Digital Radio Options for Thailand

Services and Frequency Planning

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Presentation Overview

1. Frequency & systems options

- National Spectrum Plan (NSP)
- System options

2. DRB services & planning

- Multiplex loading
- Plan targets & results
- Reaping synergies
- Local service planning

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1. Frequency & systems options

1. Frequency & System options – NSP

VHF Band III only option at present for DR introduction

Band reference	Alternative service name	Frequency Range	Options for Thailand
LF Band	AM Long Wave	30 to 300 kHz	None at present
MF Band	AM Medium Wave	526.5-1606.5 kHz	Limited at present
HF Band	AM Short Wave	3 to 26 MHz	None for coverage in Thailand[22]
VHF Band I	Television Band I	47 to 68 MHz	Not tried. Good potential.
VHF Band II	FM Radio Band	87 to 108 MHz	Very Limited to None at present.
VHF Band III	Television Band III	174 to 230 MHz	Limited, but Good
UHF Band IV/V	Television Band IV/V	470 to 854 MHz	Very Limited
UHF L-Band	L-Band	1452 to 1492 MHz	Limited to Very Limited
Source: ITU project			

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1. Frequency & System options – system options

Only DAB+ and DRM are realistic options for Thailand (for Trial)

Technology/ System	Radio	VDO/ Image	Radio On Mobile Devices	On Mobile phones/ Devices	Frequency Band
DMB (DAB, DAB+)	Yes	Yes	Yes	Yes	VHF III
DRM (DRM30, DRM+)	Yes	Yes	Yes	Yes	LF, MF, Shortwave, FM, VHF
T-DMB	Yes	Yes	Yes	Yes	VHF III
ISDB-T $_{SB}$	Yes	-	Yes	Yes	TV bands
ISDB-T $_{MM}$	Yes	Yes	Yes	Yes	VHF III, etc.
HD-Radio (IBOC)	Yes	-	Yes	-	MF, FM
Source: ITU Project					

- 4 transmission standards for VHF Band III (DAB+, DRM, ISDB-T, T-DMB):
  - ISDB-T & T-DMB radio services are part of TV multiplex
  - Thailand has opted for DVB-T2 → ISDB-T/T-DMB no option → only DAB+ and DRM are options for DR

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1. Frequency & System options – system options

DAB+ receivers commercial available with a wide product range and lowest prices

- A wide diversity of commercially available DAB(+) receivers
  - o For all Profiles, including Multimedia Receivers
  - o Prices range from 1,000 to 19,000 THB
- No/limited commercially available DRM receivers:
  - o Indian DRM-30 project may change situation
  - o DRM multiplex has relatively limited bandwidth (→ more transmitters for same # of services

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2. DRB services & planning

2. DRB services & planning – multiplex loading

Step 1: available multiplex capacity

Parameter	Digital Radio System: DAB+ Typical operating parameters	Digital Radio System: DAB+ Maximum permissible
Typical stream bitrate (kbps) at protection level 3, code rate = 1/2	1152kbps	576 – 1728 from level 1 to level 5
Typical Number of audio only services	18	63
Typical service channel rate (kbps)	32 – 80	Up to 192
Channel bandwidth (kHz)	1712	1712
Modulation / FEC coding	DQPSK Convolutional / Reed-Solomon	DQPSK Convolutional / Reed-Solomon
Typical operation	DQPSK / R=1/2	-
Robustness	Excellent	-

