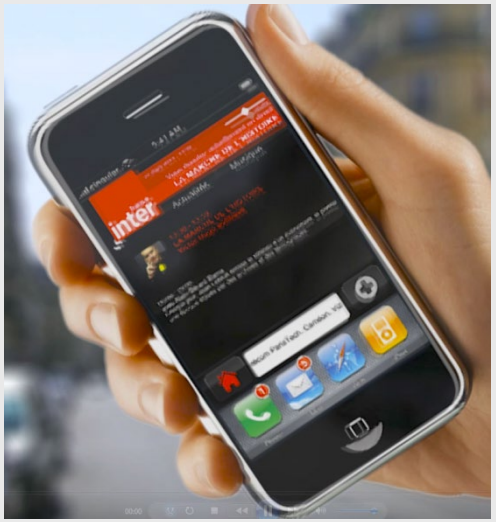
RDS2
- what it is all about

FM radio with RDS

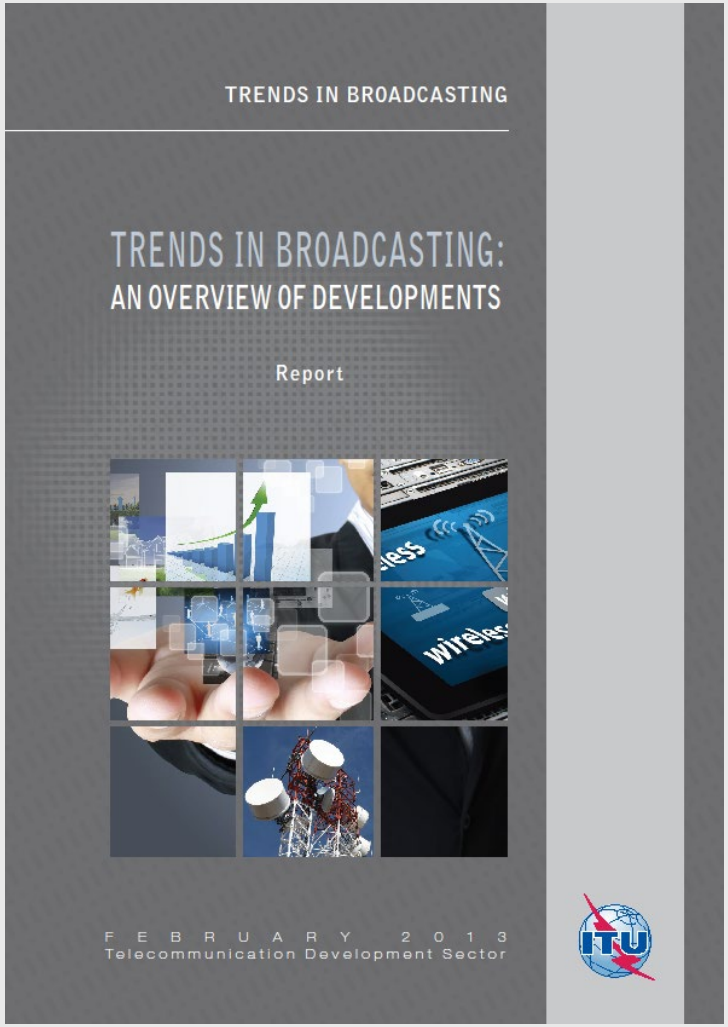


- **This is a very mature technology**
  - Widely used worldwide
  - FM radio is over 60 years old
  - RDS is 35 years old
  - Over one billion FM/RDS receiver chips are now made per year worldwide
  - Price is as low as 1 USD per FM/RDS chip
  - Smart phones have been the largest market
  - Car radio market is next and 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 less power than digital radios
- Traffic services TA/TP and TMC are well established
- Due to sophisticated technologies like multiple tuners; multiple antenna systems and RDS algorithms this system is just about perfect
- The perceived audio quality does not differ significantly from that heard via Digital Radio
- 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 as receivers

