

DAB+ Digital Radio

Receivers

Dr Les Sabel, WorldDAB Technical Committee

EBU calling for harmonised approach across Europe

EBU



Jean-Paul Philippot, President of EBU

- Digital radio required to secure long term future of radio
- Harmonisation: economies of scale / accelerate market development
- DAB / DAB+ the standard of choice

(1) Recommendation R138 <https://tech.ebu.ch/docs/r/r138.pdf>

(2) Eurochip/smart radio initiative: <http://www3.ebu.ch/cms/fr/sites/ebu/contents/programming/radio/digital-radio/welcome-page/about-euro-chip.html>

Contents



1. Receiver Architecture

2. Home

3. Personal

4. Car / Automotive

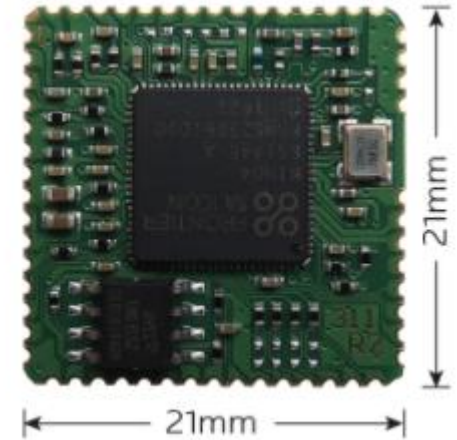
5. Smartphones



Receiver Architecture

History

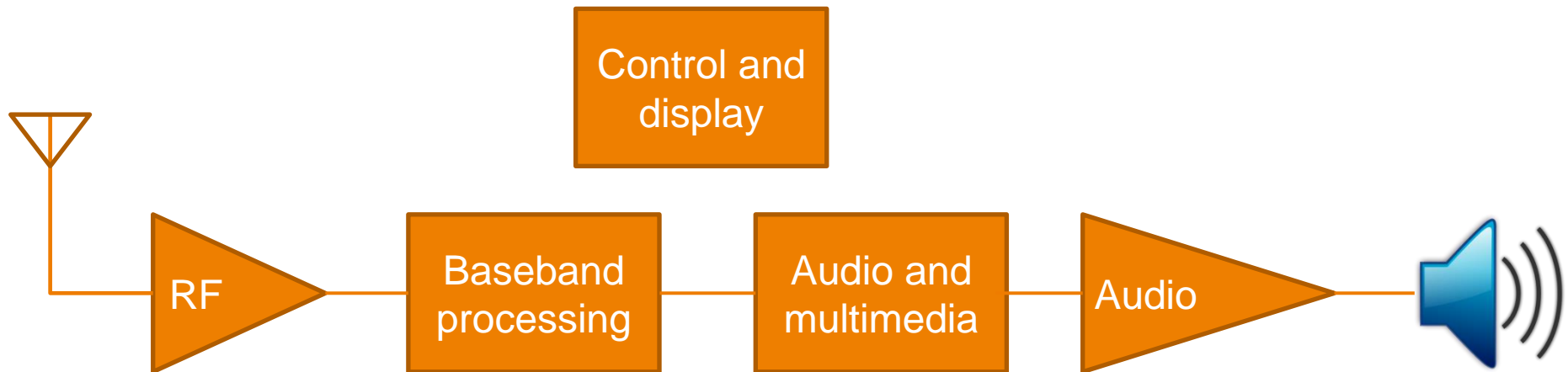
- Initial receivers were large in the 1990s
- Most were module based from early 2000's
 - Frontier-Silicon
 - Si Chip maker
 - RadioScape
 - DSP
- Single chip solutions now starting to dominate
- Most commercial products still use modules although these are now very small
- Critical aspects
 - Cost, Power, Size
- Features
 - Improving features over time
 - DAB+, MOT updates, Cat-SLS, Click-through URL, hybrid operation



Receiver Architecture

Standard receiver block diagram

- RF performance is critical
 - Antenna!
- BaseBand and control are a mixture of DSP/CPU and hard logic front end
- Features are now expanding given lower memory costs and increase CPU capabilities



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Home receivers

Different functionality for different areas of the home

Kitchen

- Stand alone
- Easy to operate
- Good sound
- Good DLS display

Options

- Colour screen
- Docking



Home receivers

Different functionality for different areas of the home

Living room

- Stand alone or HiFi connected
- Easy to operate
- Good sound with external connection
 - (RCA / Headphone)
- Good DLS display

