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

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**

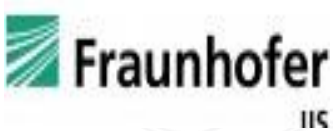
The DRM Consortium

- **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

DIGITAL radio mondiale

The FUTURE of global radio

DRM Consortium Members



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

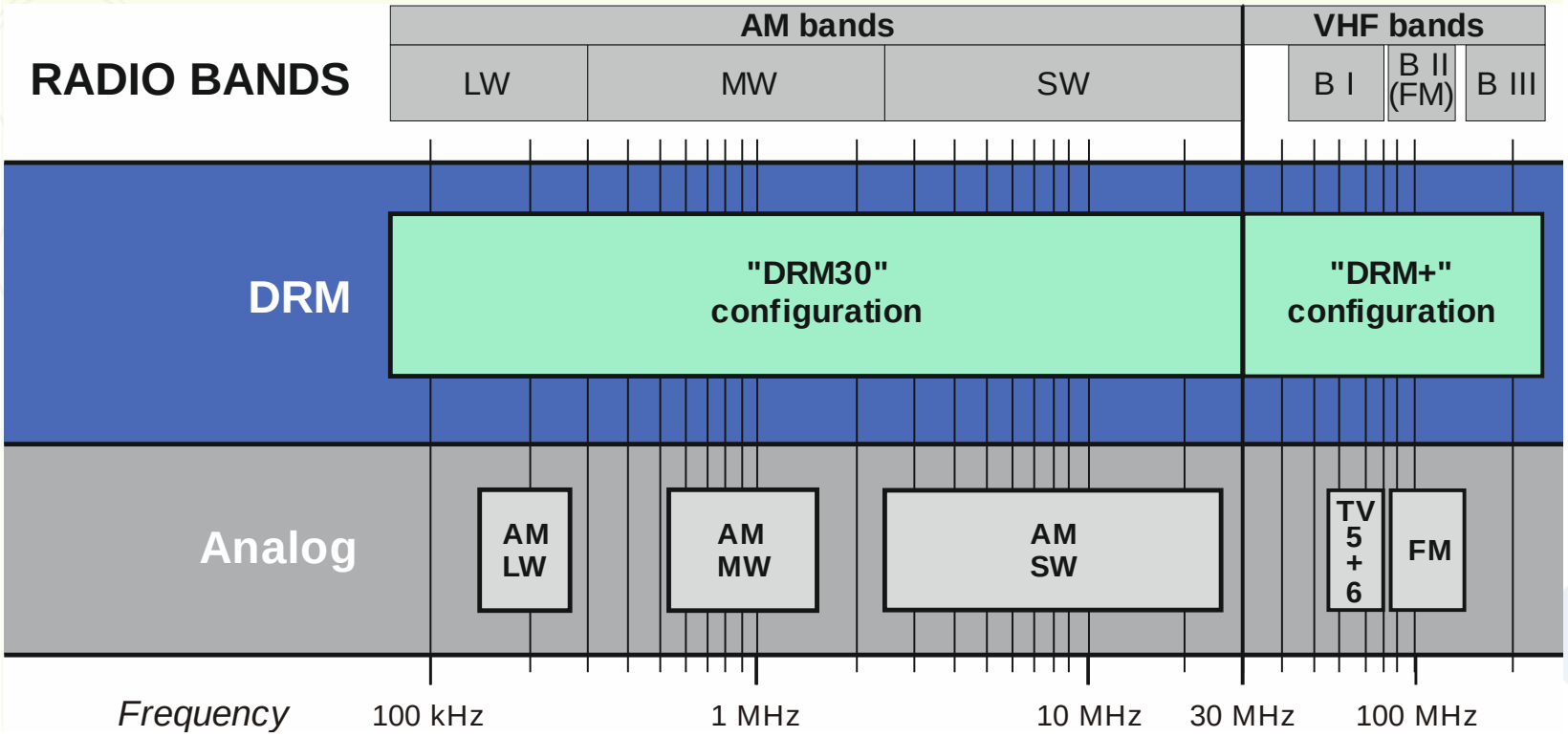
DRM and ABU

- 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 countriesglobal
- 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

DRM Frequency Bands



DRM in the World

Nearly half of the world population can listen to DRM

More than120 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

DRM Key Features

The DRM Key Features are common to the full DRM Standard –

Whether using DRM30 and DRM+ configuration

DRM Key Features

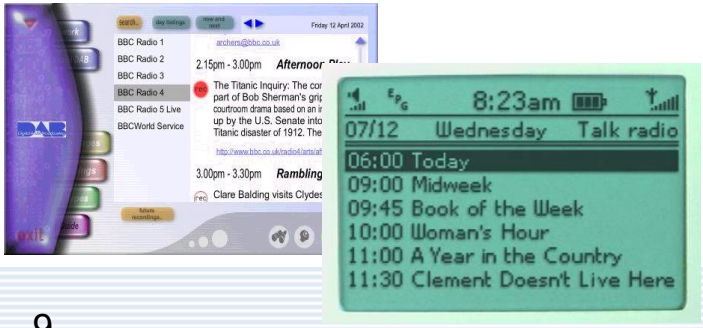
- **More choice** for listeners
  - Up to 4 programmes on 1 frequency
  - Simulcast analog / digital
- **Excellent audio** quality
  - No distortion
  - Stereo and 5.1 surround sound
- **Good coverage** area and robust signal
  - Supporting SFN (Single Frequency Networks)
  - Green and energy efficient
- **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

DRM 5.1 Surround Sound Audio

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!**

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 Warning Functionality

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**

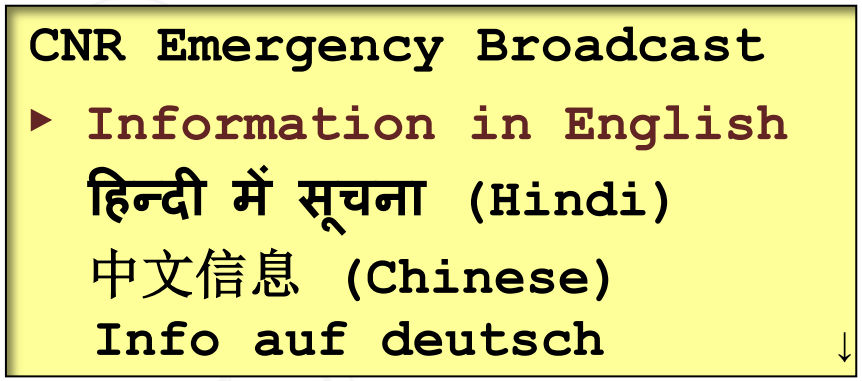
DRM Receiver Behaviour:

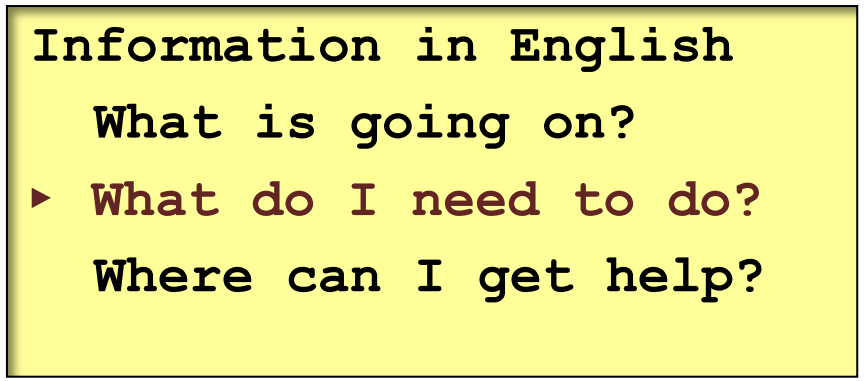
- All receivers switch automatically, present audio and text information
- Should be mandatory feature for all radios

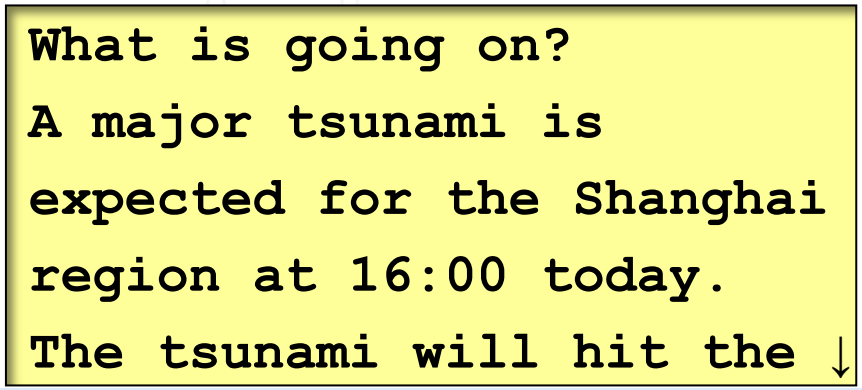
DRM EWF – Listener Experience

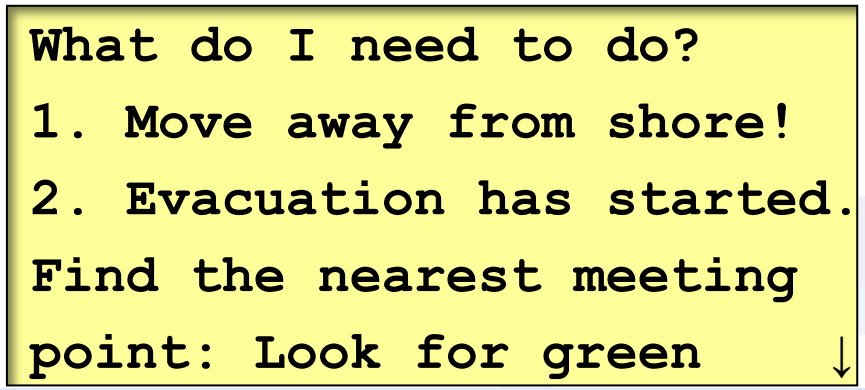
NewsService Journaline®

Examples for receiver screen renderings, showing emergency text content (Journaline):

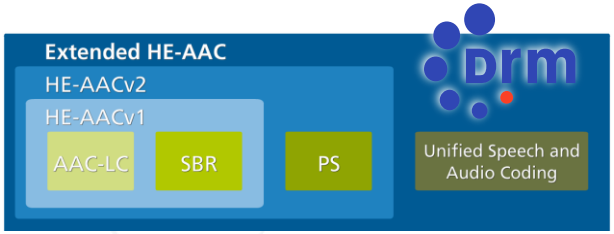








DRM Key Features – Latest ETSI Updates



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

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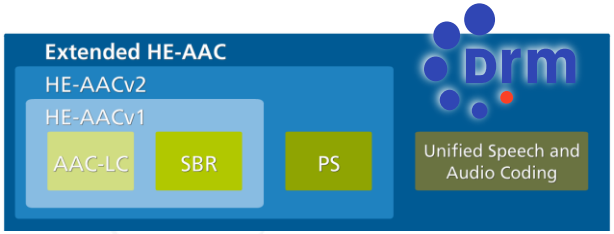

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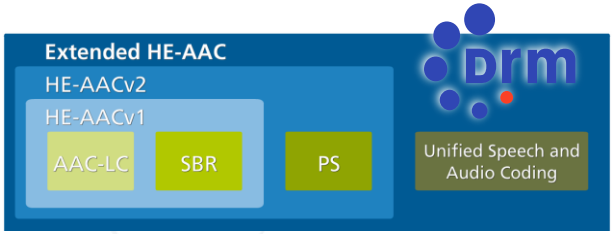
- **Unrestricted content** (speech AND music) even at very low bitrates! Examples:

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

DRM Key Features – Latest ETSI Updates



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  - → 3 full-content STEREO programs per FM

