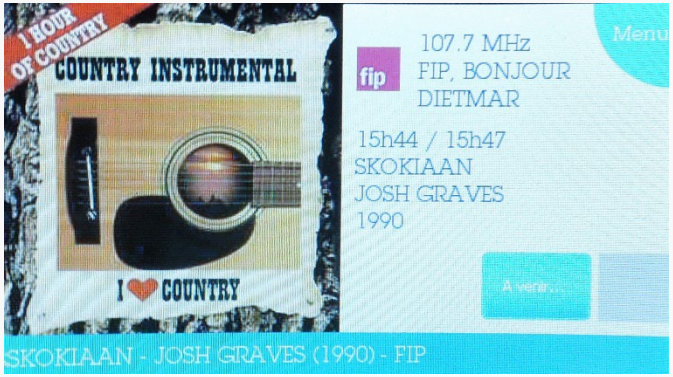
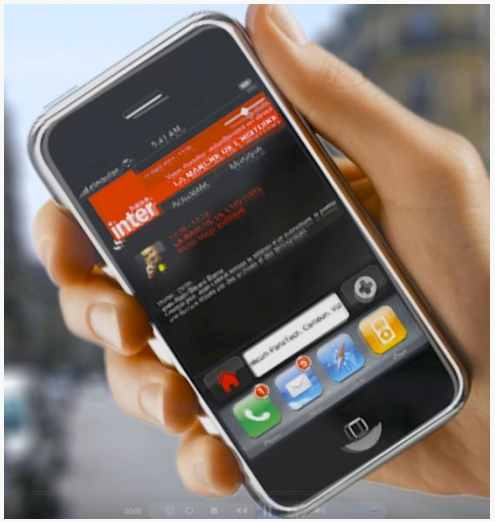
RDS2
- what it is all about



FM radio with RDS

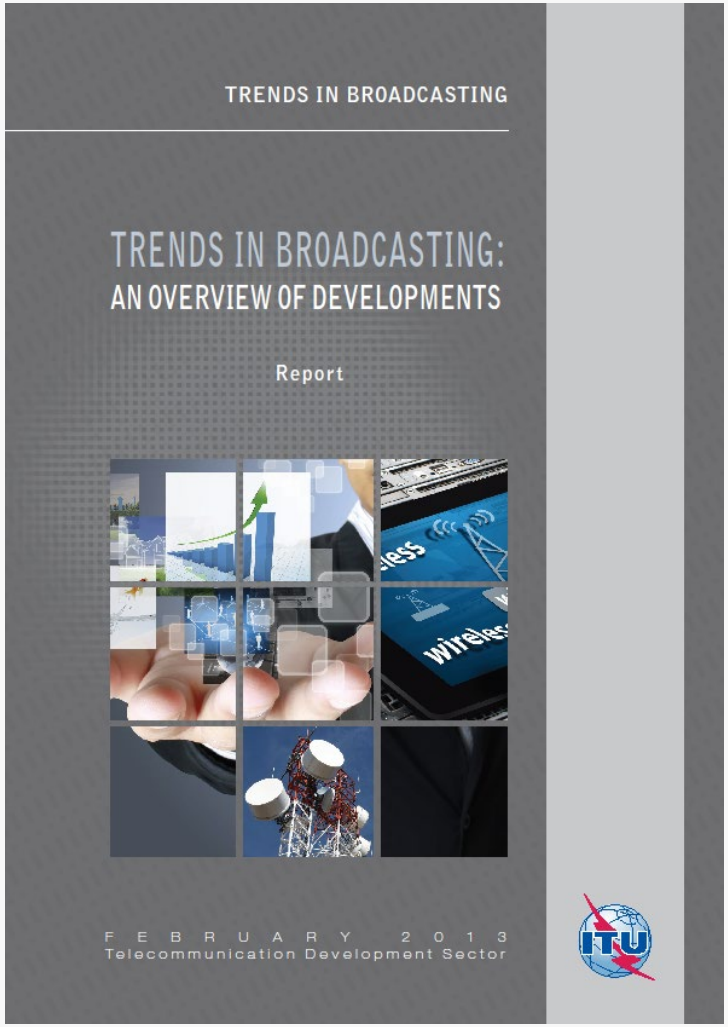


- **This is a very mature technology**
  - Widely used worldwide
  - FM radio is over 65 years old
  - RDS is 40 years old
  - Over one billion FM/RDS receiver chips are made per year worldwide
  - Price can be as low as 1 USD per FM/RDS chip
  - Mobile phones were the largest market
  - Car radio market took over, in Europe almost 100%
  - Most radio receivers sold in Europe and in the USA have RDS
  - RDS has been a kind of “silent revolution”

