DRM WEBINAR
DRM Extra Features & Benefits
A better Choice for Listeners

DRM Consortium
18th November 2013
10h00-11h30 GMT/UTC
15h30-17h00 India time
DRM Speakers

Ruxandra Obreja
DRM Chair
Head of Digital Radio Dev.
BBC World Service, UK

Dr Amal Punchihewa
Director Technology,
ABU, Malaysia

Alexander Zink
VC DRM Technical Committee
Senior BDM Digital Radio
Fraunhofer IIS, Germany

Yogendra Pal
Hon Chair of the DRM Indian Platform

Tim Hardy
Head of Engineering,
Nautel, Canada

T.V.B.Subrahmanyam
Dir. WW Home Audio Consumer
Analog Devices, India

Dominic Pushparaj
System Architect-SW
Business Unit-Automotive,
NXP Semiconductors India Pvt Ltd,
India

www.drm.org
Ruxandra Obreja
Chair of the DRM Consortium,
Head of Digital Radio Development,
BBC World Service, UK
DRM Webinar Topics

- Introduction – Dr. Amal Punchihewa (ABU)
- Key Features (Better Audio, More choice, Multimedia, Emergency Alert) – Alex Zink (Fraunhofer IIS)
- India Roll Out – Mr. Yogendra Pal (Hon. Chairman, DRM Indian Platform)
- How Is the Roll out progressing in India – Tim Hardy (Nautel)
- DRM Developments: chipsets on different platforms – Dominic Pushparaj (NXP)
- From DRM Features to DRM Receivers and Listeners’ Experience – T.V.B. Subrahmanyam (Analog Devices)
- Q&A - All
The DRM Consortium

- **Founded in 1998** to promote the adoption of the DRM standard worldwide

- **The DRM Consortium**
  - is a not-for-profit and not a commercial organization.
  - is an association of companies promoting the digital standard.
  - does not produce transmitters or receivers – manufacturing companies produce these.

- **Around 100 international members:**
  broadcasters, manufacturers, network operators, regulators, media experts, research institutes, etc.

- **Experts and technologists** ready to give objective advice on the technology

- **Open** to companies, organisations, associations, the media and individuals who can join at any time

For joining write to: projectoffice@drm.org

www.drm.org
The DRM Consortium aims to support and promote the success of the Digital Radio Mondiale standard.
Introduction

Dr. Amal Punchihewa
Director of Technology ABU
(Asia Pacific Broadcasting Union), Malaysia
• DRM and ABU – together right from the beginning
• DRM born in Asia (China 1998)
• DRM – tested with ABU in India, Sri Lanka and demonstrated in other Asia countries global
• DRM – deployed in Asian countries apart from India (Taiwan, S. Korea, Australia, New Zealand, Malaysia, Japan)
• Can cover large geographic areas as well as rural and local markets
**What is DRM?**

- **Digital Radio Mondiale (DRM)** is the global open digital radio technology which can be used in all frequency bands (*AM and VHF*).

- **DRM standard** can be used to cover large geographic areas, as well as rural and local markets and when on the move.

- DRM fits with **existing broadcast channelization** and enables broadcaster-controlled infrastructure.

- The DRM standard is **ITU recommended for worldwide adoption** on all frequencies.
Nearly half of the world population can listen to DRM

More than 120 DRM30 services in SW

- All India Radio
- BBC World Service
- KBS World
- NHK Japan
- Public Broadcaster Slovakia
- Radio Australia
- Radio New Zealand
- Radio Vatican
- Broadcast Belgium
- Voice of Russia
- Voice of Nigeria
- Saudi Broadcasting Corporation
DRM Key Features

Alexander Zink
DRM-SB, Vice Chair DRM Technical Committee, Senior BDM Digital Radio
Digital Radio at Fraunhofer IIS, Germany
The DRM Key Features are common to the full DRM Standard –

Whether using DRM30 and DRM+ configuration
### DRM Key Features

- **More choice** for listeners
  - Up to 4 programmes on 1 frequency
  - Simulcast analog / digital

- **Excellent audio** quality
  - No distortion
  - Stereo and 5.1 surround sound