Options

- More volume
- Colour screen
- Docking
- Smartphone control app



Home receivers

Different functionality for different areas of the home

Bedroom

- Stand alone
- Easy to operate
- Good sound
- Good display



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Personal / Portable receivers

Portable for a variety of situations

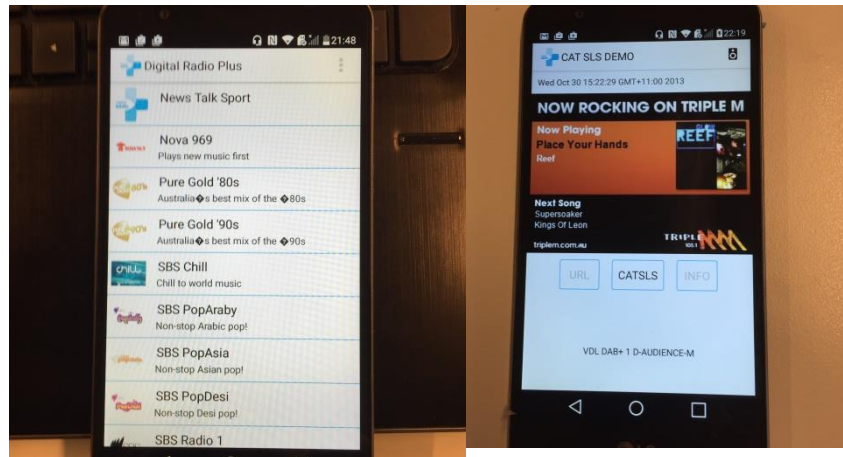
- Work
- Relaxing
- Exercising



Smartphone Receivers

Smartphone Apps

- Remote control
- Service selection
- DLS / SLS display
- Click-through URL activation



DAB+ receivers

Over 500 consumer devices available

Prices from €12



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Car / Automotive receivers

- Cars
 - Factory fit
 - After market
- Commercial
- Other?