DRM System Specification:
ETSI update early 2014

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

Transmitters

- Medium Wave 143
- Short Wave 48
- FM 385

Total Radio Transmitters 576

Medium Wave covers 98.4 % population

All India Radio – MW Coverage

- 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

Private Radio – FM Coverage

Locations: 97

Coverage: About 20% by population

A+ Class cities

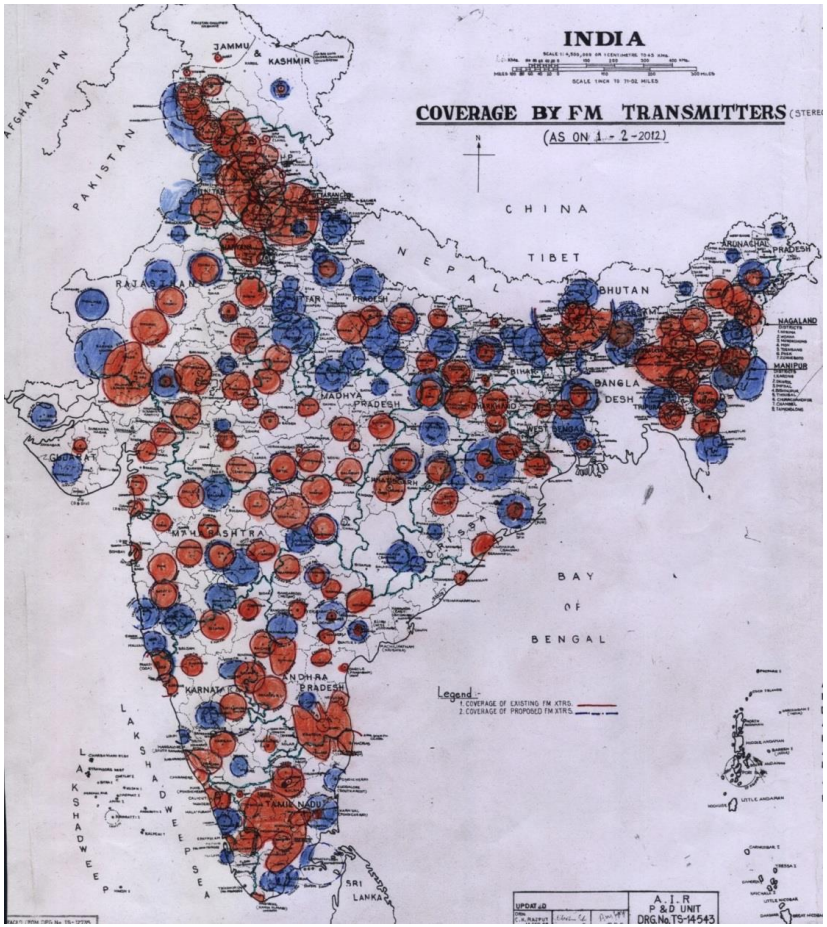
A Class cities

B Class cities

C Class cities

D Class Cities

All India Radio – FM Coverage



Existing FM Coverage –

42% of population

Overlapping with Private FM

FM Expansion Schemes being implemented

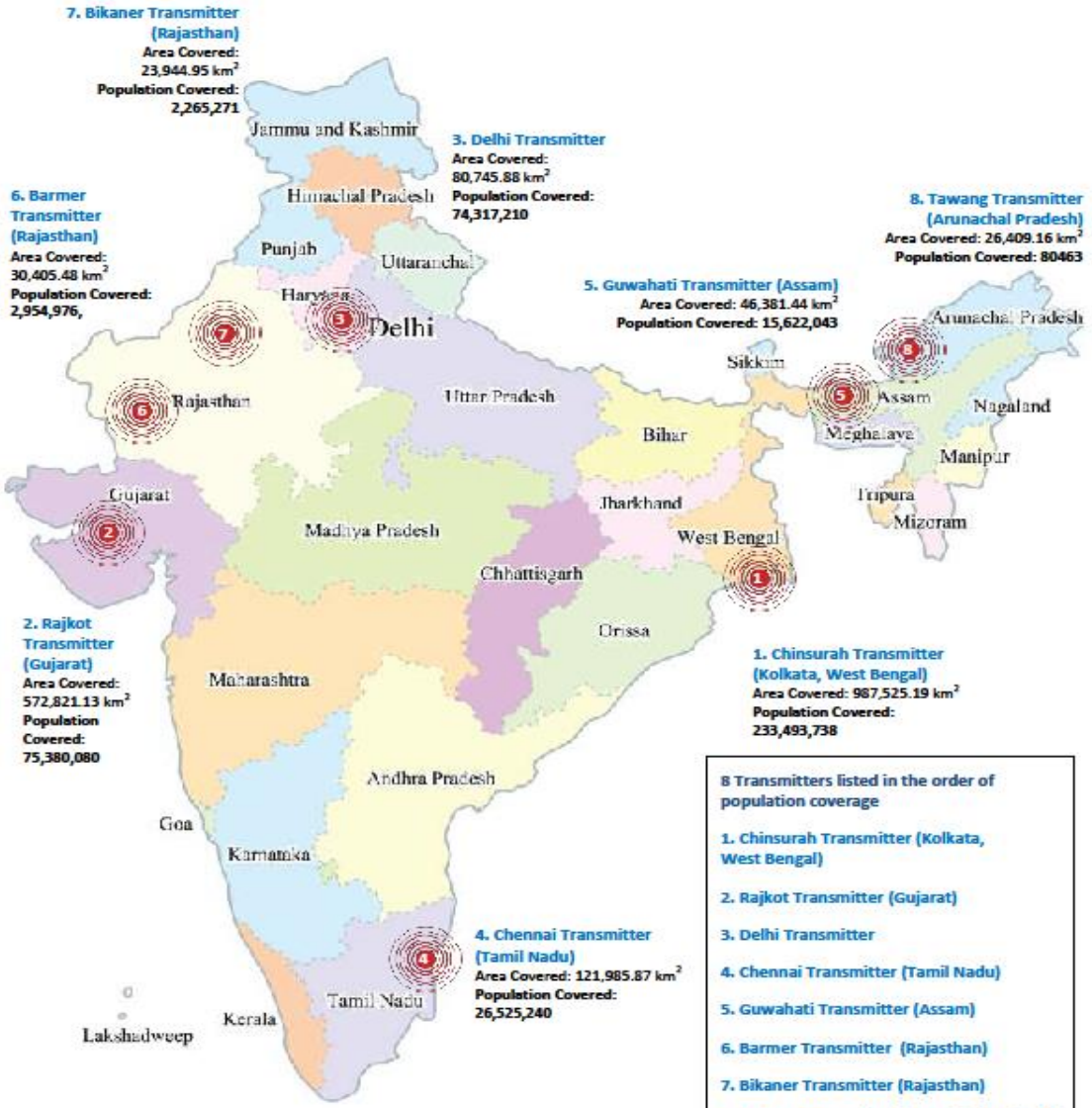
India

- **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

The FUTURE of global radio

INDIA
All India Radio (AIR) Transmitter and Population Coverage

drm digital radio mondiale
visit www.drm.org



8 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)

