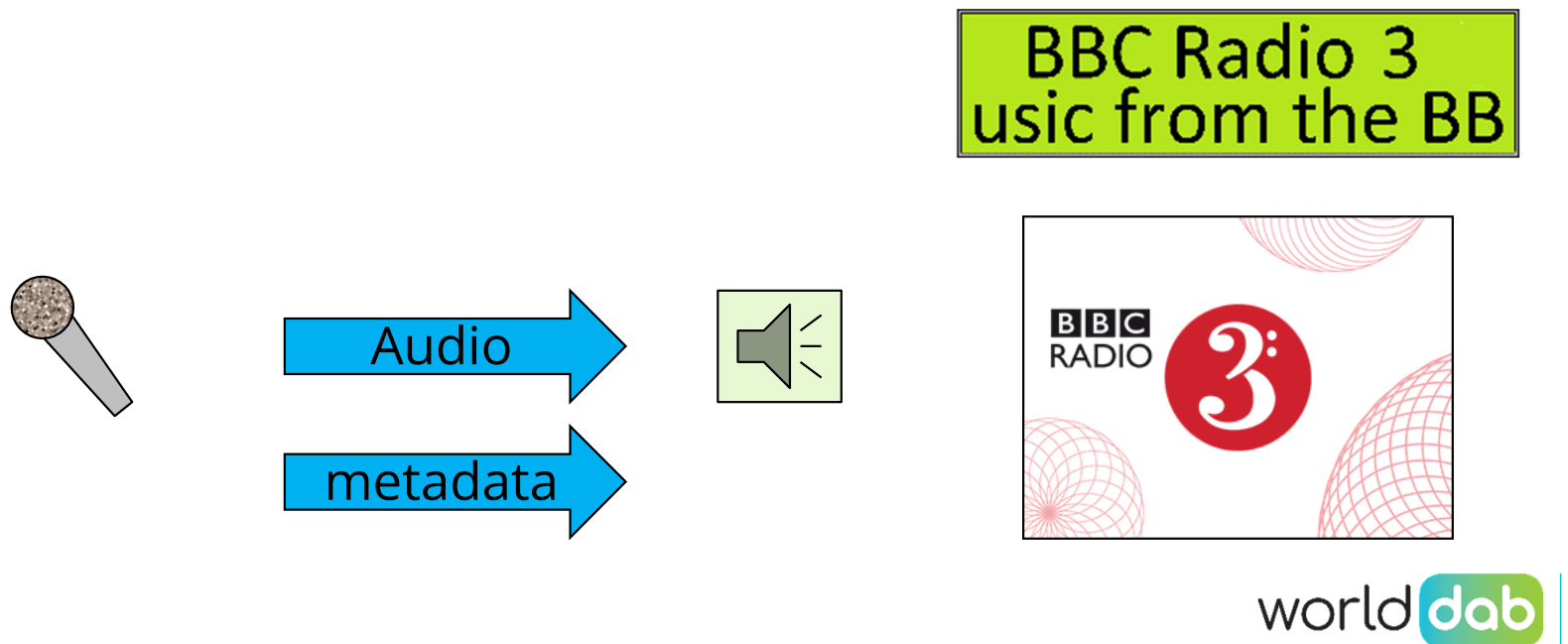


2. Analogue vs. Digital topologies

AM and FM : audio only

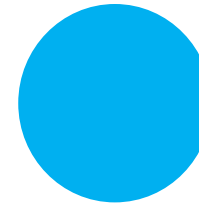
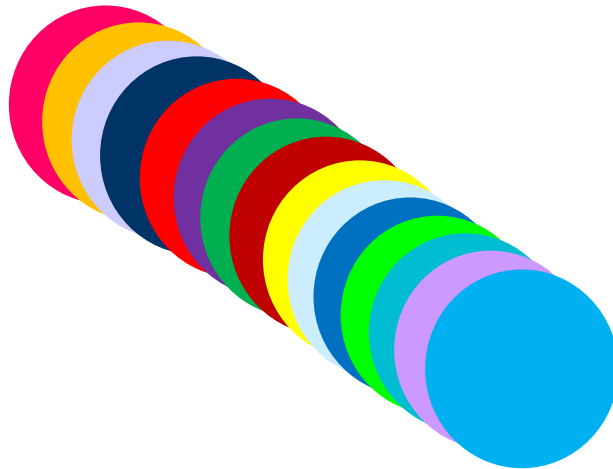