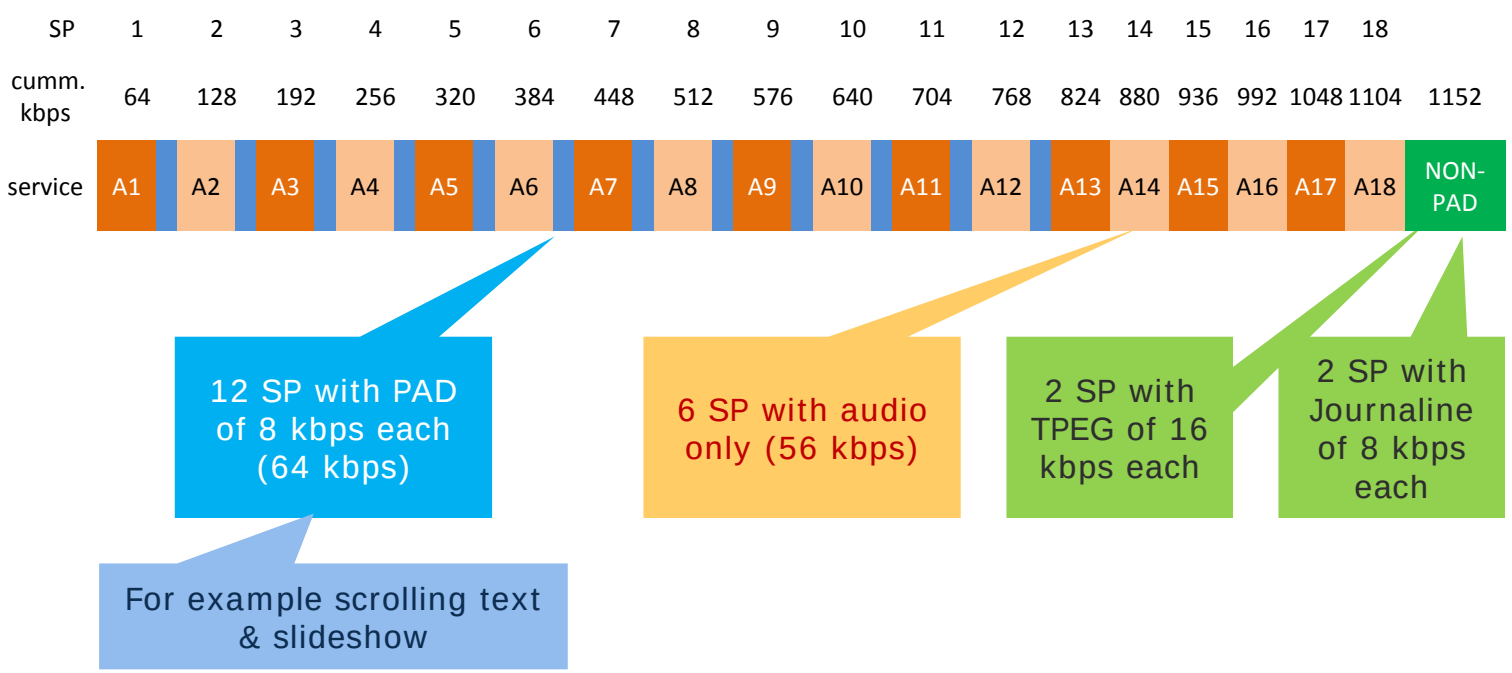
2. DRB services & planning – multiplex loading

Step 2: capacity per service

No	Service / Quality Objective	Service payload bit rates	Implemented figures	Recommended
1.	High quality 2 channel stereo sound	64-96 kbps	88kbps	64 kbps
2.	Good quality 2 channel stereo sound	48/56/64/72 kbps	56-64 kbps	40-48 kbps
3.	Limited quality 2 channel stereo sound	32-48 kbps	-	-
4.	5.1 channel surround sound	64 -128 kbps, depending on the content	-	64 -128 kbps depending on the content
5.	PAD data service	10 % of above	-	10 % of above

2. DRB services & planning – multiplex loading

Step 3: loading the multiplex



- Many loadings possible which can vary daily
- Number of Service licenses and capacity per license determines multiplex load

2. DRB services & planning – plan targets & results

Two frequency planning scenarios & targets

Frequency Plan completed

	Plan A **Scenario 1**	Plan B **Scenario 2**
Description	All VHF Band III on air (and protected)	All digital situation – ASO VHF Band III
Pop coverage target	10 +1 city	95%, including 11 cities
# national MUX	3	4
# national audio services	3x(18 or 9)=54 to 27 (1)	4x(18 or 9)=72 to 36
# local MUX	None	4
# local services	None	72 to 36 in 39 local areas
# regional MUX	None	None
# regional services	None	None