DAIMLER



PEUGEOT



HYUNDAI



JAGUAR



VAUXHALL



NISSAN



RENAULT



Mercedes-Benz

HONDA
The Power of Dreams



HINO



TOYOTA



LAND-ROVER



LEXUS

In developed markets, many new cars have DAB and FM

% of new cars with DAB+ digital radio

Technology is
tried and tested



Norway
98%



UK
87%



Switzerland
66%

Aftermarket product manufacturers

PURE

Dual

JVC

KENWOOD

Roadstar

BLAUPUNKT

AUTODAB
...digital radio on the move

Pioneer

CALIBER

ALPINE
Mobile Media Solutions

DENSION
LEGAL CONNECTED ENTERTAINMENT

DAEWOO

ALBRECHT® Audio

Clarion

SONY

DAB
motion

Panasonic
ideas for life

LG

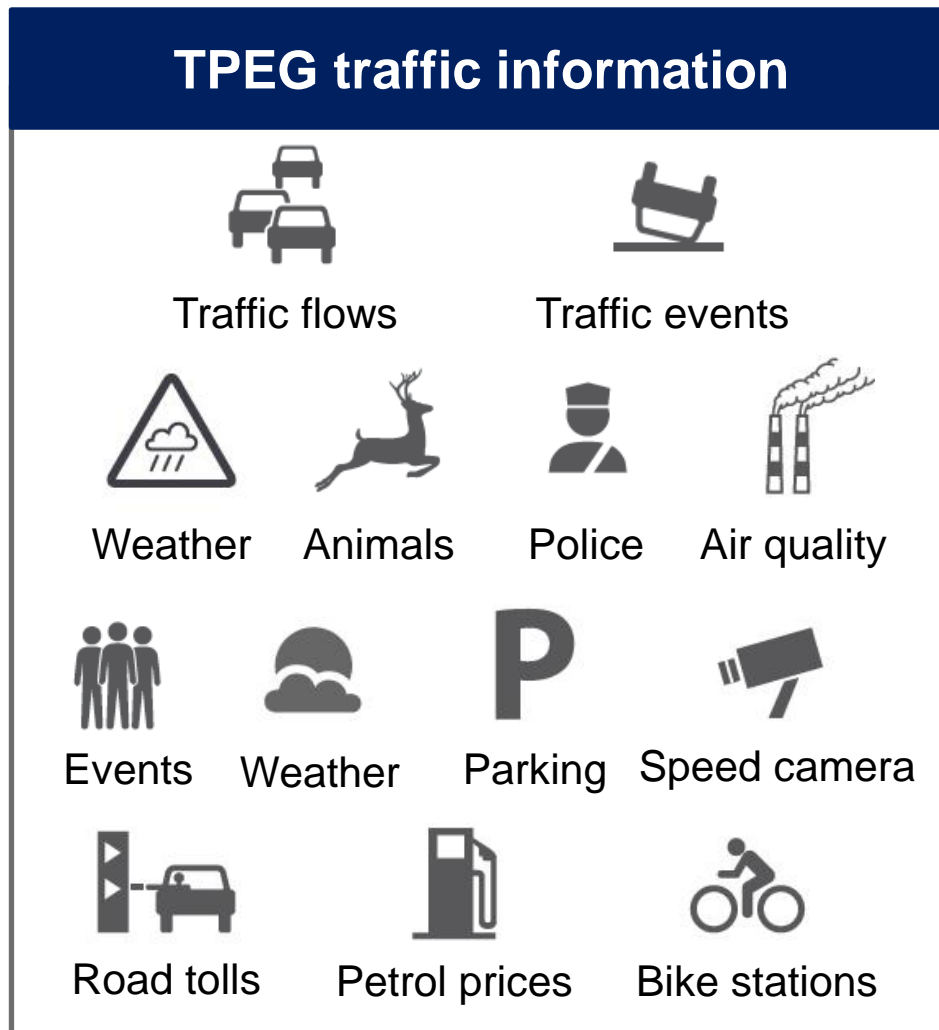
mp man

PHILIPS

PASER

AEG

DAB offers new levels of traffic information



- TPEG via DAB is free to air
- Greatly superior to TMC (20x)
 - more information and event types
 - faster delivery of information
 - better location precision

The automotive sector is ready



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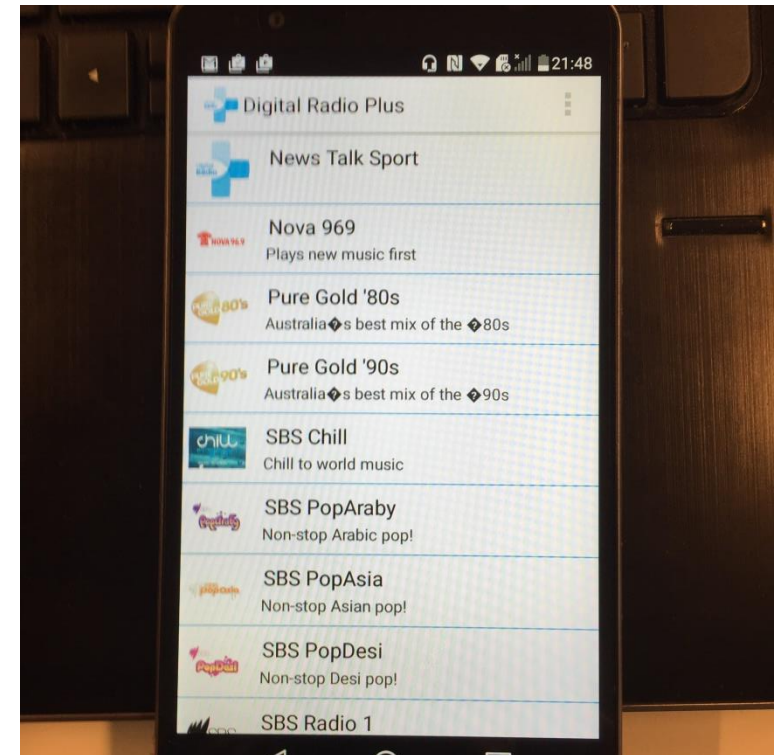
Smartphone receivers

Significant activity to include DAB+ into smartphones

- WorldDAB – OMRI Task Force
- iDAG

Issues

- Telco industry tries to dominate, controls handsets
- Network overload is changing this attitude
- Need broadcasters to push Telcos to specify smartphones which include DAB+



DAB+ Receivers

Conclusions

- There is a very large selection of DAB+ receivers available
- Range from very cheap <20 Euro to very expensive high-end brands
- Broadcasters increasingly keen to use new features
- Receiver manufacturers and chip/module makers gradually including new features
- Radio is a dynamic industry which pushes technology to ensure the best listener experience