DAB+ : enhanced metadata, visual applications



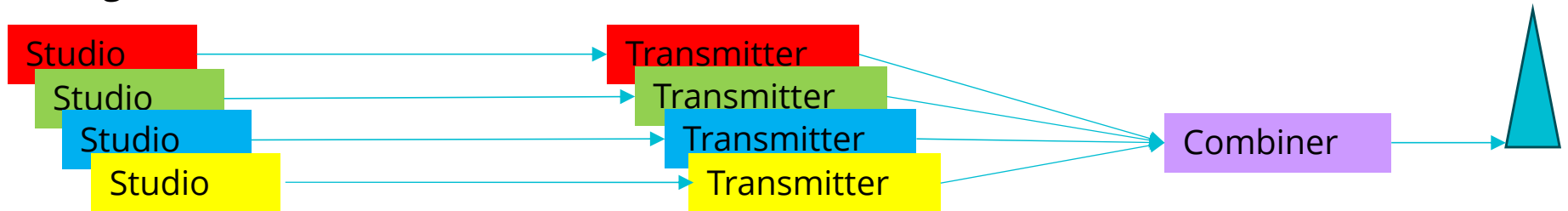
Multiplexing

- Analogue – AM or FM
 - 1 radio station = 1 frequency
 - 15 to 25 radio stations = 15 to 25 frequencies
- Digital – DAB+
 - 15 to 25 radio stations = 1 frequency

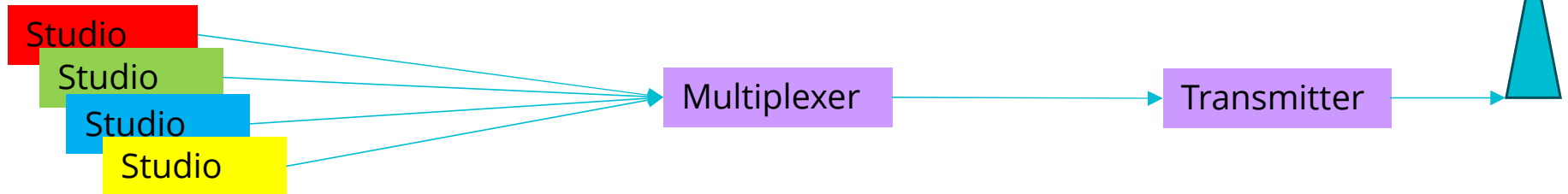


System design

- Analogue radio stations

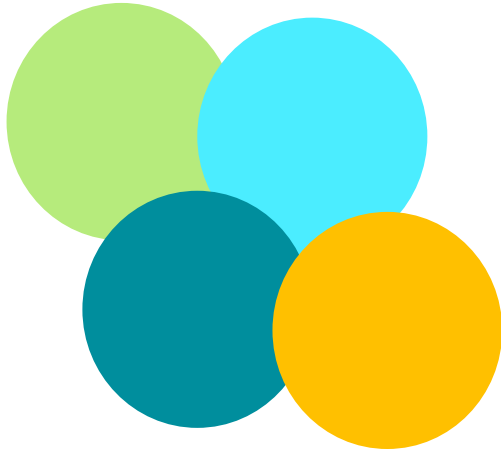


- Digital radio stations

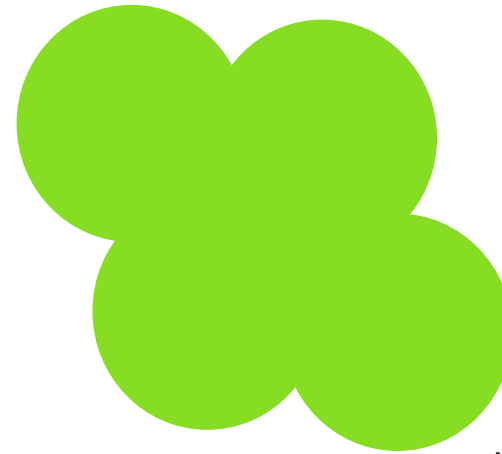


Coverage

- Analogue – AM or FM
 - More coverage requires more frequencies and more transmitters



