EBU Digital Radio Summit – Geneva 2010

DAB Architecture, Network Deployments & Future Plans

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WORLD DAB Digital Multimedia Broadcasting
Radio • Mobile TV • Multimedia • Traffic Data

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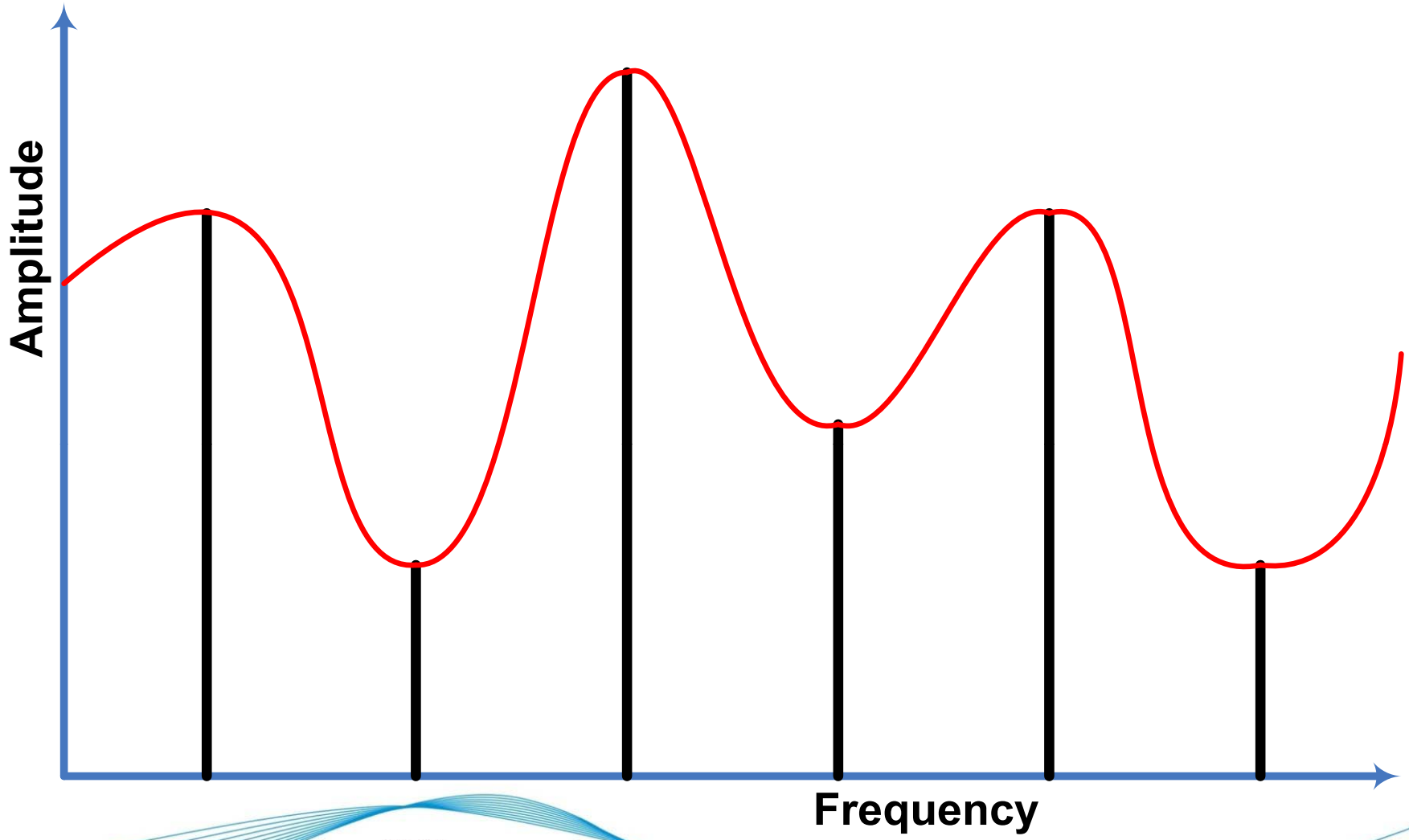
- Introduction – what is DAB designed to do
- DAB Architecture
- DAB Services
- Why Adopt DAB?
- Established Markets
- Evolving Markets
- World DMB
- Commercial and Technical Strategy
- Conclusion