Frequency Planning in progress

Plan A FP results:

- 3 cities not possible due to ATV adjacent channel interference
- BKK TX site serves 4 cities
- 4 other TX sites cover other cites
- Total pop coverage = 8-15%
- Blocks 7 B,C,D and 8 B,C,D

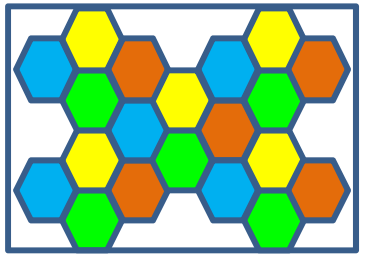
2. DRB services & planning – plan targets & results

Further planning work will show required spectrum

- Planning shows targets are demanding:
  - Scenario 1: avoiding adjacent channel interference
  - Scenario 2: number of blocks for national and local layer -> 2 in FP (Trial) and 7 (t.b.c) blocks (for nat. & loc.)
- Further planning work will show blocks for each local layer

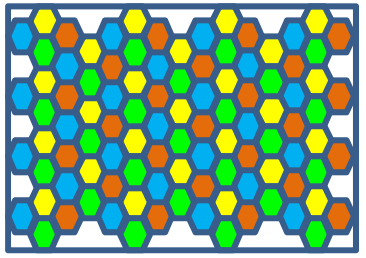
Target (scenario 3)	# blocks
4 national layers	8
4 local layers	28
total	**36**
Available	**32-3=29**

1 layer = 4 blocks



20 areas

1 layer = 4 blocks



100 areas

= SFN or single site

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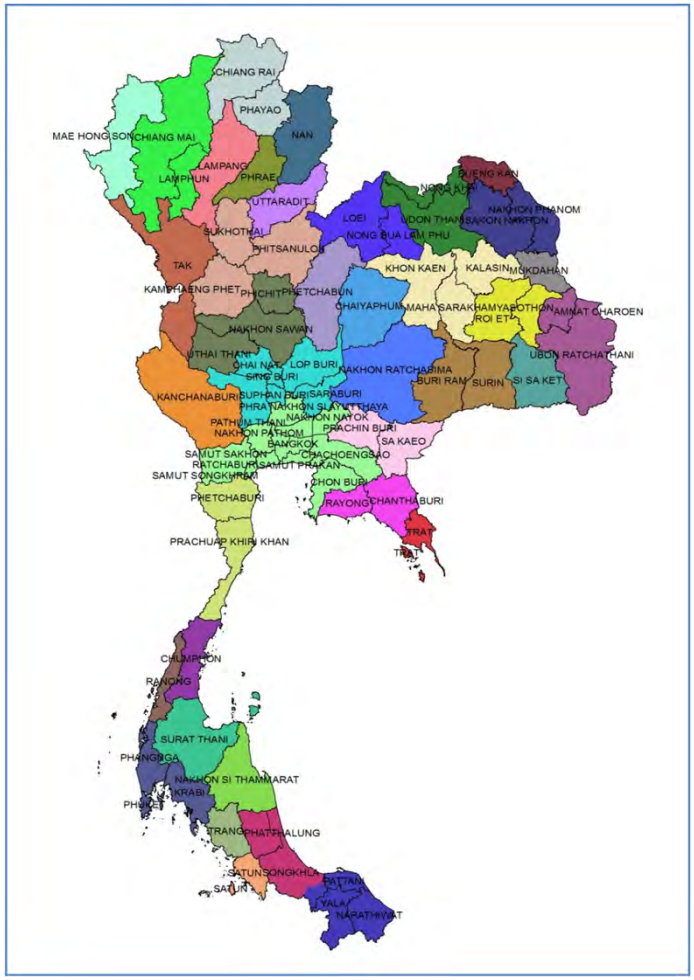
2. DRB services & planning – reaping synergies