Thank you

For further information, please contact:

www.worlddab.org

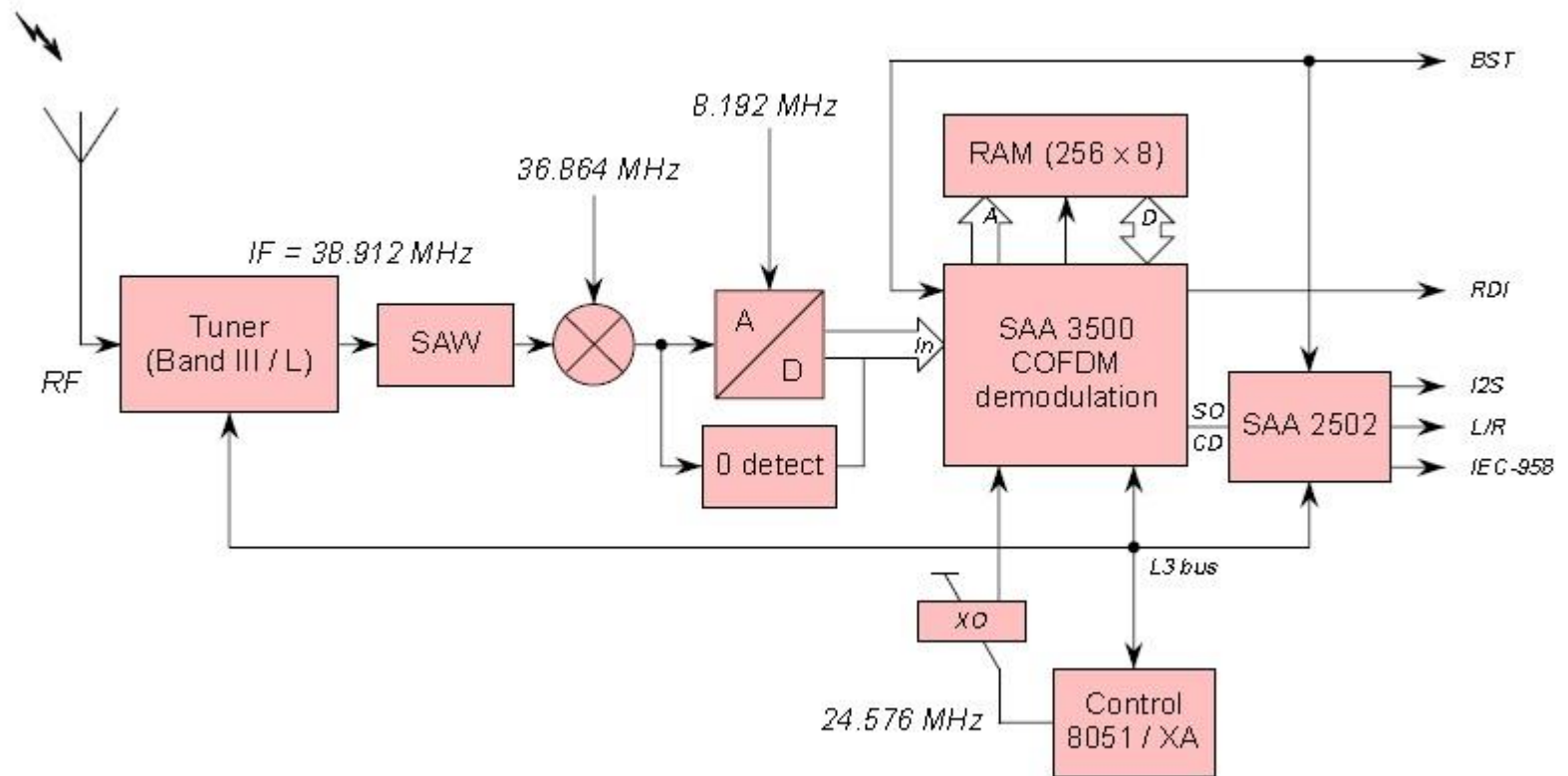
or

les.sabel@scommtech.com.au

Receiver Architecture

Standard receiver block diagram

- State of the art in 1997
- Multiple chips – separate RF, DSP