FM/RDS still have a long future

- FM radio with RDS is mature, cheap and universally available
- FM radio attracts by far the largest number of listeners everywhere
- FM receivers consume the least energy by far
- Traffic services are mature and well established (TA/TP and TMC)
- Due to sophisticated technologies like multiple tuners; multiple antenna systems and RDS algorithms this system is just about perfect for mobile reception
- The perceived audio quality in the car is good and similar from that heard via Digital Radio – for fixed receivers it can deliver HiFi
- FM with RDS is still more used than Internet radio or digital radio
- Outside Europe the number of FM radio listeners increases as also smart phones are used in some markets as receivers

What the ITU said about the future of FM



Conclusions in this ITU study:

- Broadcasting by the end of this decade -

  "FM will remain an important means of delivery of audio broadcasting. In general switch-off of FM stations lies far ahead, but a few countries may have switched-off analogue radio."

  Source: Revised and updated edition of report published by ITU in February 2013

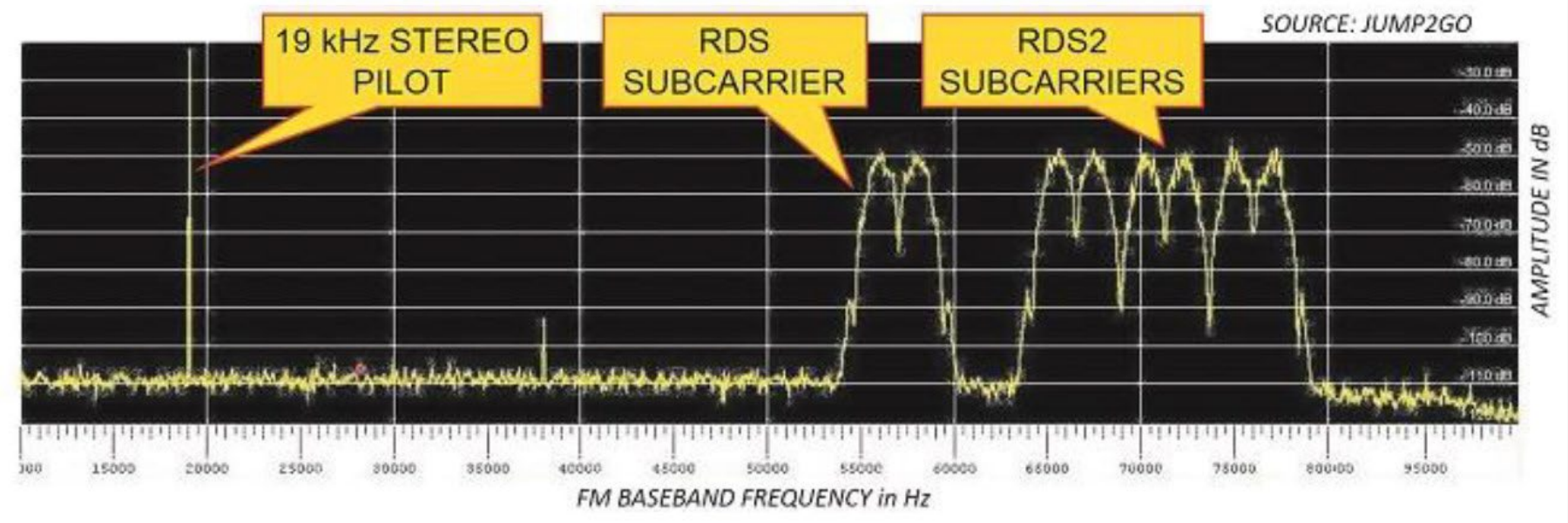
In the meantime, it has become obvious that the switch-off of FM radio stations is off the table and that Norway and Switzerland remain exceptional cases. (see next slide)