Introduction: Selective Fading – The age old problem for mobile reception

- Provide robust mobile reception
- High quality audio & data services
- Be Spectrally Efficient

Introduction: Selective Fading – The multicarrier approach

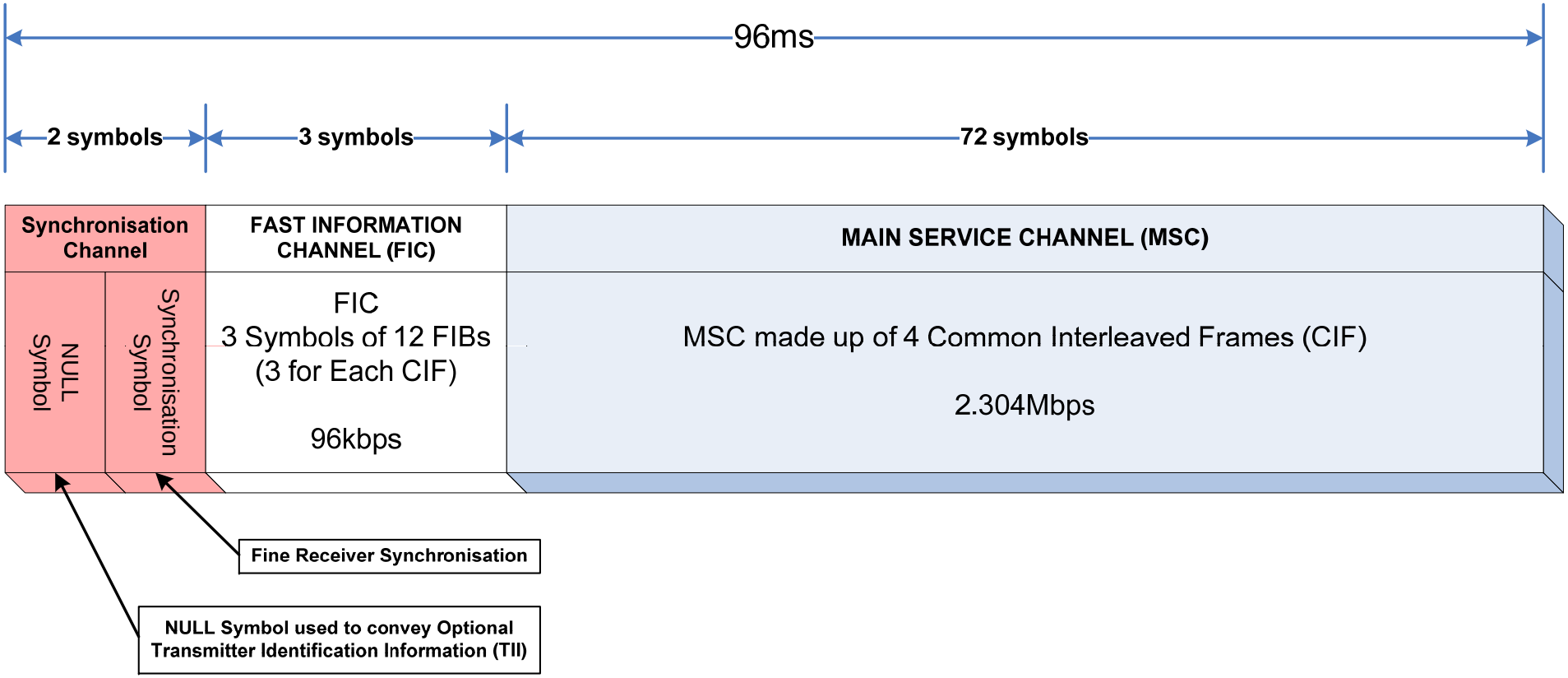


DAB Architecture: The Fundamentals

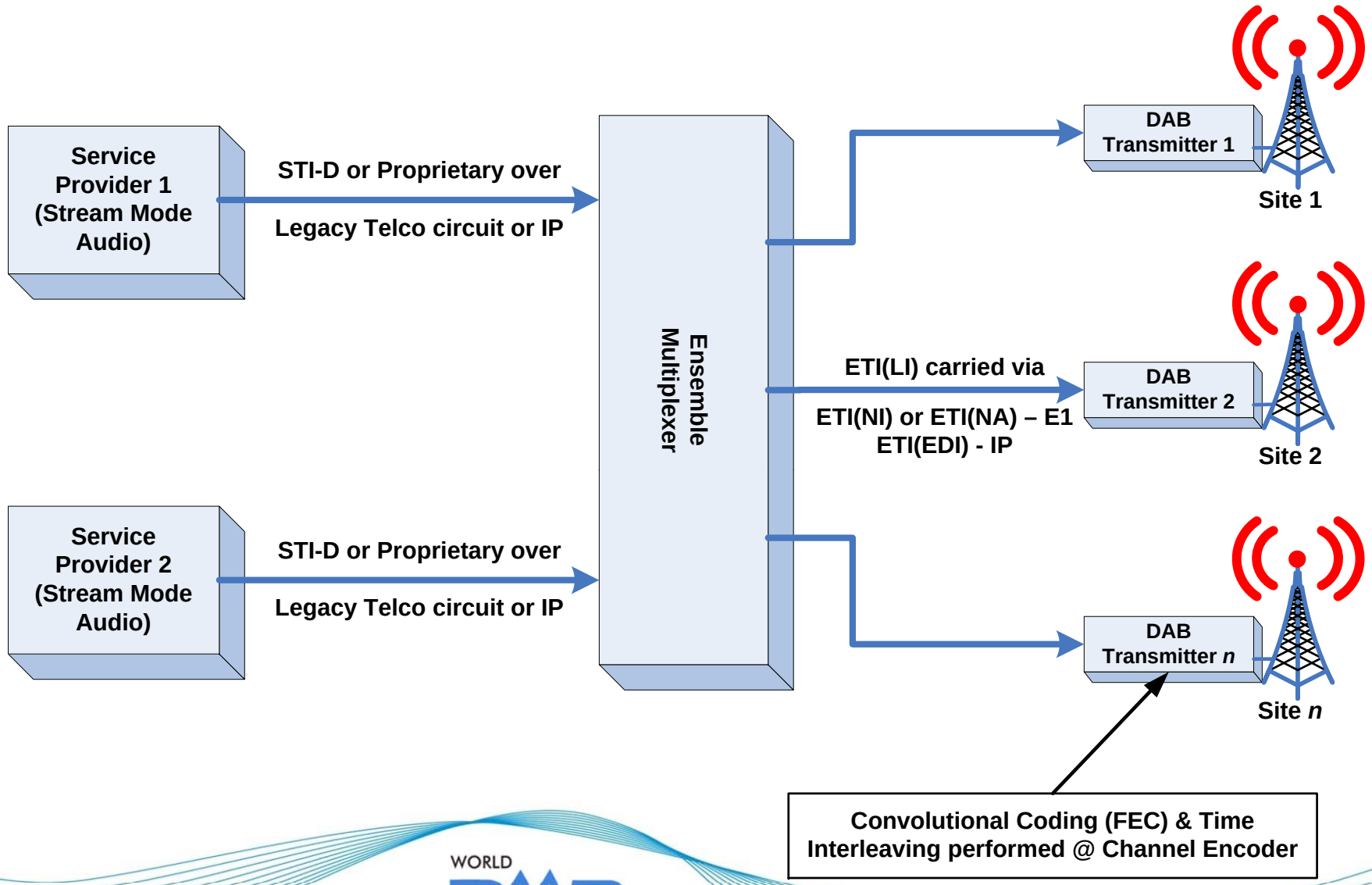
- D-QPSK OFDM Modulation, Convolutional Coding, Time and Frequency Interleaving
- Channel bit rate: 2.34Mbps
- Useful bit rate is approximately 1.3Mbps due to FEC & other requirements
- Channel bandwidth (spectrum) of 1.536MHz
- ETSI EN 300 401 and a family of supporting standards
- DAB produces an “ensemble” of audio and data service
- Up to 64 sub-channels can be supported