S. No.	Power of Txs (kW)	Total No. of Txs.	DRM Txs (on completion of 11th Plan)	Remaining Txs
1.	1000	3	2	1
2.	300	11	11	0
3.	200	17	13	4
4.	100	26	18	8
5.	50	1	1	0
6.	20	46	27	19
7.	10	5	0	5
8.	1	34	0	34
	Total	143	72	71

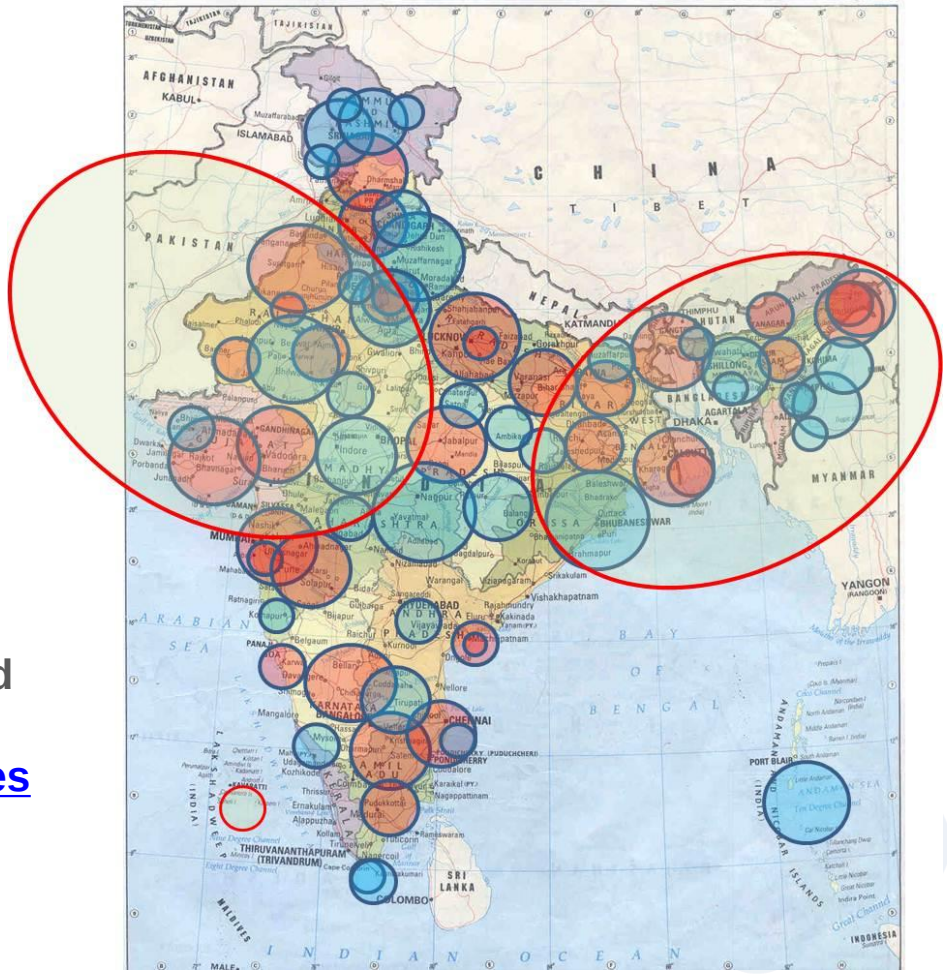
SUMMARY OF MW TRANSMITTERS COMMISSIONING

S. No.	Tentative Date of Commissioning	Transmitters	Places
1.	June, 13	20kWx 6	Guwahati, Delhi, Barmer, Bikaner, Chennai, Tawang,
2.	Dec., 13	20kWx 19	Aizwal, Ambikapur, Bhuj, Chhattarpur, Chennai, Darbanga,Gangtok, Jalgaon, Kota, Udipi, Rewa, Hyderabad, Leh, Ratnagiri, Rohtak, Silchar, Trivendrum, Tiruneveli, Tura,
		200kWx1	Delhi
		300kWx3	Jammu, Jalandhar, Lucknow
3.	Jan., 14	100kWx 4	Vijayawada, Patna, Ranchi, Tiruchirapalli,
4.	Feb., 14	200kWx 4	Bangalore, Dharwad,Chennai A', Kolkatta B'
5.	Mar, 14	20kWx 2	Kupwara, Naushera,
		100kWx 7	Cuddaph, Delhi, Kohima, Port Blair, Shillong, Shimla, Raipur,
		200kWx 3	Kargil, Indore, Najibabad,

S. No.	Date	Transmitters	Places
		300kWx 5	Cuttack, Srinagar, Imphal, Jodhpur, Nagpur
6.	May, 14	100kWx 3	Goa, Mumbai A', Mumbai B', Pune
	Jun., 14	300kWx 3	Dibrugarh, Suratgarh, Rajkot
	Aug., 14	100kWx3	Varanasi, Kolkatta A', Passighat,
		200kWx5	Ahmedabad, Jabalpur, Ajmer, siliguri, Itanagar