Synergies between DTTB and DRB

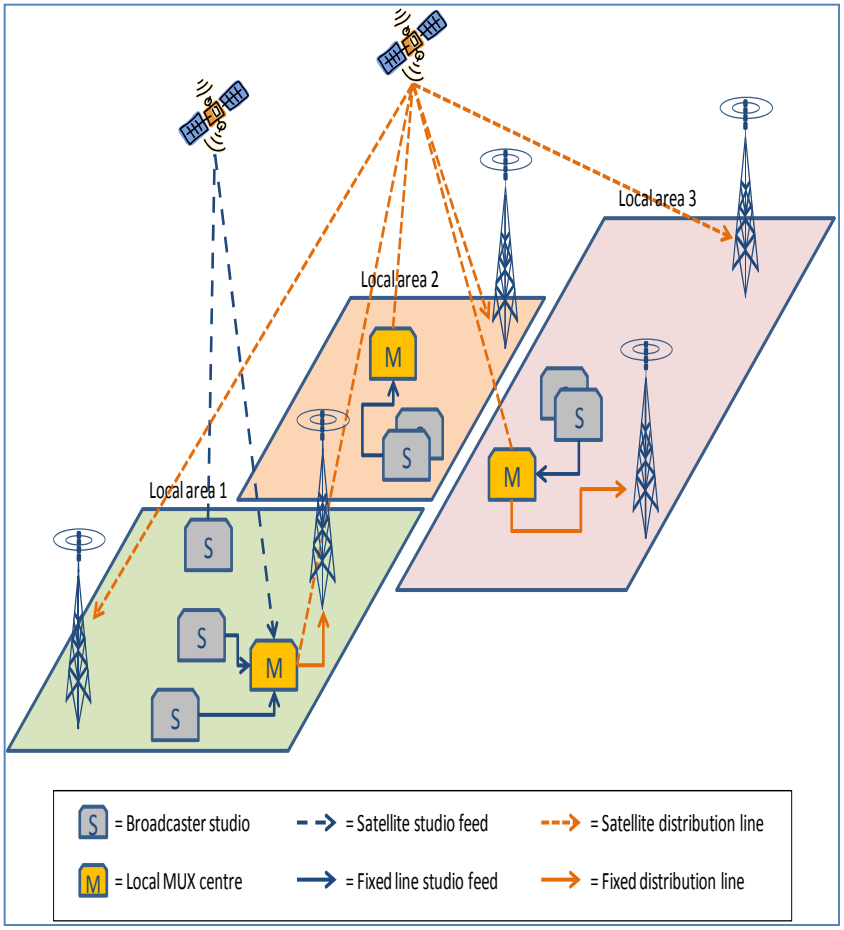
- DTTB network deployment before DRB
- 39 DTTB Local areas will be defined
- DRB Local areas should be the same because:
  - o Communication / consumer confusion
  - o Infrastructure / facility sharing between DTTB and DRB networks



2. DRB services & planning – reaping synergies

Facility sharing reduces DRB cost levels

- Facility sharing between DTTB / DRB:
  - Combined DTTB / DRB NOs
  - Sharing agreements
- Reducing DRB cost levels by sharing:
  - Distribution links
  - Site facilities
  - Fixed line studio feeds
  - Tower sharing



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2. DRB services & planning – local service planning

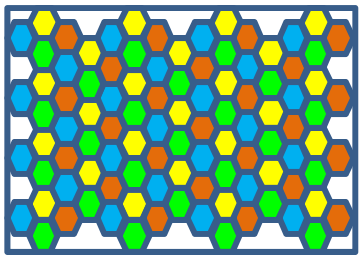
Size of DRB Local areas drive FP and costs

- **Economic viability:**
  - Smaller areas limit DRB earning capacity
  - Smaller broadcasters can still access market by Point of Service (PoS) pricing
- **Frequency inefficiency:**
  - Smaller areas lead to spectrum inefficiencies
  - Planning targets are spectrum demanding
- **Deployment costs:**
  - Smaller areas will require lower ERPs and more sites

Local area pop	#
< 1m	15

Local area size	#	PI diameter (10 kW ERP)
~ 25 – 80 km	10	~ 60 km

1 layer = 4 blocks



100 areas

= SFN or single site

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