DAB Architecture: The Transmission Frame

- Three main elements to ensure that DAB receivers work correctly



DAB Architecture: Basic Building Blocks

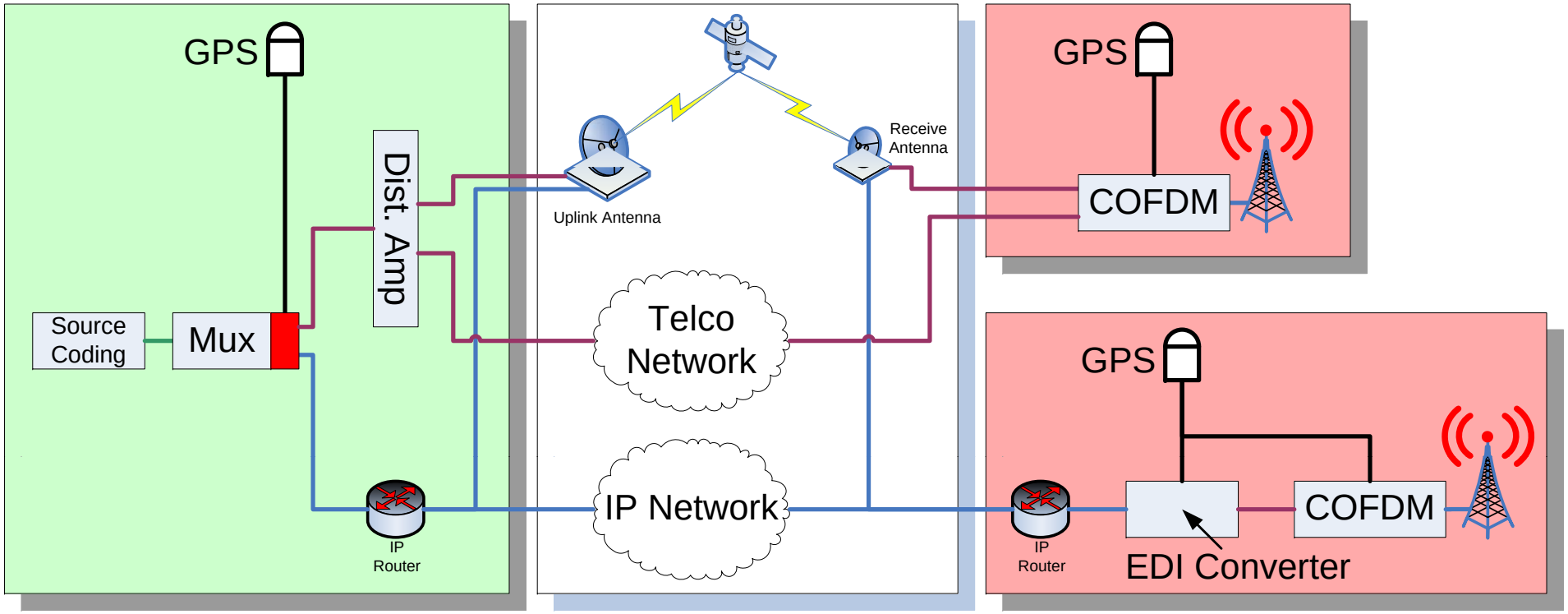


DAB Architecture: Modes of Operation & the SFN

- Guard Interval & SFNs
- Frequency / Modes of Operation
  - The guard interval extends the active symbol period by a fixed value (246us in Mode 1)
  - Mode 1: Terrestrial broadcast on Band 3
  - 246us is approximately equal to 75KM, and leads to transmitter separations on B
  - Mod
  - Mode: Ac ltiple transmitter locations, as lo
  - If a t ate into the Single Frequency Network it may violate the guard interval and Inter-Symbol-Interference (ISI) will result
  - This could result in the receiver not being able to decode the wanted data
  - However when SFNs are correctly designed and managed, they are able to provide nationwide networks on single frequency blocks, and it is easy to extend coverage with the simple addition of transmitters

MODE	I	IV	II	III
Number of Carriers	1536	768	384	192
Carrier Separation	1 kHz	2 kHz	4 kHz	8 kHz
Active Symbol Duration	1 ms	500 µs	250 µs	125 µs
Guard Interval Duration	246 µs	123 µs	62 µs	31 µs

DAB Architecture: A Representative Network



Encoding and Headend System

Transmission Network

Distribution Network

ETI(EDI) or Proprietary (various bitrate)

ETI(NA) (fixed bitrate E1)

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DAB Services

- Audio
  - MPEG Layer 2 Audio
  - DAB+ (MPEG4 HE AAC v2)
  - DMB Audio with BIFS
- Audio (Programme Related services)
  - Slide show
  - EPG
  - Broadcast Website
- Other Data services
  - TPEG and TMC
  - Journaline
  - IP Datagram tunnelling
- Mobile TV
  - DMB

Why adopt DAB?