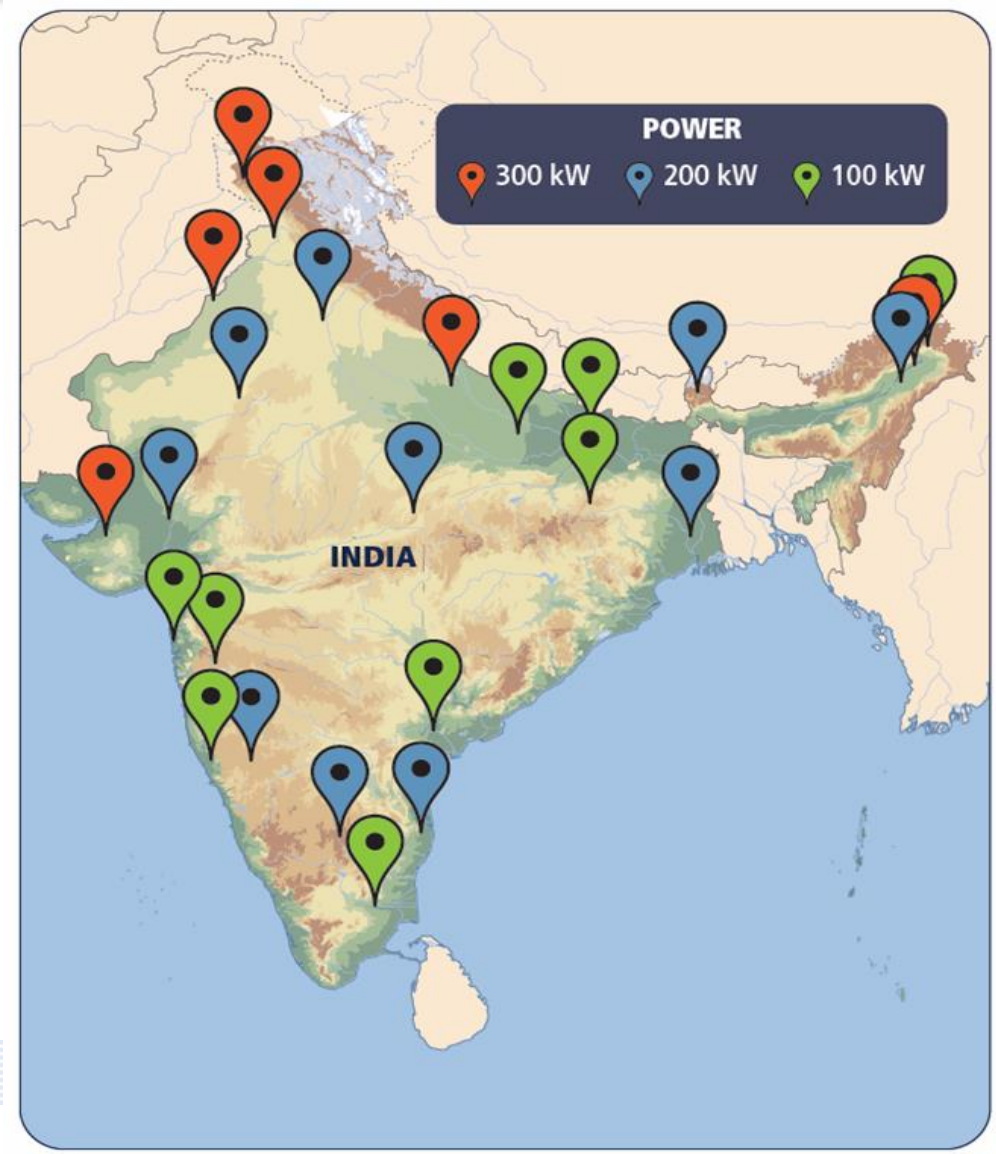
When Completed –
Over 70% of India
covered by area
will be covered
with DRM30 Broadcasts

AIR digitisation plans - dedicated website page:
http://allindiaradio.gov.in/Services/Digital%20Transmission



How is it going then with the rollout?

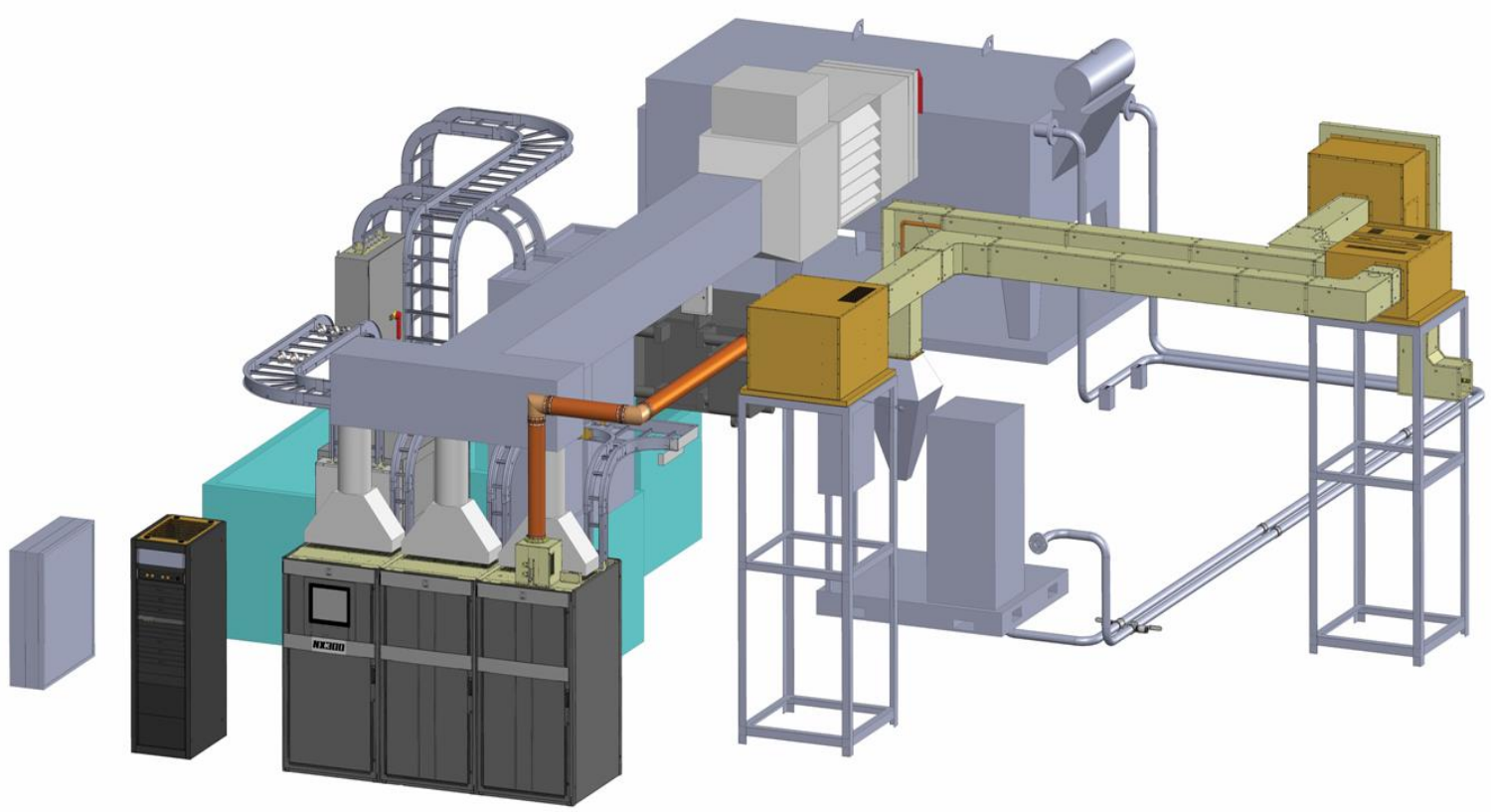
Tim Hardy
Head of Engineering, Nautel, Canada