What the ITU says about the future of FM



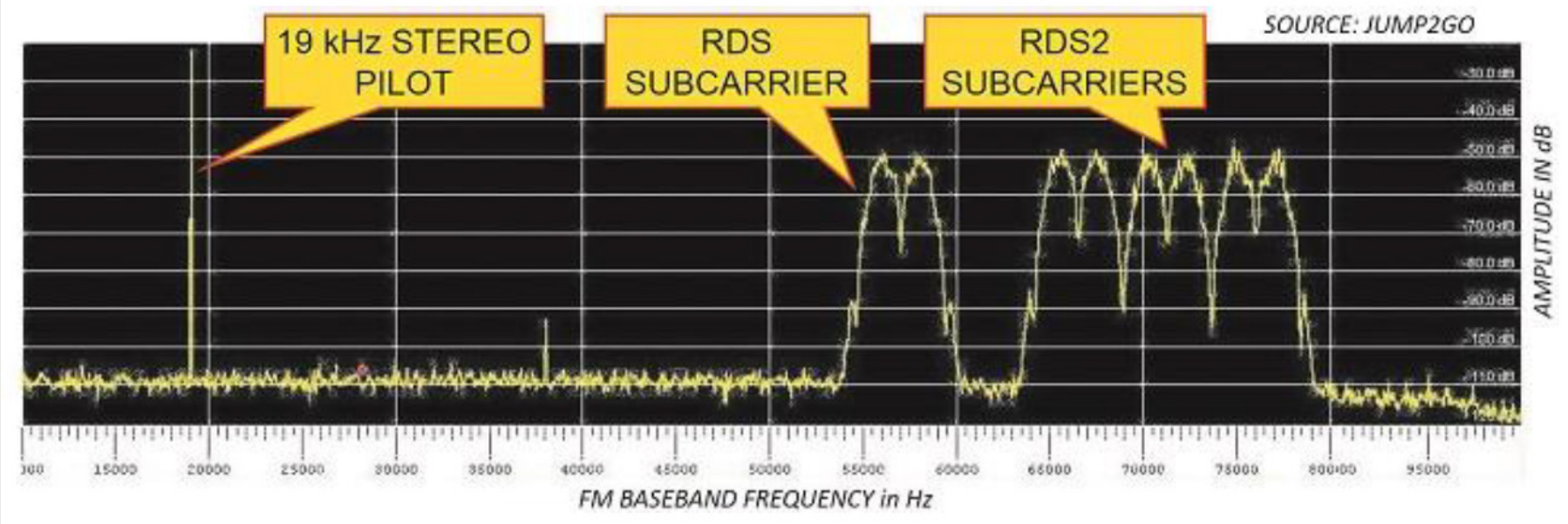
Conclusions in this ITU study:

- 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."

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

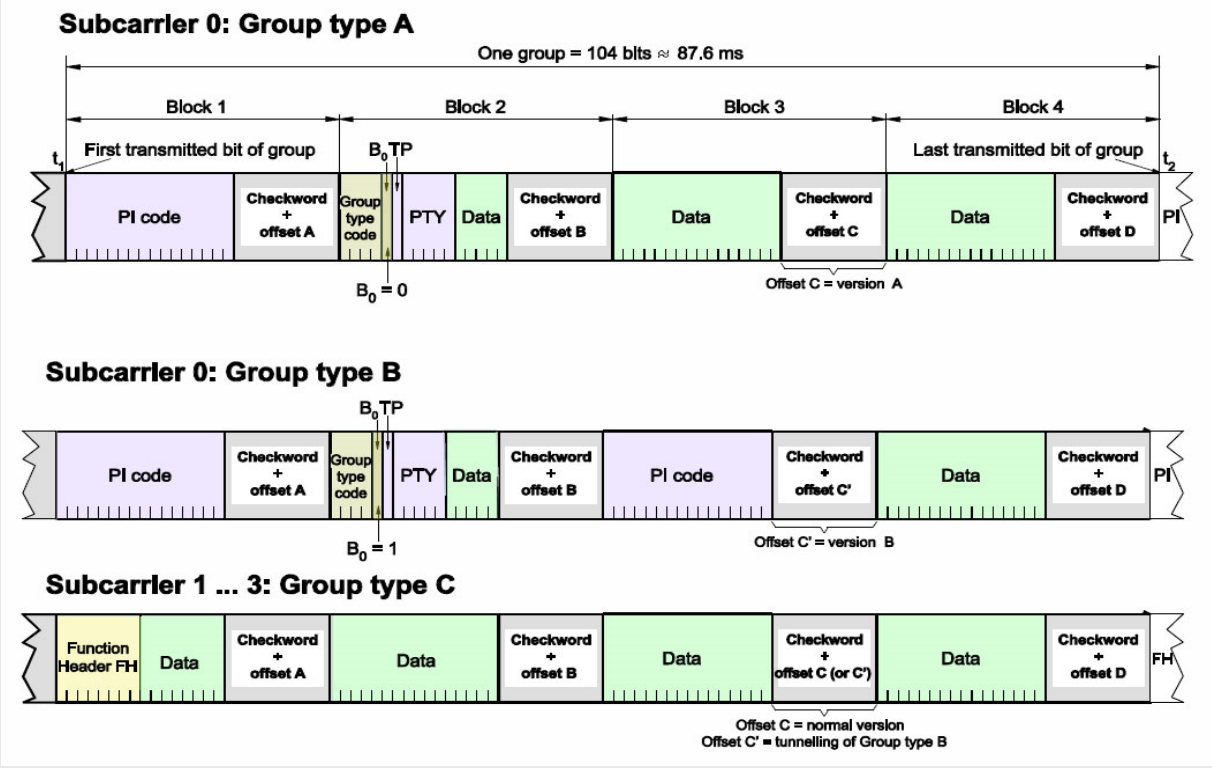
- RDS2 offers very strong opportunities where increased data capacity for added value features and services is required
  - On the RDS Forum web site is a Table that compares RDS and RDS2
  - http://www.rds.org.uk/2010/pdf/R16_055_1.pdf
  - RDS2 is capable to offer a great chance for enriched TMC services, 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
  - Using DSP technology / Many existing RDS ICs can be adapted to RDS2 for manufacturing new RDS2 chips
- Worldcast Systems has since April 2018 **the world's first RDS2 ready commercially available encoder**
- **RDS2 is optional**
  - 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 where ever possible**
  - Also new RDS2 file transfer protocol RFT (October 2018)
  - **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 some 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**