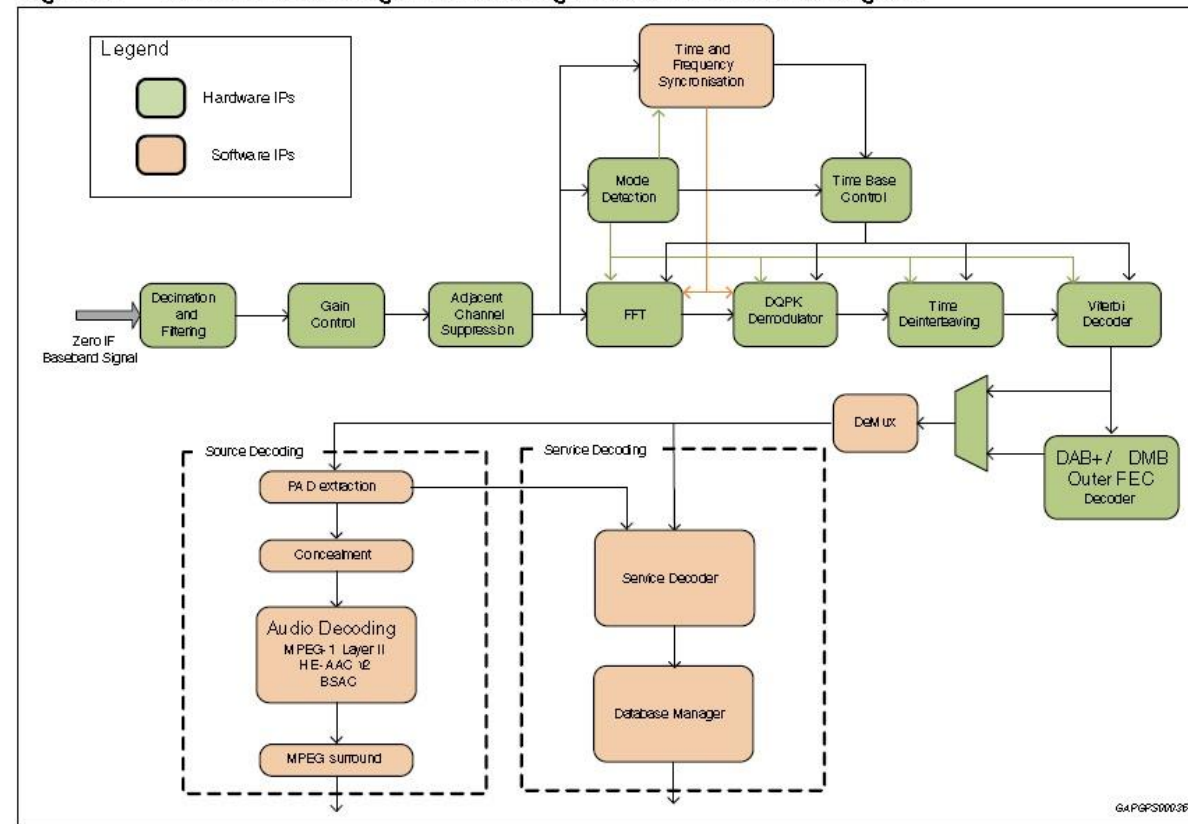


Receiver Architecture

Example digital processor

- Signal processing is done in hardware to minimise power consumption
- Software processing for audio and PAD decoding
- As Silicon feature size reduces more processing is being done in software (SDR)