Where FM radio really still matters

- **FM radio is available in 194 countries worldwide**
  - Mostly with RDS support
  - Switch off is extremely rare – worldwide only in Norway and Switzerland
    - Norway's and Switzerland's result of FM switch-off: Sharp losses in radio listening for the public broadcasters and significant fall of advertising revenue to be faced by commercial stations that broadcast on DAB+ only
  - Investment in FM radio technology is future-proof and more affordable than DAB+
  - FM radio using modern transmission technology can be very energy efficient
- **FM radio is still the most import radio technology**
  - Specifically in countries/regions with little or no Digital Radio area coverage
  - Europe: Finland, Sweden, Ireland, Hungary, France, Spain, Portugal, Russia, etc.
  - British Commercial Radio will continue on FM at least until 2032
  - North America, India, Africa, Brazil
  - Mobile phones marketed in Brazil from 2021 come with FM radio reception activated
  - Brazil has expanded the FM band, now from 76 - 108 MHz ! The most cell phones should be able to receive it.

Possibilities to enhance RDS

- **Use of three additional subcarriers**
  - Remains within the ITU modulation limits of 10% (Rec ITU-R BS.450-3)



  - RDS2 is backwards compatible for data stream 0 on 57 kHz

Positioning of RDS2

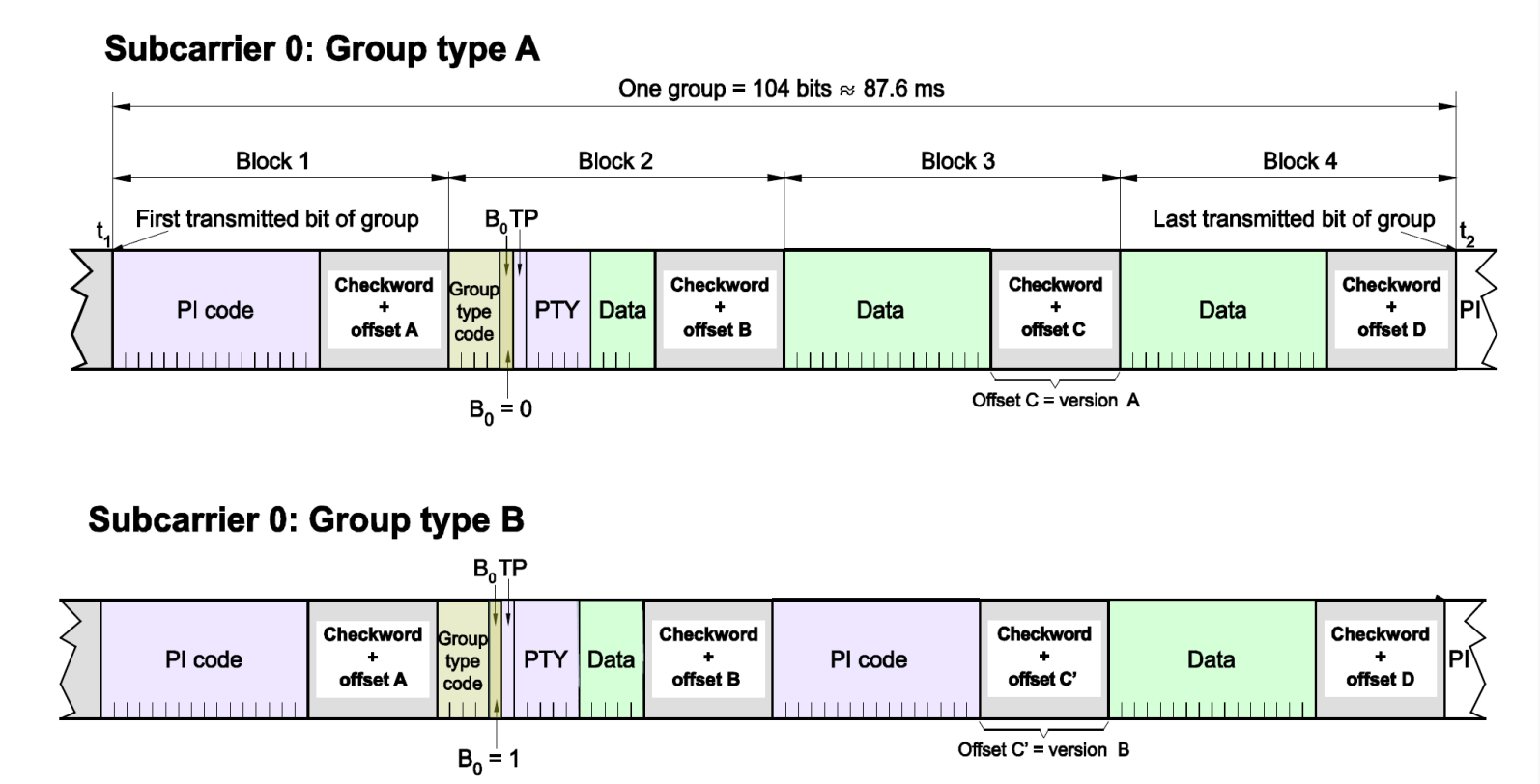
- **RDS2 offers very strong opportunities** where increased data capacity for radio programme added value features and services is required
  - On the RDS Forum web site is a Table that compares RDS and RDS2
  - http://www.rds.org.uk/2010/pdf/R16_055_1.pdf
  - RDS2 is capable to offer a great chance for enriched TMC services, particularly for detailed road information in large urban areas, increasingly required and feasible
  - http://www.rds.org.uk/2010/pdf/R16_061_1.pdf
- **RDS2 is free of IPR**
  - Developed as an open technology by the RDS Forum
- **RDS2 is relatively inexpensive to implement**
  - Thanks to state-of-the art DSP technology current radio platforms can be adapted to RDS2, e.g. those of NXP
  - For 2026 we expect an FM radio chip with RDS/RDS2 available from Korea
- **RDS2 ready encoders are available from WCS**
  - Software Defined Radio methods are used in DSP based encoders
- **RDS2 is optional and part of the updated RDS standard**
  - This is also true for each of the upper data-streams 1 - 3