How the data capacity was increased?

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



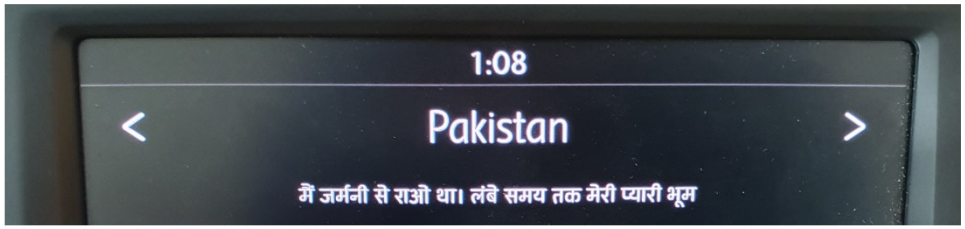
Some more detail about RDS2

- The structure of RDS is completely maintained on stream 0
  - Streams 1 – 3 simply add three more ‘pipes’ to deliver the RDS data stream to the RDS receiving device using up to 64 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

RDS standard review of RDS features

- Everything that has 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

- However in RDS2 for new applications, the ODA concept will be on top of everything
  - We have by 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 in October 2018

New RDS standard version of 2018

- **This new version IEC 62106:2018 has**
  - Six Parts (published in October 2018)
    - Part 1: Modulation characteristics and baseband coding
    - Part 2: RDS message format, coding and definition of RDS features
    - 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 7 and 8 were completed during 2019 and are submitted for standardization to the IEC**
    - Part 7: RBDS
    - Part 8: UECP with RDS2

The new RDS standard version

- The RDS standard remains the IEC 62106 with an incremented edition counter
  - All Parts start first with Edition 1
- 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 the best known

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

...but not always used as standardised

In this particular case PS is toggled as ENERGY and BERN

- **Hence a good example why a Long PS is now needed**

RDS2 will enhance the PS name

Screen shot: VW - 2014

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

The power of RDS2 – more examples

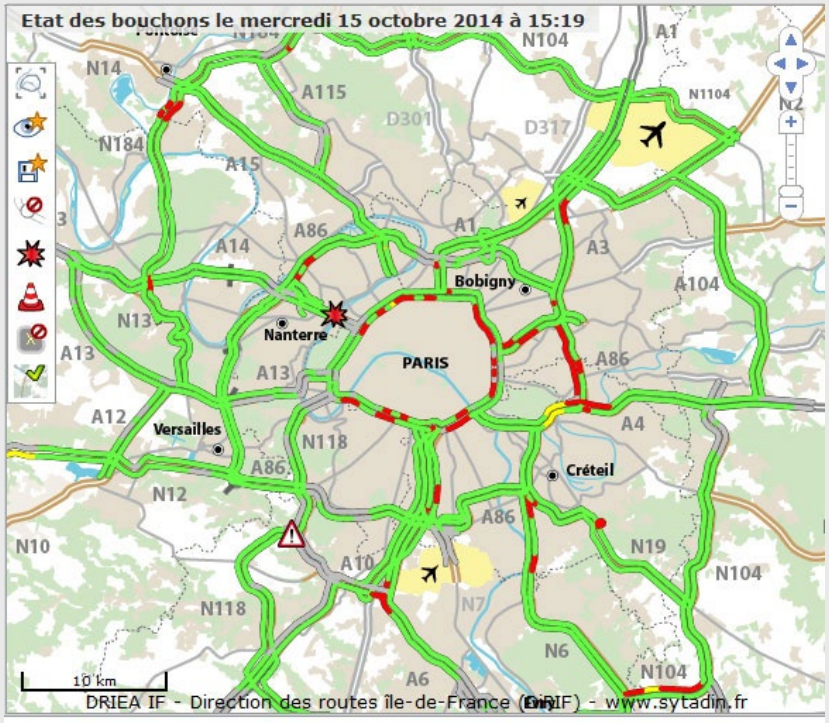
All screen shots: VW - 2014

- 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 will 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