- DAB uses a broadcast channel, i.e: one to many.
- SFNs
- Costs of the network are shared between all key stakeholders – not just one content provider required to fund the architecture
- Wide range of services (audio, mobile TV, Interactive)
- DAB is based on open standards
- An existing large range of receivers on the open market at low cost: <30Euros for a new receiver
- Future-proof

DAB

DAB+

DMB

DMB Audio

Established Markets: The UK

- 2 national DAB networks
- 46 local DAB networks
- DAB provides 90% population coverage, and extends to the majority of the UK road network
- Services: layer2 audio, EPG, slide-show, TPEG
- Device count 10.5million
- RAJAR figures (Jan 10) confirm that DAB is the most used digital platform for the consumption of digital radio, and supports 14% of all consumer Radio listening in the UK
- UK Government committed to analogue switch-off ("Digital Britain" report)
- Regional and National FM switch-off by 2015

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Other Established Networks

- **Denmark:** 1 national multiplex, 14 public broadcast services, 3 commercial on DAB. Every third household has a DAB radio, 225,000 receivers sold.
- **Norway:** 2 national multiplexes, 1 split into 7 regions. 26 services running on DAB. Just launched MiniTV using DMB. 67,000 devices sold in total.
- **Switzerland:** 5 national multiplexes, 4 public and 1 private. 63 DAB/DAB+ services. 450 - 500,000 receivers sold
- **Australia:** 5 regional multiplexes using DAB+, located around the major cities and conabations. Now working on Application Development, including Animated Slideshow. Receiver sales data to be released in March.




Established Markets: Korea

- **South Korea** – first country to commercially launch mobile TV, and now one of the most successful markets in the world.
- **26 million devices sold -** Of these devices the most popular are mobile phones followed by navigation systems and PDAs. There are a couple of hundred DMB device types available in this market and usage of mobile TV increases year on year in this region.
- **Services -** There are six major broadcasters providing a variety of services to the South Korean market including mobile TV services and new data applications such as BIFS. TPEG services are also available giving the consumer traffic and travel information.

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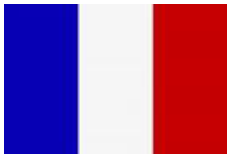
Evolving Markets: France



- DMB Audio with BIFS is the choice of France
- Licensing will be based on 10 year periods
- Band III will be used for digital radio only
- French law: Digital radio will be mandatory for all receivers including those in cars by 2013
- December 2009 – symbolic launch of digital radio in Paris

Evolving Markets: Germany

- Approximately 0.5m devices sold
- Southern states have confirmed they will go forward with the launch of DAB+ - as licensed by the local government authorities
- In November 2009, the German central government decided that DAB+ would be the chosen coding standard for the national DAB multiplex
- An invitation to tender for the provision of services on the national multiplex to commercial media authorities was sent out in January 2010
- Public & Commercial broadcasters working together to move digital radio forward

Evolving Markets: Italy

- New national government regulation released for digital radio in December 2009
- Broadcasters will have the choice of DAB+ and DMB Audio in Band III and L Band
- Each broadcaster is allowed 72 capacity units
- A clear timeline has been set and agreed by all key stakeholders
- Clear regulation has been agreed for commercial rollout (June – Sep 2010)
- The future of the DAB family in Italy has been secured