Use of data streams 1 to 3

- **New features shall use ODA concept whereever possible**
  - The RDS2 file transfer protocol RFT (October 2018) can be used
  - **This increases data transmission rate for ODAs by more than 10 – 15**
    - **RDS stream 0 has capacity for 2 – 4 ODA groups/sec**
    - **RDS2 streams 1 … 3 can transport over 30 ODA groups/sec**
  - **Data throughput increases with new group type C**
    - **3* 56/37 = 4.5 (see next slide for more detail)**
    - **Reason: Not necessary to repeat the basic tuning elements from data stream 0**
- **Significant improvements for current RDS features**
  - **In mobile reception: Increased repetition rates for RT/RT+ and LPS are possible if also distributed on upper data streams**
  - **Increase of reception reliability and short acquisition**
  - **Tunnelling permits to carry basic RDS groups (Type A or B) on the upper carriers**

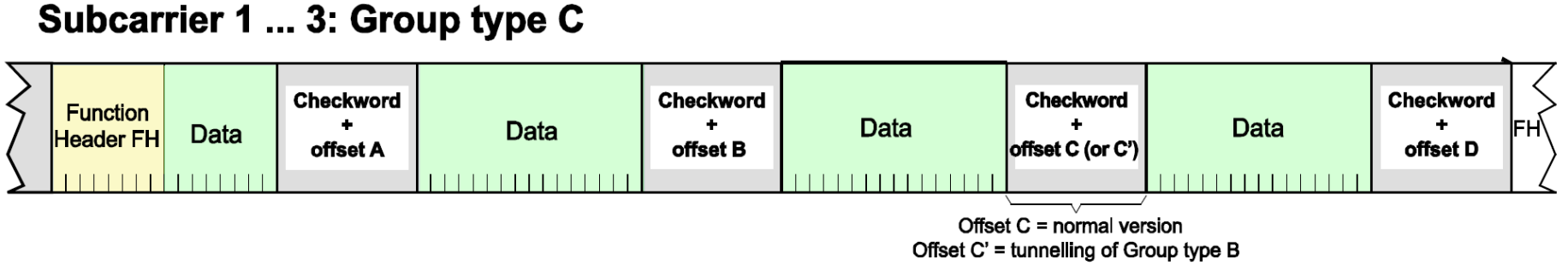
Legacy RDS – group types

- RDS subcarrier 0 uses Group types A (Data: 37 bits) and B (Data: 21 bits)



RDS2 – group type C

- RDS2 subcarriers 1 … 3 use the new Group type C (Data: 56 bits)
  - Group type C consists of a
    - Function Header byte FH (Function ID > 2 bits and Function Number > 6 bits) and
    - 7 bytes of data
  - FH determines the identification and the usage of the group