- Digital – DAB+
 - More coverage requires more transmitters only (Single Frequency Network)



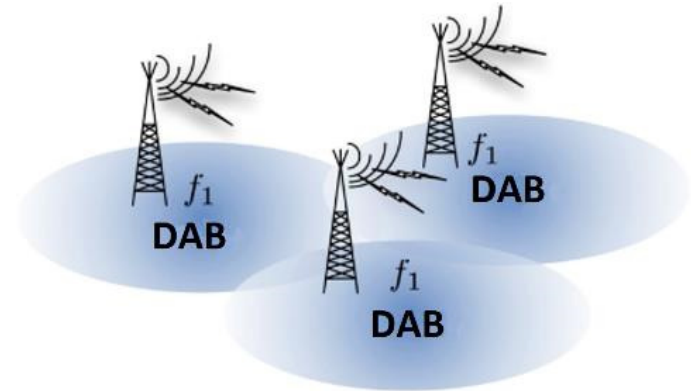
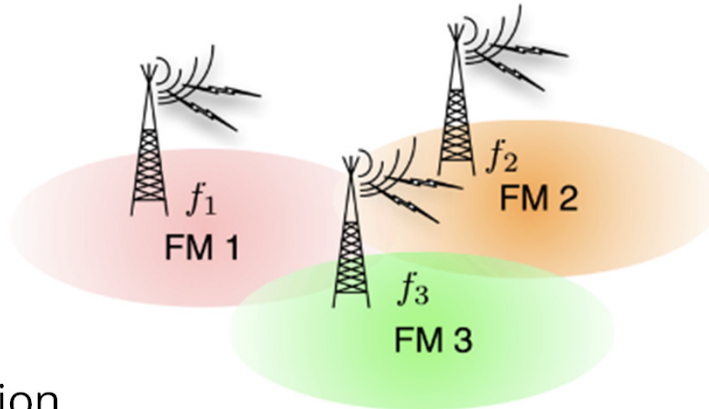
Single Frequency Networks

Benefits:

- Network gain
- Coverage extension
- Spectrum efficient hole filling

But:

- No localisation of content



DAB Planning

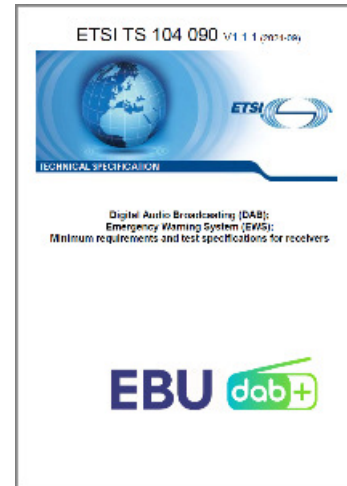
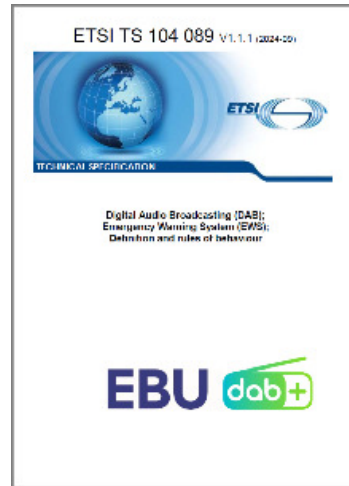
- ITU-R Rec BS.1660 provides planning parameters for DAB
- EBU Tech 3391 is a comprehensive guide to planning DAB and is available here:
<https://tech.ebu.ch/files/live/sites/tech/files/shared/tech/tech3391.pdf>
- WorldDAB held a seminar in March 2024. Details and presentations are available:
<https://www.worlddab.org/dab/dab-plus-network-planning>



3. Emergency Warning Systems

Emergency Warning System

- A new Emergency Warning System for DAB has been created recently
- New standards document the system description, signalling and receiver behaviours to support a receiver testing compliance scheme