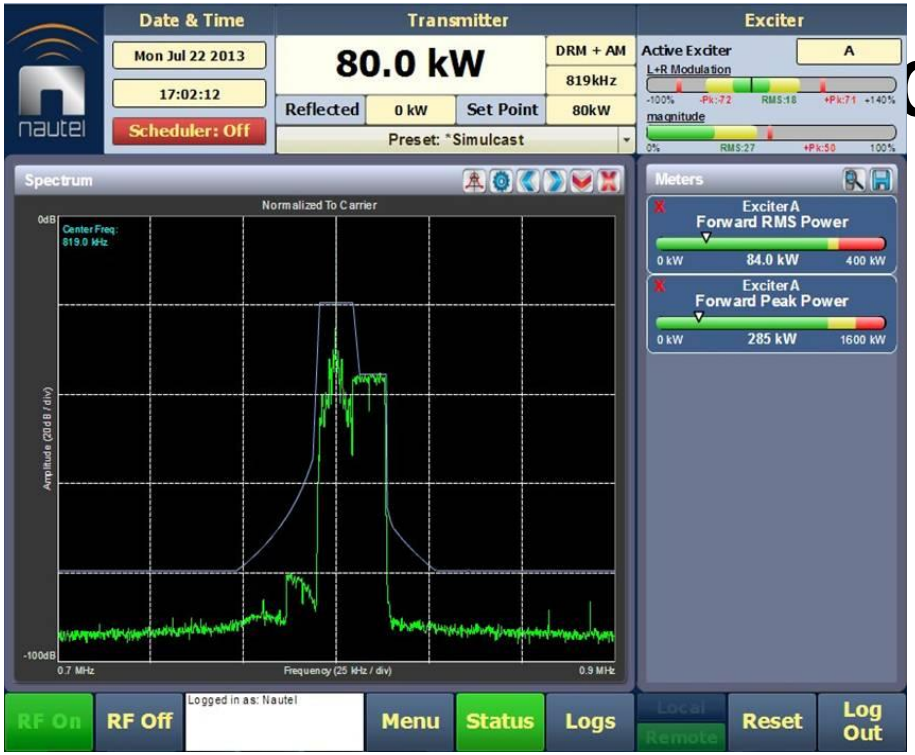
"One of the world's largest digital radio deployments"

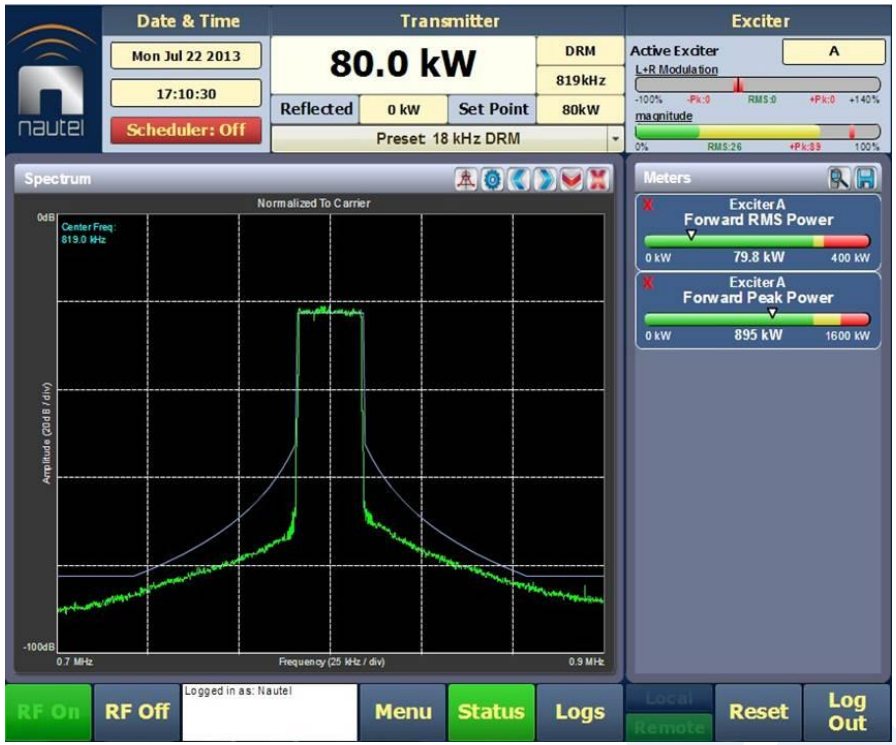
Building the network: Nautel supplying 21 MW Tx