Some more detail about RDS2

- The structure of RDS is completely maintained on stream 0
  - Streams 1 – 3 simply add three additional RDS channels
- In traffic terms it's like widening a single carriageway road to four lanes
- The data throughput is increased quite dramatically
  - not just by a factor of four, but by more, as
  - it is not necessary to carry in the additional streams 1 - 3 'mandatory' RDS auto-tuning elements that are already on stream 0

For example, the 'PI Code' – which takes up 25% of stream 0 doesn't need to be carried at all in any of the additional streams

Updated RDS standard since 2018

- **Everything that had proven not being implemented and without any future was deleted from the RDS standard**
  - **Deleted:** Paging, Music/Speech flag, certain DI codes, Language id, PIN
- A good alternative to redefining unused bits is to declare them as reserved for future use (rfu)
- A new feature is nice to have in RDS: The long PS - LPS (32 bytes long) and eRT (128 bytes long) with UTF-8 coding which supports many languages

The same text in Urdu and Hindi on VW MIB2 display
(Spoken identical but different character sets.)

RDS2 is ideal for new applications

- **With RDS2 for new applications, the ODA concept needs to be on top**
- **We have now a new IEC draft standard version for RDS/RDS2**
  - http://www.rds.org.uk/2010/RDS2Spec.htm
  - Submitted to the IEC in December 2016 for standardization
  - The new version was published by the IEC since October 2018, and in eight parts all updated by 2023

New RDS standard version of 2018/2023

- **This new version IEC 62106 has**
  - Six Parts (first published in October 2018)
    - Part 1: Modulation characteristics and baseband coding
    - Part 2 rev.2: RDS message format, coding and definition of RDS featuresand RFT (RDS2 file transfer protocol) updated in 2021
    - Part 3: Usage and registration of Open Data Applications ODAs
    - Part 4: Registered code tables
    - Part 5: Marking of RDS and RDS2 devices
    - Part 6: Compilation of technical specifications for Open Data Applications in the public domain
  - **Parts 9 and 10 were completed during 2021 and issued as standards in 2023**
    - Part 9: RBDS
    - Part 10: UECP now with RDS2

The new RDS standard version

- The RDS standard remains the IEC 62106 with an incremented edition counter
  - All Parts started first with Edition 1
  - Part 2 is already Edition 2
- The difference of RDS2 with respect to the legacy RDS standard is clearly explained
- RDS2 remains an option
- The backwards compatibility issue has been fully secured

PS name is best known RDS feature

The PS name in RDS has 8 characters at maximum. It shall be static so that listeners can see what programme they hear

But PS is not always used as standardised

In this case the PS is toggled as ENERGY and BERN

- **A good example why a long PS is required**

RDS2 will enhance the PS name

BBC Radio 6 Music

In addition to the existing "short" PS there is now the Long PS with max. 32 byte

Character coding in all languages worldwide is then possible

Station logos possible with RDS2

All screen shots: VW - 2014

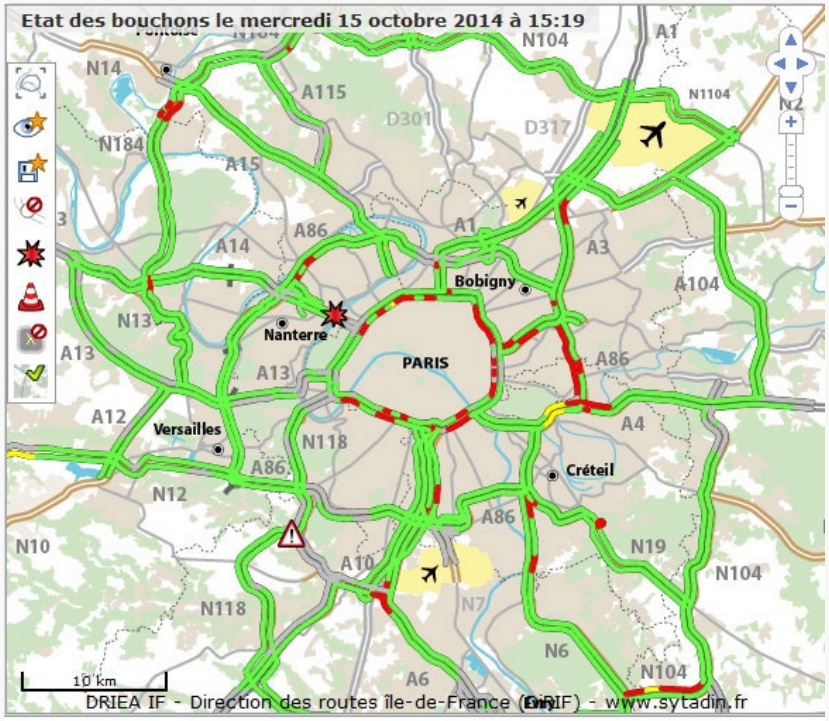
Screen shot: Frits de Jong from Peugeot 2008