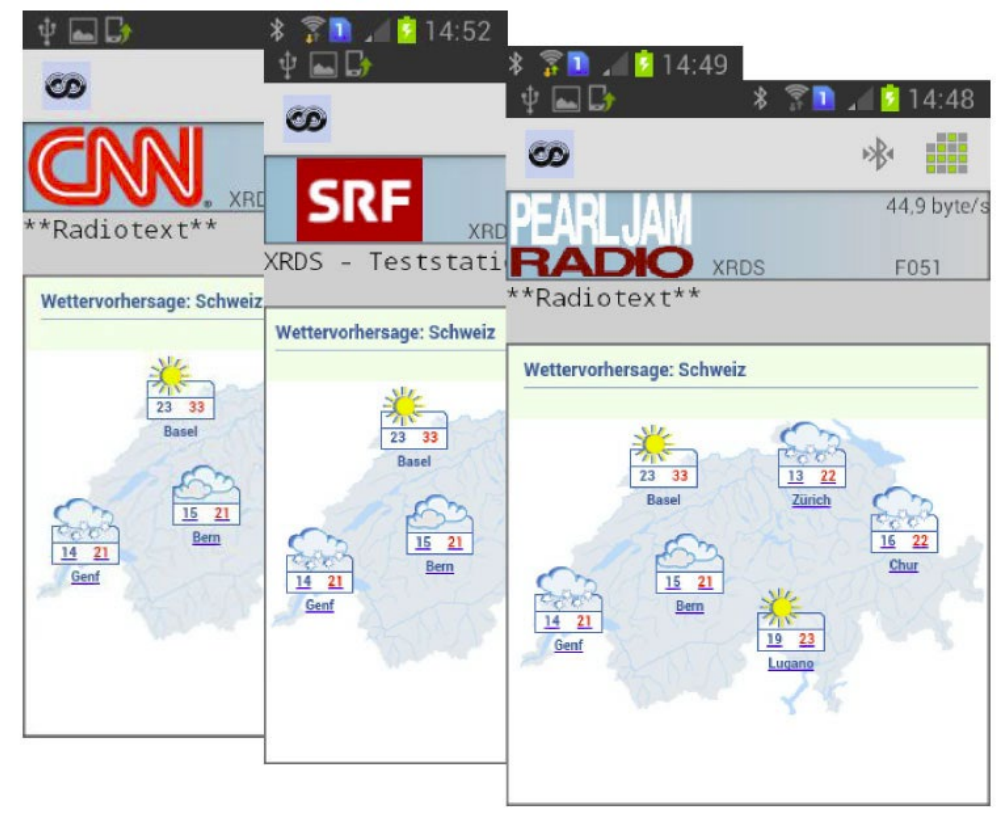


Unique selling points

- **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 will is able to support graphical features, logos, EPG etc**

- **RDS2 will be able to support Hybrid radio** (receiver connected to Internet)
  - Service Following for Internet audio streams carrying the same content is an objective still to be achieved by the RDS Forum 2019 / 2020

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



RDS2 – More objectives

- **Support the connected car concept**
  - Provide Internet links using the Hybrid radio concept
    - Radio France started developing this ODA application
- **The Forum aims at better support applications development**
  - Example: Android OS
  - Use 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.

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

Validation of RDS2

- **What we still need to do:**
  - **Validate the RDS2 propagation 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
        Catena / NXP, Silicon Labs and ST Microelectronics
    - **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
    - **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 without public funding**

More is under study in the Forum

- **RDS2 development has highest priority**
  - Current activities
    - RDS2 file transfer protocol RFT integration into Part 2
      - To provide additional programme related information
        - Logo, Music cover art, Slideshow, Structured text
        - New version of IEC 62106-2 was submitted to IEC in Autumn 2019
    - Internet radio adaptation to achieve service following and provide additional programme related information
      - A working group meeting is planned for January 2020
    - UECP adaptation to fully support RDS2
      - Final draft of IEC 62106-8 was submitted to IEC in Autumn 2019
  - Many of the RDS Forum 2019 members are very actively involved
  - **The next annual RDS Forum meeting is on 8 & 9 June 2020**
    - Will bring up to light many more new RDS2 developments to be done
  - **Join this meeting as a new Forum member or simply as a Guest**
    - **You can register as a new RDS Forum member here:**
    - http://www.rds.org.uk/2010/pdf/Joining%20the%20RDS%20Forum%20in%202020_191008_2.pdf

Thank you for your attention

- **Contact us at the RDS FORUM**
  - rdsforum@bluewin.ch
- **Consult the RDS Forum web site**
  - www.rds.org.uk