- **Good coverage** area and robust signal
  - Supporting SFN (Single Frequency Networks)
  - Green and energy efficient

- **Multimedia Applications**
  - Great listener benefits
  - Extra revenue opportunities for broadcasters

- **Automatic tuning**
  - by station name, no longer by frequency
  - re-tunes when leaving coverage area

- **Emergency warning & alert**
  - All stations switch, present audio and text information
MPEG Surround

- Enables true 5.1 surround services (sports, jingles, ads, concerts, ...)
- Very small extra bit rate over stereo
- Compatible with all stereo/mono receivers

Mono → Stereo → 5.1 Surround
past → present → future!
DRM – More than Audio

- **DRM Text Messages** – Programme accompanying labels (Unicode)
- **Journaline** – Text based information service (Unicode)
  - Easy access & “Hot Button triggers” interactivity:
  - Web pages (sites)
  - Phone numbers
  - SMS / E-mail
  - Links to other Journaline or DRM services pages
- **MOT Slide Show** – Graphics with Animation
- **EPG** – Electronic Programme Guide
- **TPEG / TMC** – Traffic Information

→ Great potential for new revenue sources!

www.drm.org
Application: Emergency Information

- Natural disaster strikes
  → local communications infrastructure breaks, power loss, etc.
- **DRM** Digital radio broadcast
  → reaching trouble spots from a distance/remote
  → battery powered and wind-up receivers
DRM EWF – Emergency & Disaster Warning

- Immediately spreads urgent information
- E.g. to be used in case of natural disasters or pending catastrophes (earthquakes, tsunamis, …)

Benefits using DRM:
- Deploys wide-spread radio sets, remote infrastructure
- Provides spoken announcements on alert channel
- Provides detailed textual information (Journaline) for immediate look-up by listeners, explaining alert reason and behaviour recommendat.
- Textual information to be multi-lingual/-script

DRM Receiver Behaviour:
- All receivers switch automatically, present audio and text information
- Should be mandatory feature for all radios
Examples for receiver screen renderings, showing emergency text content (Journaline):

**CNR Emergency Broadcast**

- Information in English
- हिन्दी में सूचना (Hindi)
- 中文信息 (Chinese)
- Info auf deutsch

**What is going on?**
A major tsunami is expected for the Shanghai region at 16:00 today.
The tsunami will hit the

**What do I need to do?**
1. Move away from shore!
2. Evacuation has started.
Find the nearest meeting point: Look for green

**Information in English**
- What is going on?
- What do I need to do?
- Where can I get help?
1. Enhanced Audio Codec – MPEG xHE-AAC

- Latest MPEG xHE-AAC codec (+ HE-AAC v2) replaces former speech codecs HVXC, CELP
- **Unrestricted content** (speech AND music) even at very low bitrates!

DRM System Specification:
**ETSI update early 2014**

www.drm.org
1. Enhanced Audio Codec – MPEG xHE-AAC

- Latest **MPEG xHE-AAC** codec (+ HE-AAC v2)
  - replaces former speech codecs HVXC, CELP
- **Unrestricted content** (speech AND music) even at very low bitrates!
  Examples:
  - 8 kbps mono → 1 full-content program in most-robust SW
  - 12 kbps stereo → 2 full-content STEREO programs per MW
  - 24 kbps stereo → 3 full-content STEREO programs per FM

**Full DRM xHE-AAC audio demo:**
Download from www.drm.org
1. Enhanced Audio Codec – MPEG xHE-AAC

- Latest MPEG xHE-AAC codec (+ HE-AAC v2)
  → replaces former speech codecs HVXC, CELP
- Unrestricted content (speech AND music)
  even at very low bitrates!
  Examples:
  → 1 full-content program in most-robust SW
  → 2 full-content STEREO programs per MW
  → 3 full-content STEREO programs per FM

2. Signalling Improvements

4 PAD per audio service (Programme Associated Data)
→ Each audio service with TM, Journaline, SLS, EPG…

India Roll Out

Yogendra PAL
Hon Chair of the DRM
Indian Platform, India
Medium Wave covers 98.4 % population
• Coverage – about 99% by population