- Best example is **RadioText Plus**
  - Used up to now mostly in Germany and the USA
    - The potential for being used more widely remains very high
      - Not only in car radios but also in smart phones

Screen shot: BMW Professional nav car radio - 2013

RDS2 could offer better TMC

- **RDS2 can be a kind of turbo engine for TMC**
  - Supra-regional TMC can remain on RDS stream 0
  - RDS2 on streams 1 … 3 could offer more regional and urban info



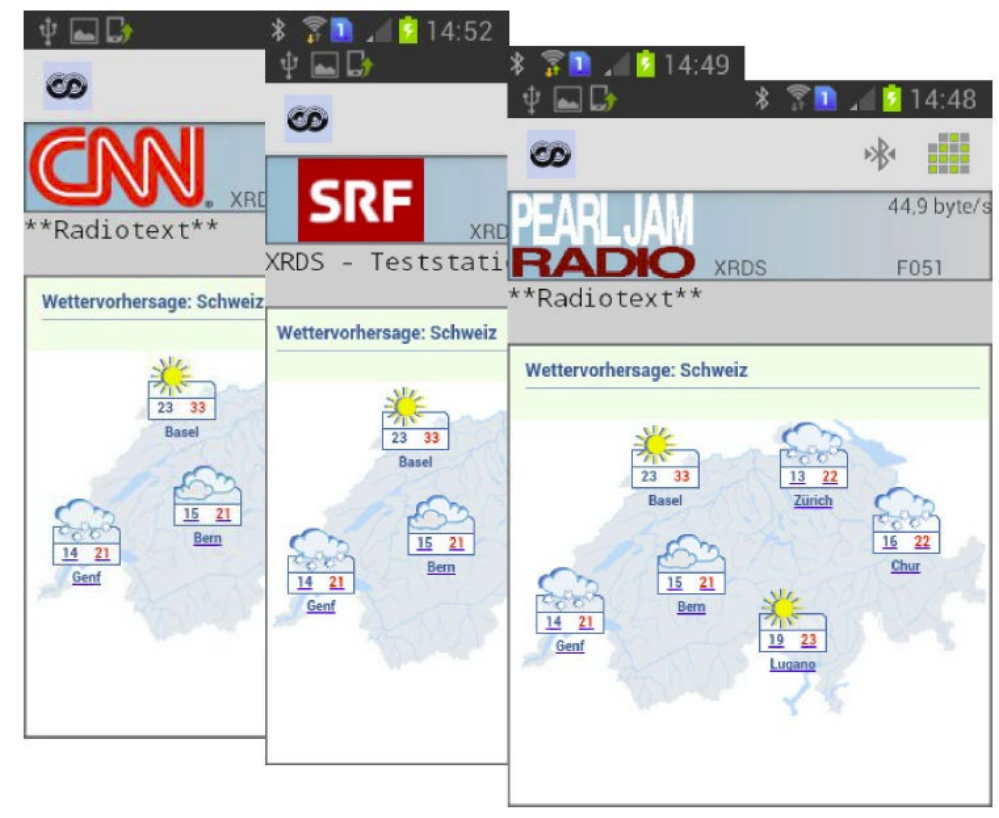
Unique selling points

- **LPS name possible in characters used worldwide**
- **Two kinds of RadioText are possible in parallel**
  - RT with group type 2A can be used for English text
  - eRT as ODA with UTF-8 and 128 byte long can be used in addition with non-Latin characters such as Russian, Chinese, Arabic or Indian text
- **Very widespread TMC could be much powered up**
  - To provide also more regional & and better local info in urban areas
- **RDS2 is able to support graphical features station logos and images**