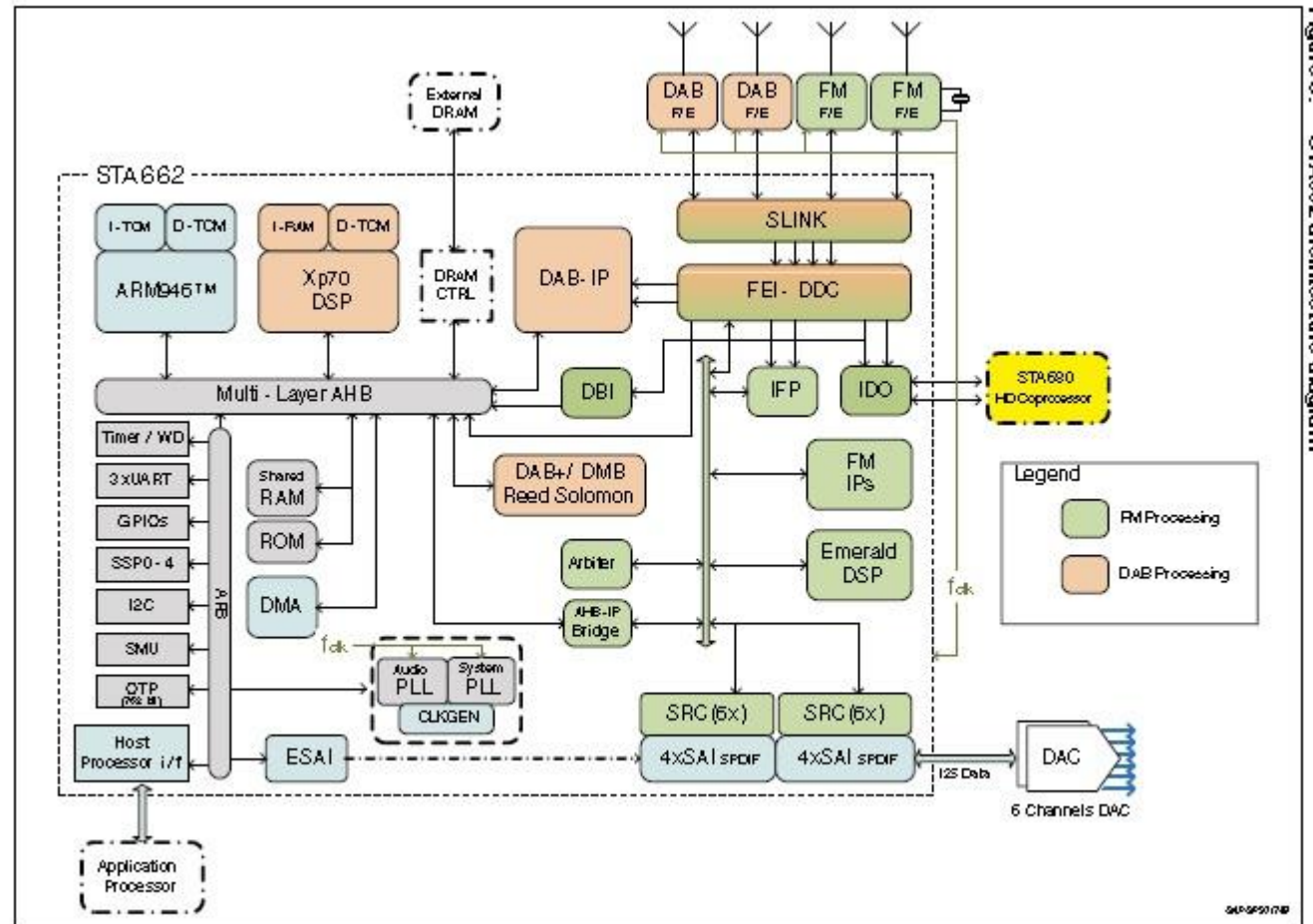
Figure 1. DAB demodulating and decoding functional data flow diagram