DAB EWS: Key features

Alert Messages

- Spoken message for essential information: where, when, what to do
- Cross ensemble signalling to inform receivers when an alert is active
- Location targeting to reach the right people (and not disturb the rest)

Sleep and Wake-up

- Receivers have a low-power sleep mode but monitor a DAB ensemble for alert signalling even when sleeping
- Receivers evaluate alert signalling and wake-up to play the audio, retuning to another ensemble if needed

Receiver testing

- A formal testing specification to ensure that receivers react correctly to the alert signalling
- This technical standard to be the basis for a compliance scheme with a recognisable Mark to be used on product packaging

Three key innovations

- A novel location coding system
 - Alert areas and DAB ensemble coverage areas will rarely align
 - Globally applicable with a resolution of c.1 km²
 - Lightweight with high coding efficiency
- New signalling specifically tailored to alerting
 - Identification of participating ensembles
 - Identification of incidents, the alert stage, its importance, its location
- Receiver synchronisation
 - to minimise audio loss at the start of an alert
 - to maximise battery life

Roll-out plans: Germany

- Major flooding in 2021
 - 135 people killed
 - extensive damage to roads, bridges
 - water contamination, crop losses
 - Mobile phone networks out of action for days
- EWS network infrastructure rolling out for public launch in 2025



DAB receiver testing and certification

- For DAB receivers, the ETSI standard TS 103 461 is the basis of receiver testing
- It is used for the Digital Radio UK Tick Mark certification scheme
- It provides functional and performance requirements for DAB receivers
- It provides test methods and success criteria for both core technology (i.e. chips and modules) and for products



EWS testing and certification

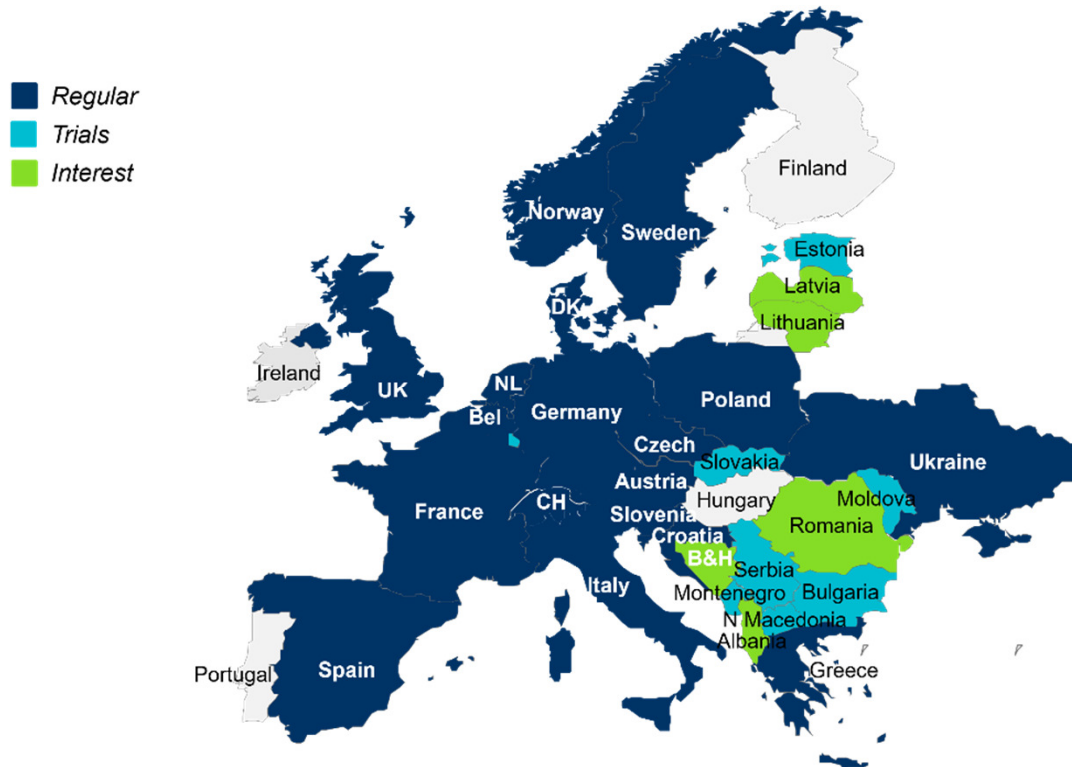
- EWS testing builds on top of DAB receiver testing
 - Manufacturers are already familiar with the processes
- The new ETSI standard sets out the additional testing and results needed for achieving the EWS certification mark
- The EWS scheme ensures public safety
 - Devices carrying the EWS mark have proved their reliability and compliance in an independent test laboratory