Source: Radio France / Cameon

- **RDS2 is able to support Hybrid radio** (receiver connected to Internet)
  - Service Following for Internet audio streams carrying the same content

- **Improved graphical possibilities for presenting FM radio**

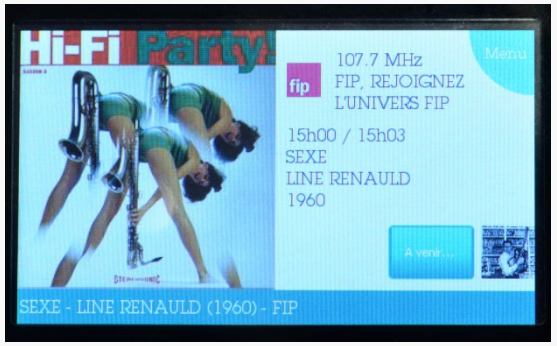


Source: Attila Ladanyi

RDS2 – More objectives

- **Support the connected car concept**
  - Provide Internet links using the Hybrid radio concept
    - Radio France started developing this
- **The Forum aims at supporting applications development**
  - With ODAs to achieve this
- **Support character coding as used on the Internet**
  - UTF-8 coding is already applicable worldwide
  - Supports Chinese, Arabic, Cyrillic, Indian etc.

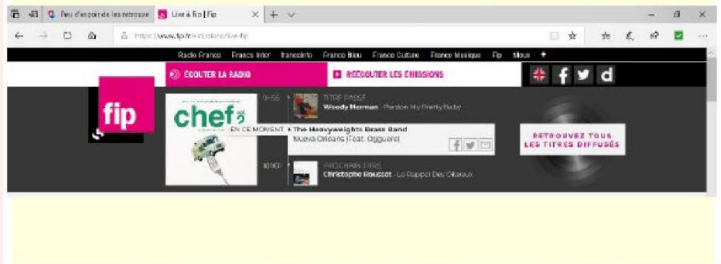
Source: Radio France / Cameon



- **Make FM radio look more modern and interactive**
  - Create business opportunities for the next 30 years of FM radio with RDS

RDS2 demo at the “Salon de la Radio” Paris – La Villette 2020

From RDS to RDS2



24 january 2020 Salon de la radio 2020 4

Source: Radio France /Cameon/ WorldCastSystems

RDS-ODA feature offers -

- **Unlimited possibilities to application developers**
  - The only constraint is the limited data transmission capacity taking into account the number of subcarriers that the app can use

Some more examples:

- **Advertising** in rural areas where no internet is available

using billboards alongside the road

- **Early Warning/Alert Systems** where now also graphic information can be conveyed.

Also, applications like Amber alert and stolen goods can benefit from this new technology

Validation of RDS2

- **What we still need to do:**
  - **Validate the RDS2 performance at various challenging conditions for mobile reception**
  - **What is also needed by the car radio industry are:**
    - **RDS2 decoder chips and/or firmware adaptations for existing RDS chips**
      - Still under development by
        NXP and in Korea by a national RDS2 project (2023 – 2025)
        RDS2 test receiver for RDS/RDS2 data analysis
      - RDS2 USB receiver stick RX014 from MacBe already exists since 2015
        http://www.rx014.com/home/buildpage.php
      - RX014 uses a standard NXP chip with a software patch to make it fully RDS2 compatible

    - **Modulation analyser**
      - Audemat FM MC5 can be used for RDS2 since 2016
      - https://www.worldcastsystems.com/en/c63p37/fm-test-and-measurement/audemat-fm-mc5-modulation-analyzer
  - **In France several industry partners are interested in RDS2 development**
    - **Work started in Dec. 2016 – Progress slow when without public funding**

- **In the RDS Forum RDS2 development has highest priority**
  - **Recent activities**
    - RDS2 file transfer protocol RFT integration into Part 2, achieved
      - To provide additional programme related information – apps being developed
        - Station logo, Slideshow with structured text and Music cover art,
        - Internet radio adaptation to achieve service following and provide additional programme related information
        - UECP adaptation to fully support RDS2, achieved in 2021
  - Many of the RDS Forum members were very actively involved
  - **The pandemic slowed down everything as meetings had become impossible**
  - **If interested in these developments, join the RDS Forum**

- **Thank you for your attention**

- **Contact us at the RDS FORUM**
  - rdsforum@bluewin.ch