Receiver Architecture

Example processor architecture

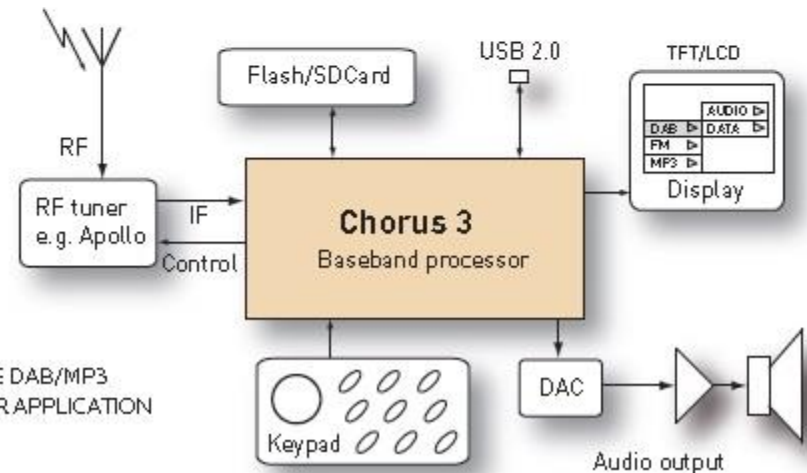
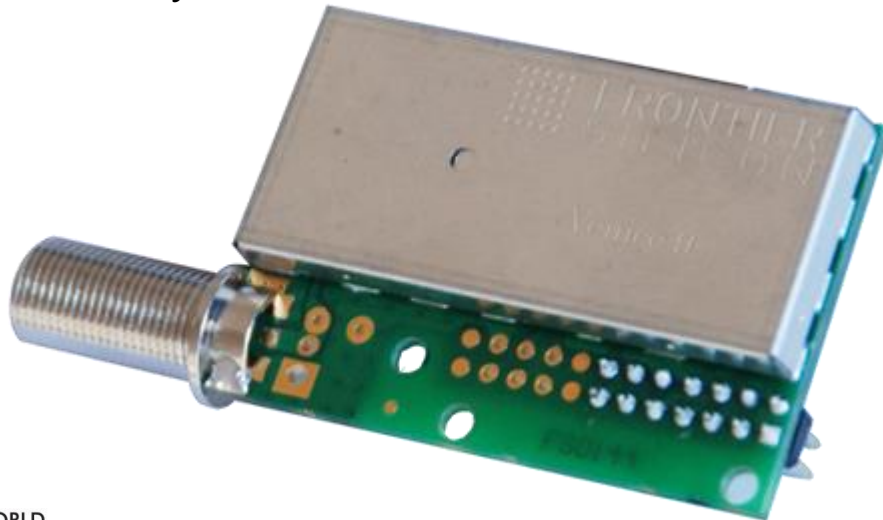
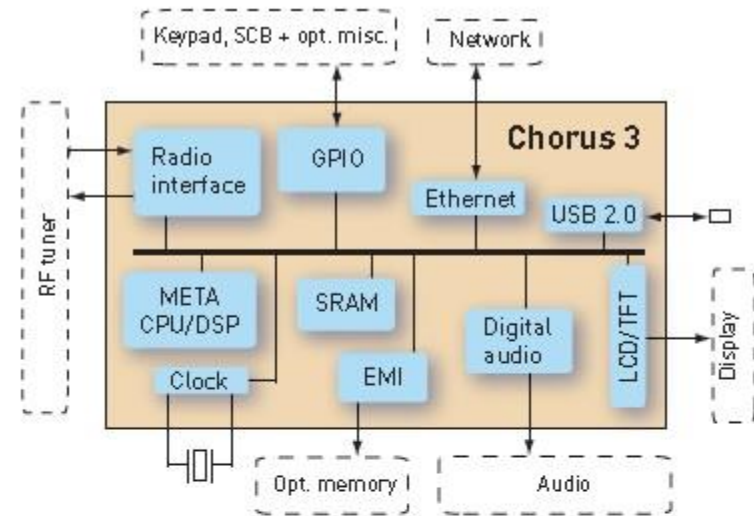
- Multiple RF inputs
- Flexible processing
 - DSP
 - ARM
- Multiple peripherals
- Host processor interface
 - Slave mode
- Memory!



Receiver Architecture

Example processor architecture

- Higher integration
- Includes baseband and control processing
- Flexible processing – META core
- Multiple peripherals
- Host processor interface
 - Slave mode
- Memory!