Typical Installation



Initial and eventual transmission





Simulcast

20 kHz DRM

Signed, sealed, delivered…

Installations scheduled for Q1 2014

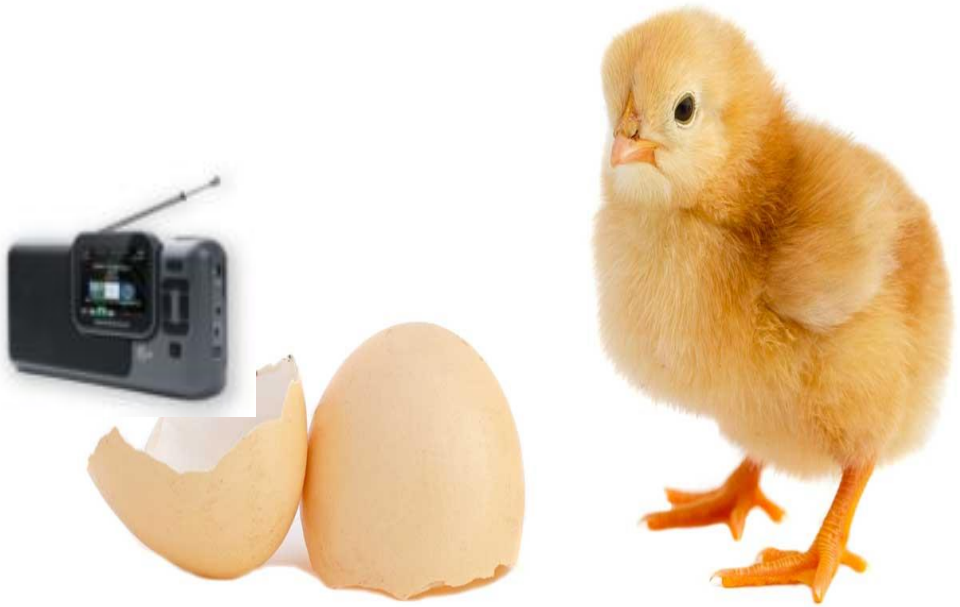
The time for manufacturers is now…

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

Radio Receiver Building Blocks

Ingredients of a DRM Receiver

- 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

These blocks can be packaged as…

RF Tuner

Base Band

Man-Machine Interface

Ingredients of a DRM Receiver

Desktop radio

Car radio

Mobile phone radio

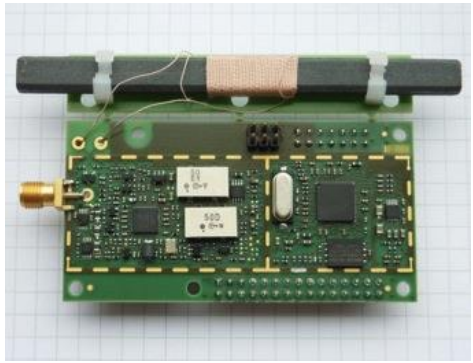
There are some key differences though…

Chipsets for different receivers

Features	Desktop	Car	Mobile phone
Cost	Low	Medium	Very Low
Noise Immunity	Low	High	High
Antenna diversity	X	Required	X
Power	Low	Can be high	Very low
Operating Voltage	3V	5V	1.8V
Own Display	Yes	Yes	No
Keypad	Yes	Yes	No
Amp + Speaker	Yes	Yes	No
USB	Yes	Yes	No
SDCard	Yes	Yes	No