• Over 60% population of country depends only on MW coverage

• There are plans for FM expansion by Private Stations as well as AIR but still coverage would be limited

• Quality concerns on MW:
  ● Poor quality
  ● Only one service per transmitter
  ● No Value Added Service
Locations: 97
Coverage: About 20% by population

- A+ Class cities
- A Class cities
- B Class cities
- C Class cities
- D Class Cities
Existing FM Coverage – 42% of population Overlapping with Private FM

FM Expansion Schemes being implemented
• DRM trials: In MW, SW (DRM30) in 2007 and in DRM+ in 2011
• Jan 2009: Regular AIR DRM SW service started from Delhi
• Oct. 2011 AIR increased DRM SW to 16 hours/day
• April 2010: Indian government announced adoption of DRM for India
• AIR: Renewing, replacing 72 MW transmitters with DRM30
  2 x 1000 kW transmitters already operational (Rajkot & Kolkata)
  6 x 20 kW transmitters already delivered, tested and operational
  6 mobile transmitters used for training
• Dec 2012: AIR ordered six 300kW & 21 x 200/100 kW MW DRM30 transmitters
• Nov 2013: 8 x 300/200/100 kW MW DRM transmitters inspected out of which 4 received
  4 x 100 kW MW DRM transmitters under inspection
India
All India Radio (AIR) Transmitter and Population Coverage

1. Chinsurah Transmitter (Kolkata, West Bengal)
   Area Covered: 987,525.19 km²
   Population Covered: 23,493,178

2. Rajkot Transmitter (Gujarat)
   Area Covered: 572,821.13 km²
   Population Covered: 75,380,080

3. Delhi Transmitter
   Area Covered: 80,745.88 km²
   Population Covered: 74,317,210

4. Chennai Transmitter (Tamil Nadu)
   Area Covered: 121,085.87 km²
   Population Covered: 26,529,240

5. Guwahati Transmitter (Assam)
   Area Covered: 48,381.44 km²
   Population Covered: 15,622,043

6. Barmer Transmitter (Rajasthan)
   Area Covered: 30,405.48 km²
   Population Covered: 2,954,976

7. Bikaner Transmitter (Rajasthan)
   Area Covered: 23,944.95 km²
   Population Covered: 2,265,271

8. Tawang Transmitter (Arunachal Pradesh)
   Area Covered: 26,409.16 km²
   Population Covered: 80,463

Transmitters listed in the order of population coverage:
1. Chinsurah Transmitter (Kolkata, West Bengal)
2. Rajkot Transmitter (Gujarat)
3. Delhi Transmitter
4. Chennai Transmitter (Tamil Nadu)
5. Guwahati Transmitter (Assam)
6. Barmer Transmitter (Rajasthan)
7. Bikaner Transmitter (Rajasthan)
8. Tawang Transmitter (Arunachal Pradesh)
# Transmitters Under Digitalisation (MW)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Power of Txs (kW)</th>
<th>Total No. of Txs.</th>
<th>DRM Txs (on completion of 11th Plan)</th>
<th>Remaining Txs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1000</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>300</td>
<td>11</td>
<td>11</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>200</td>
<td>17</td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>100</td>
<td>26</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>5.</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>20</td>
<td>46</td>
<td>27</td>
<td>19</td>
</tr>
<tr>
<td>7.</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>1</td>
<td>34</td>
<td>0</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>143</td>
<td></td>
<td>72</td>
<td>71</td>
</tr>
</tbody>
</table>
## SUMMARY OF MW TRANSMITTERS COMMISSIONING