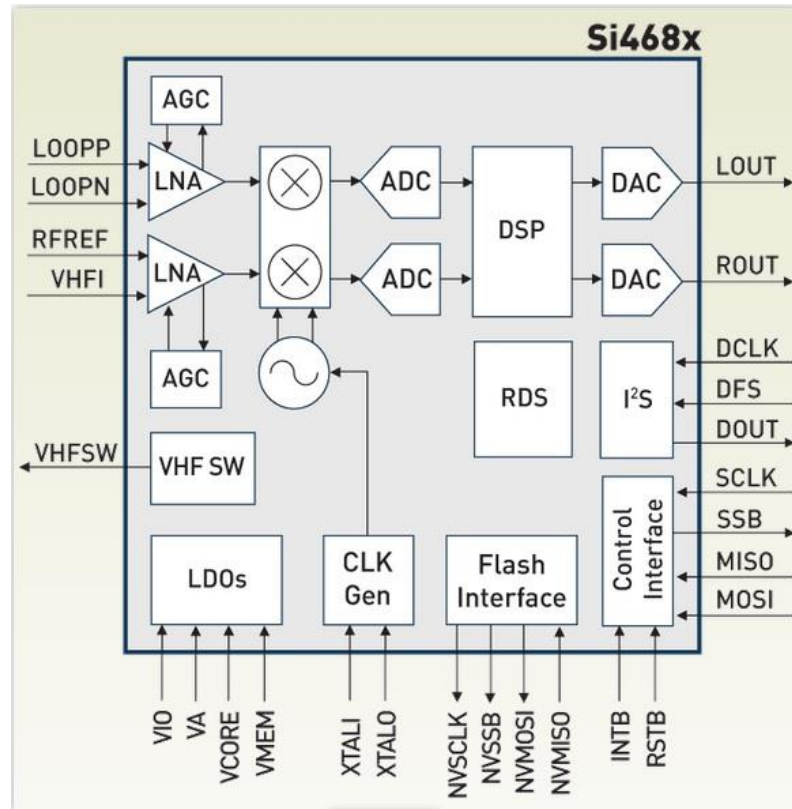
Receiver Architecture

Even a single chip solution still requires all the support hardware and software

Antenna system

The antenna is CRITICAL

Power supply



Audio Amplifier



Control Processor

Connectivity
WiFi, Bluetooth

Keypad

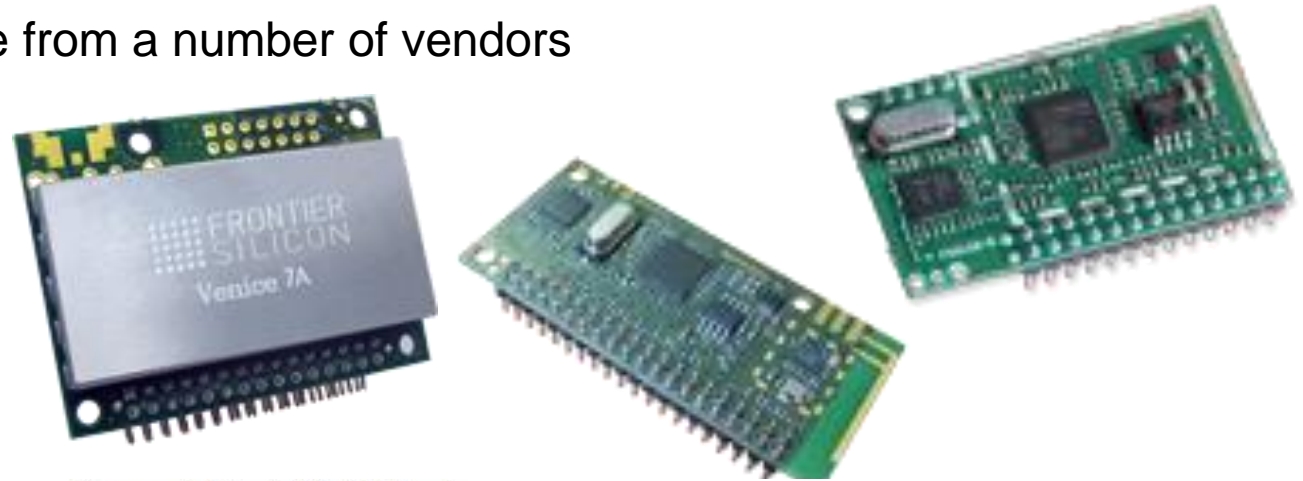
Display

Silicon Labs Si468x



Receiver Architecture

Modules and chips available from a number of vendors

- Analogue Devices
- Atmel
- Etherwave
- Frontier Silicon
- Imagination Technologies
- Keystone
- Maxim
- NXP
- Samsung
- Siano
- Silicon Labs
- Silicon Motion
- STMicro
- Texas Instruments



Commercial Grade Module Family

	Part Number	Standards Supported	Major-Features	Comments	Size
OEM Modules	 T1-L4A-8088CS	FM / DAB	DLS	Complete Modules	26mm x 26mm
	 T1-L4A-8290C	FM / DAB / DAB+ / DMB-R	RDS / RBDS	Complete Modules	26mm x 26mm
	 T2-L4A-8650C	FM / DAB / DAB+ / DMB-R	SLS / DLS+ / EPG / TPEG / RDS / RBDS	Complete Modules	26mm x 26mm
	 T3 series (C)	FM / DAB / DAB+ / DMB-R	SLS / DLS+ / EPG / TPEG / RDS / RBDS	Complete modules	57mm x 32mm