Chips & designs are available to meet these requirements

Availability of Processors and Tuners



NXP

ANALOG DEVICES

FRONTIER SILICON

SILICON LABS

MIRICS

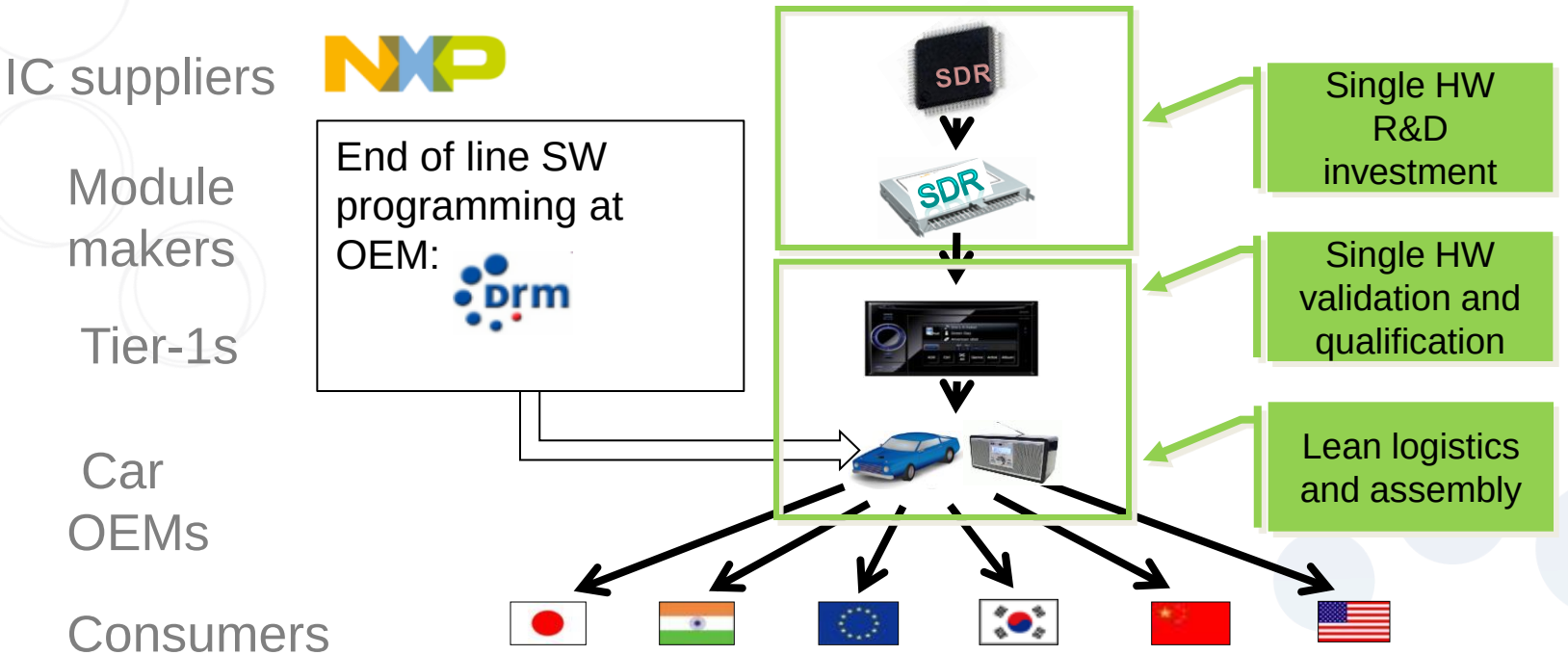
csr

Developments: Chipsets on Different Platforms

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

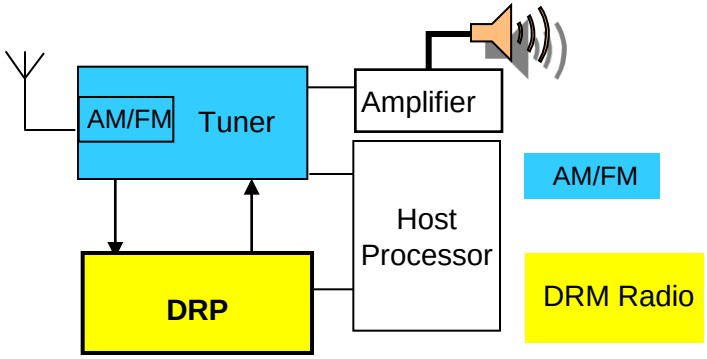
NXP Digital Radio Processor: Lower R&D Investment, leaner Supply Chain

NXP continuously **drives down system cost** and application size



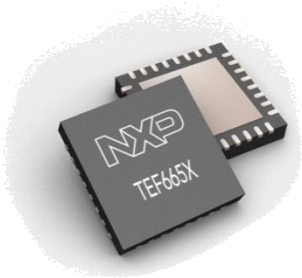
DRM System with NXP's Digital Radio Co-Processor and AM/FM Tuner

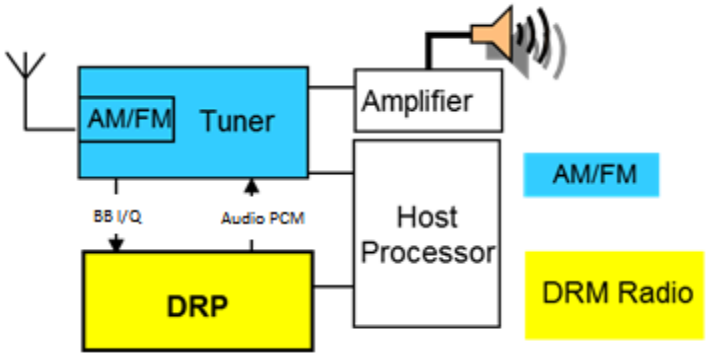
- **NXP's DRM Radio System**
  - Consists of AM/FM + Digital Radio Co-processor (DRP)
  - Customer's Host Processor controls the DRM Radio System
  - Low system cost with minimal external components
- **Digital Radio Co-Processor**
  - Automotive qualified low cost digital terrestrial radio processor
  - 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 au
  - 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





DRM System with NXP's Digital Radio Co-Processor and Hero/AtomIC2 Tuner

From Features to DRM Receivers and Listeners' Experience

T.V.B.Subrahmanyam
Director – Worldwide Home Audio Consumer Segment,
Analog Devices, India

DRM Receivers

- **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

Transmitters

Receivers

Content

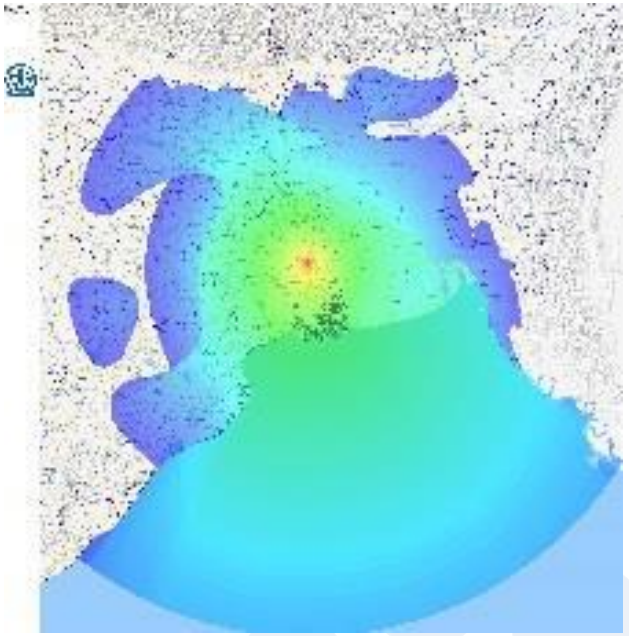
- Setting a target date for start of services is a must for a success story:
  - Germany
  - Australia
- Broadcast content to make it a compelling reason to buy digital radio receiver

Content

- 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?

Conclusion: DRM in India represents a significant commercial opportunity for receiver manufacturers

- 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



Kolkata/Chinsurah 1000KW Transmitter Coverage

Source: AIR October 2013, Frontier Silicon analysis

India can and will lead the way technologically in audio broadcasting

Q & A

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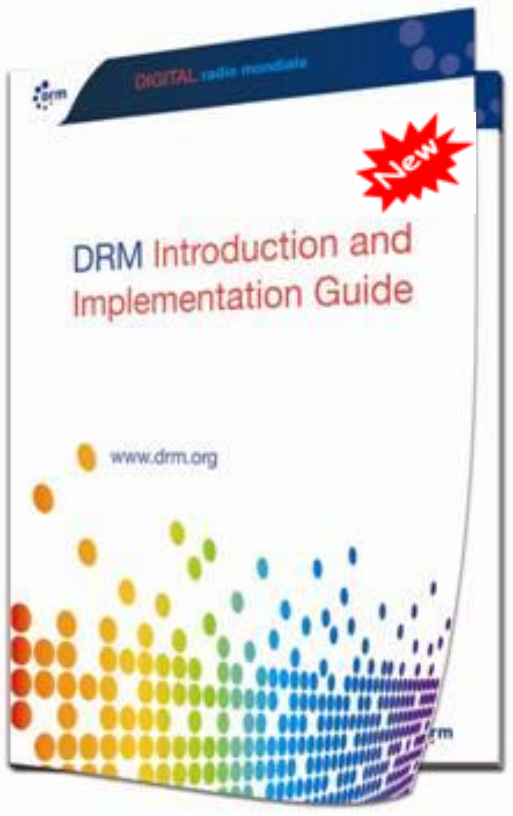

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