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Tentative Date of Commissioning</th>
<th>Transmitters</th>
<th>Places</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>June, 13</td>
<td>20kWx 6</td>
<td>Guwahati, Delhi, Barmer, Bikaner, Chennai, Tawang,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200kWx1 3</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Dec., 13</td>
<td>20kWx 19</td>
<td>Aizwal, Ambikapur, Bhuj, Chhattarpur, Chennai, Darbanga, Gangtok, Jalgaon, Kota, Udipl, Rewa, Hyderabad, Leh, Ratnagiri, Rohtak, Silchar, Trivendrum, Tiruneveli, Tura, Delhi Jammu, Jalandhar, Lucknow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300kWx3</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Jan., 14</td>
<td>100kWx 4</td>
<td>Vijayawada, Patna, Ranchi, Tiruchirapalli,</td>
</tr>
<tr>
<td>4.</td>
<td>Feb., 14</td>
<td>200kWx 4</td>
<td>Bangalore, Dharwad, Chennai A’, Kolkatta B’</td>
</tr>
<tr>
<td>5.</td>
<td>Mar, 14</td>
<td>20kWx 2</td>
<td>Kupwara, Naushera,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100kWx 7</td>
<td>Cuddapah, Delhi, Kohima, Port Blair, Shillong, Shimla, Raipur,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200kWx 3</td>
<td>Kargil, Indore, Najibabad,</td>
</tr>
<tr>
<td>S. No.</td>
<td>Date</td>
<td>Transmitters</td>
<td>Places</td>
</tr>
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<td>-------</td>
<td>--------</td>
<td>--------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>300kWx 5</td>
<td>Cuttack, Srinagar, Imphal, Jodhpur, Nagpur</td>
</tr>
<tr>
<td>6.</td>
<td>May, 14</td>
<td>100kWx 3</td>
<td>Goa, Mumbai A’, Mumbai B’, Pune</td>
</tr>
<tr>
<td></td>
<td>Jun., 14</td>
<td>300kWx 3</td>
<td>Dibrugarh, Suratgarh, Rajkot</td>
</tr>
<tr>
<td></td>
<td>Aug., 14</td>
<td>100kWx3</td>
<td>Varanasi, Kolkatta A’, Passighat,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200kWx5</td>
<td>Ahmedabad, Jabalpur, Ajmer, siliguri, Itanagar</td>
</tr>
</tbody>
</table>
When Completed –
Over 70% of India covered by area
will be covered
with DRM30 Broadcasts

AIR digitisation plans - dedicated
website page:
http://allindiaradio.gov.in/Services
/Digital%20Transmission
How is it going then with the rollout?

Tim Hardy
Head of Engineering, Nautel, Canada
“One of the world’s largest digital radio deployments”
Building the network: Nautel supplying 21 MW Tx
Typical Installation
Initial and eventual transmission modes:

- **Simulcast**
- **20 kHz DRM**
Signed, sealed, delivered…
Installations scheduled for Q1 2014

Delhi
The time for manufacturers is now…

Compelling broadcast technology/benefits
Large listener community
Broadcast infrastructure being deployed

Manufacturer opportunity
From Features to DRM Receivers and Listeners’ Experience

T.V.B. Subrahmanyam
Director – Worldwide Home Audio Consumer Segment, Analog Devices, India
Change should always be for better...
Transitioning to Digital Radio is also better

• Good Audio
  • Stereo
  • Hi-Fi
  • No fading and no noise
• Display
  • Colour – Good for slide show
  • Text information
  • Can be used commercially for ads

• Social Needs
  • Disaster and Early Warning
  • Other Emergencies
  • Weather
  • Traffic
• Entertainment & Other needs
  • Latest news
  • Cricket & other sports
  • Album art with songs
RF Tuner captures radio frequency signals of desired frequency, amplifies and digitizes.

Baseband processor demodulates and decodes to provide audio and data.

An amplifier + speaker enables us to listen to an excellent audio output/reception.

Man-machine Interface provides the required text and graphical information and ability to control the radio.

Ingredients of a DRM Receiver
There are some key differences though…
### Chipsets for different receivers

<table>
<thead>
<tr>
<th>Features</th>
<th>Desktop</th>
<th>Car</th>
<th>Mobile phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>Low</td>
<td>Medium</td>
<td>Very Low</td>
</tr>
<tr>
<td>Noise Immunity</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Antenna diversity</td>
<td>X</td>
<td>Required</td>
<td>X</td>
</tr>
<tr>
<td>Power</td>
<td>Low</td>
<td>Can be high</td>
<td>Very low</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>3V</td>
<td>5V</td>
<td>1.8V</td>
</tr>
<tr>
<td>Own Display</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Keypad</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Amp + Speaker</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>USB</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>SDCard</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
Availability of Processors and Tuners
Developments: Chipsets on Different Platforms