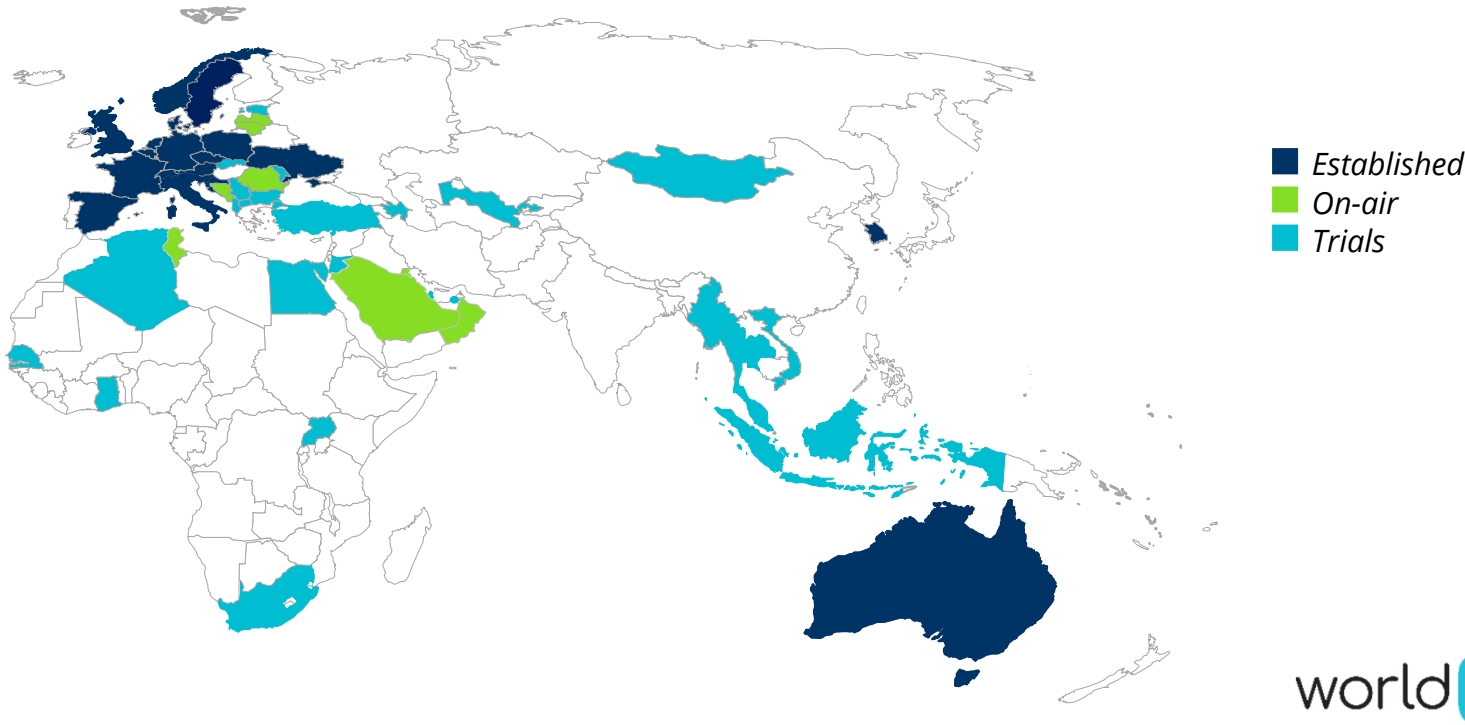
4. Current Status

In Europe, DAB+ is the core digital platform for radio

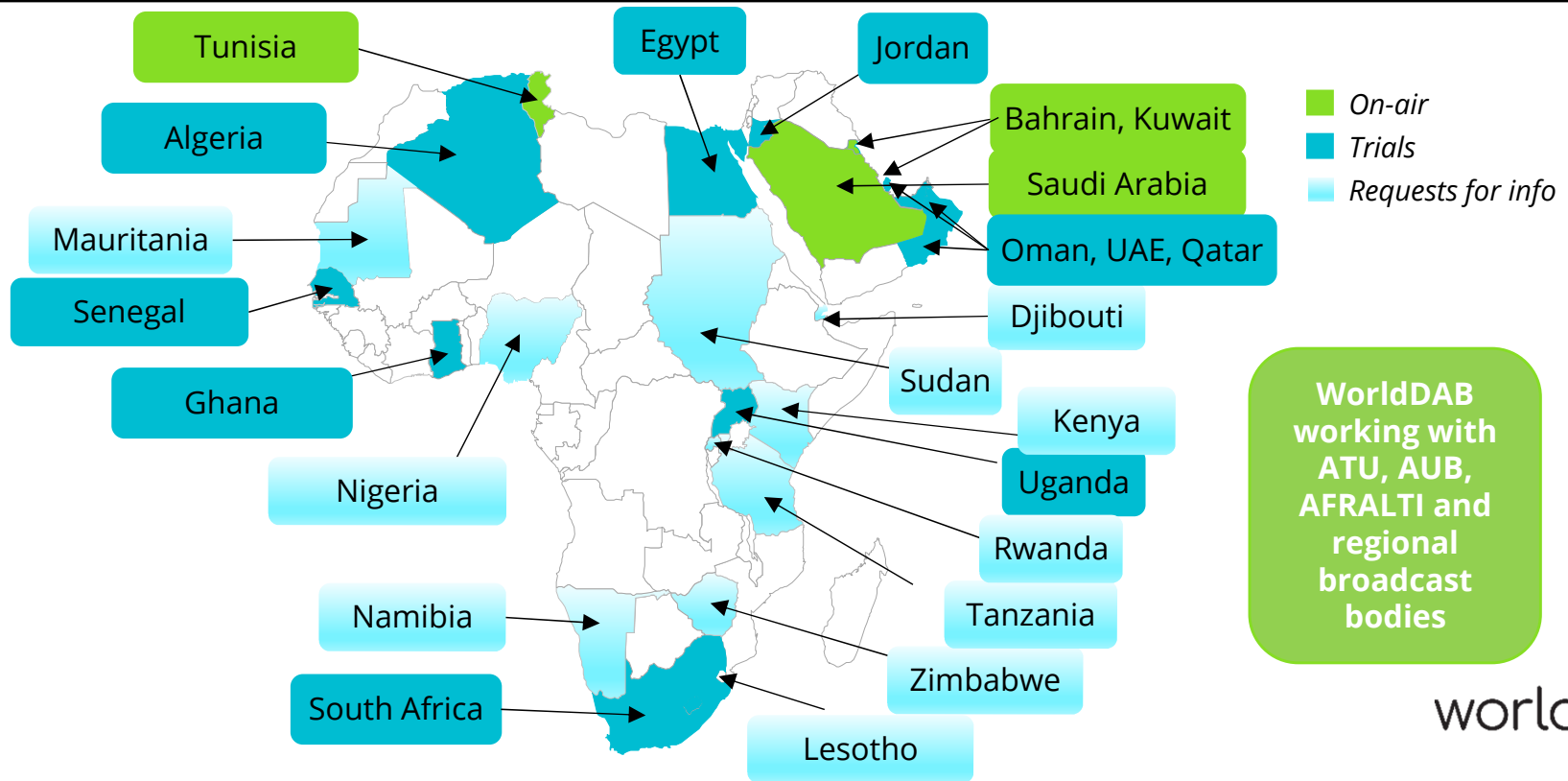


- 100s of DAB ensembles
- 1000s of DAB+ radio stations

Africa, Middle East and Asia are assessing the opportunity for DAB+



Increased interest in Africa and Middle East



Domestic and automotive DAB+ receivers

Cumulative DAB sales:
129 million

Sources: WorldDAB, GfK, JATO, national industry associations

DAB+ offers “now playing” info, song and artist, station logos



DAB digital radio - the benefits

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