Worldwide Eureka Development

http://www.worlddab.org/country_information

Canada

Singapore

Ghana

Indonesia

Israel

Hong Kong

Malaysia

Mexico

New Zealand

South Africa

Taiwan

Vietnam

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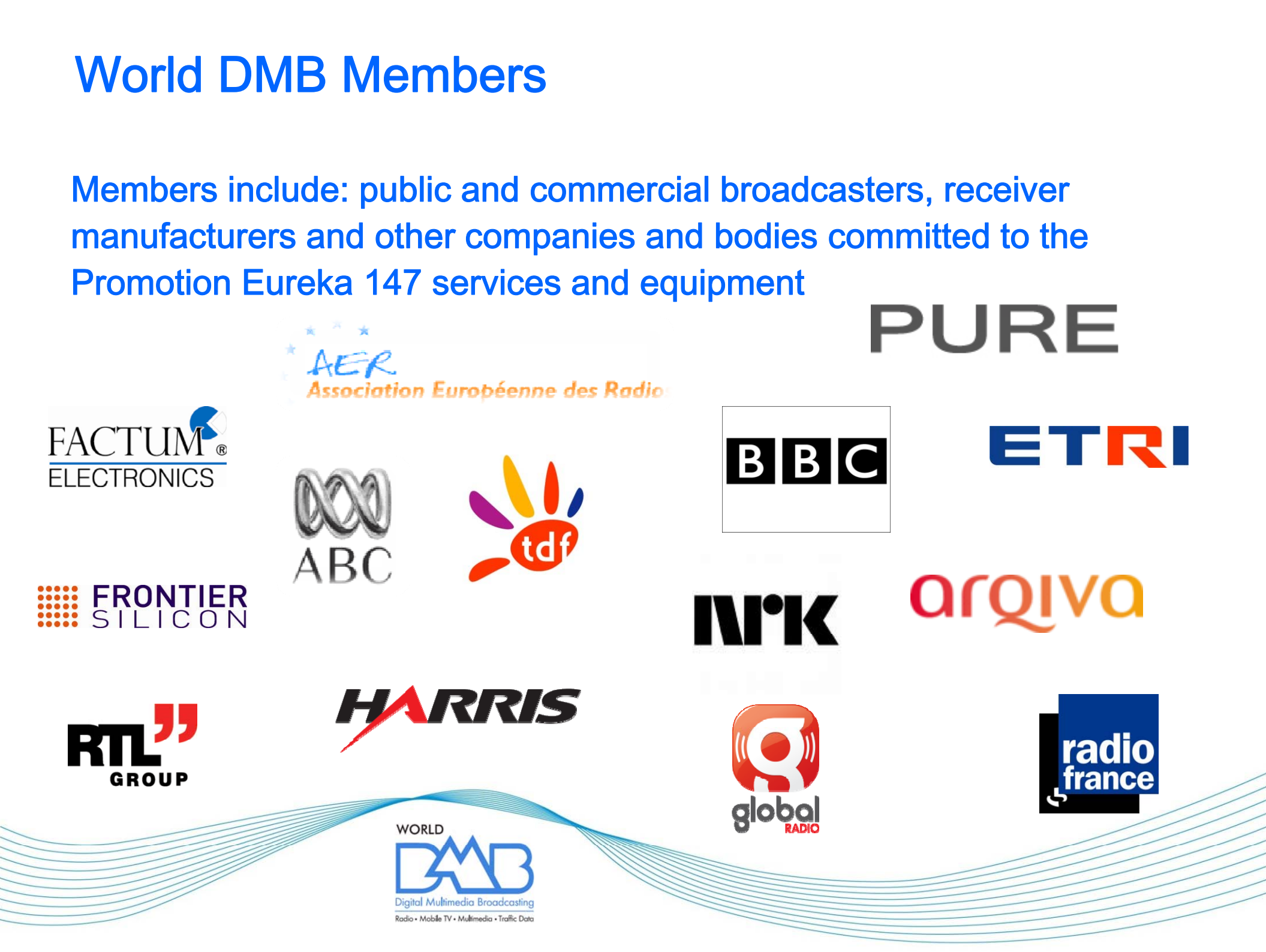
World DMB Members

Members include: public and commercial broadcasters, receiver manufacturers and other companies and bodies committed to the Promotion Eureka 147 services and equipment



Commercial Strategies 2010

- WDMB is in Brussels. Ensure digital radio is on the political agenda in the European Commission – stimulate debate & increase the awareness of digital radio
- Increase focus on digital radio promoting harmonisation, convergence and economies of scale
- As illustrated by the successful receiver profiles launch which promotes pan-European interoperability
- Adoption of more proactive approach and to actively support the key markets, e.g.: presidential/Vice Presidential visits are planned to developing markets

Technical Strategies for 2010

- Continue to develop open specifications to enhance digital radio
- Filecasting
- Interactivity through BIFS (already in DMB) for DAB MPEG Audio layer2 and DAB+

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Conclusion – The motivation for DAB

- COFDM & Interleaving
- Transmission modes
- SFN
- “Agile” multiplexing for many services
- Many different types of services supported
- Open Standards

Conclusion – The motivation for DAB – Part2

- Efficient coding bit rates
- Flexibility for content producers
- WDMB Receiver Profiles – promoting pan-European interoperability
- Common network architecture - spread the cost of build and long-term operation
- Large selection of existing receiver devices at low cost


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