Dominic Pushparaj
System Architect-SW
Business Unit-Automotive,
NXP Semiconductors India Pvt Ltd,
India
NXP Digital Radio Processor: Lower R&D Investment, leaner Supply Chain

NXP continuously drives down system cost and application size
DRM System with NXP’s Digital Radio Co-Processor and AM/FM Tuner

- **NXP’s DRM Radio System**
  - Consists of AM/FM + Digital Radio Co-processor (DRP)
  - Customer’s Host Processor controls the DRM Radio System
  - Low system cost with minimal external components

- **Digital Radio Co-Processor**
  - Automotive qualified low cost digital terrestrial radio processor
  - Provides demodulation, channel decoding, audio decoding and application processing for DRM

- **Advanced radio performance**
  - State of the art algorithms used to deliver best quality in Fading, noise, simulcast and other interferences

- **Field tested DRM Solution**
  - Total system test of tuner + digital radio processor
  - Berlin, Rajkot, New Delhi and Chennai

- **DRM Product Releases**
  - DRM (India): Engineering releases available, gearing towards commercial production in 2014
Radio Tuner IC

- **AM/FM Tuner used with DRP**
  - Tuner feeds digital baseband I/Q Data to DRP for DRM decoding
  - DRP returns DRM-decoded audio PCM to AM/FM Tuner chip
  - Two important ICs: Hero TEF663x and AtomIC2 TEF665x
  - Simple Control API
  - Covers AM Band (LW/MW and full SW)

- **Hero**
  - First all-in-one digital chip incl. AM/FM tuner, radio and audio
  - 4x Audio ADC & 4x Audio DAC
  - Minimize BOM, PCB Space and RF risk

- **AtomIC2 Premium**
  - New DSP-based AM/FM single-chip tuner in RFCMOS with Digital Radio support
  - Best-in-class Performance/System Price ratio

www.drm.org
From Features to DRM Receivers and Listeners’ Experience

T.V.B. Subrahmanyam
Director – Worldwide Home Audio Consumer Segment, Analog Devices, India
• **Receivers** follow markets. Volume decreases prices
• **Receiver manufacturers joining:** JVC Kenwood
• Indian market has stimulated membership in DRM
  • **Chipsets manufacturers:** Frontier, NXP, KeyStone, Dibcom/Parrot, Analog Devices
  • **Receiver manufacturers:** JVC Kenwood
• Indian and high-end brands
• Discussions with car manufacturers: Jaguar Land Rover (Tata) joined this summer
Transformation has to be stable

- Setting a target date for start of services is a must for a success story:
  - Germany
  - Australia
- Broadcast content to make it a compelling reason to buy digital radio receiver
• What content will make digital radios a compelling reason to buy?
• What features should receiver manufacturers must have for this content?
• When will this start?
Current coverage from 8 recently installed transmitters:
• 430m people – 36% of 1.2bn population
• Chinsurah transmitter (Kolkata, West Bengal) covers almost 20% of population alone

By contrast, European DAB coverage at 200m is less than half that and generates sales of ~4m units per year

Huge opportunity for India-based CE companies

Target FOB price for a kitchen radio <$20 is feasible and provides an opportunity for the whole supply chain

Source: AIR October 2013, Frontier Silicon analysis
India can and will lead the way technologically in audio broadcasting
Q & A

**Ruxandra Obreja**
DRM Chair  
Head of Digital Radio Dev.  
BBC World Service, UK

**Dr Amal Punchihewa**
Director Technology,  
ABU, Malaysia

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**Dominic Pushparaj**
System Architect-SW  
Business Unit-Automotive,  
NXP Semiconductors India Pvt Ltd, India

www.drm.org
DRM Introduction and Implementation Guide

Updated September 2013

Free download available at www.drm.org
For Monthly DRM updates visit and subscribe to:

www.drm.org/newsletters

For any inquiries or comments, please write to:

projectoffice@drm.org