# Service Following

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# What is service following?

- The ETSI standard TS 103 176 tells us:
  - Service following is the term applied to maintaining the same audio or data content that the user has selected in spite of the varying reception conditions that occur, for example, when travelling by car or train. Many broadcast network topologies are possible, and the tuned service may be carried on an ensemble with multiple tuning frequencies, on more than one ensemble, may carry common programming with other DAB services, and for audio services, also be carried on FM-RDS or another bearer. The best service following experience for the listener is achieved when the broadcaster minimises the timing differences between different bearers, taking into consideration the different coding and decoding delays of the different systems. Reliable service following also requires that all the identifiers used are properly allocated in such a way as to make them unique within their respective scope.

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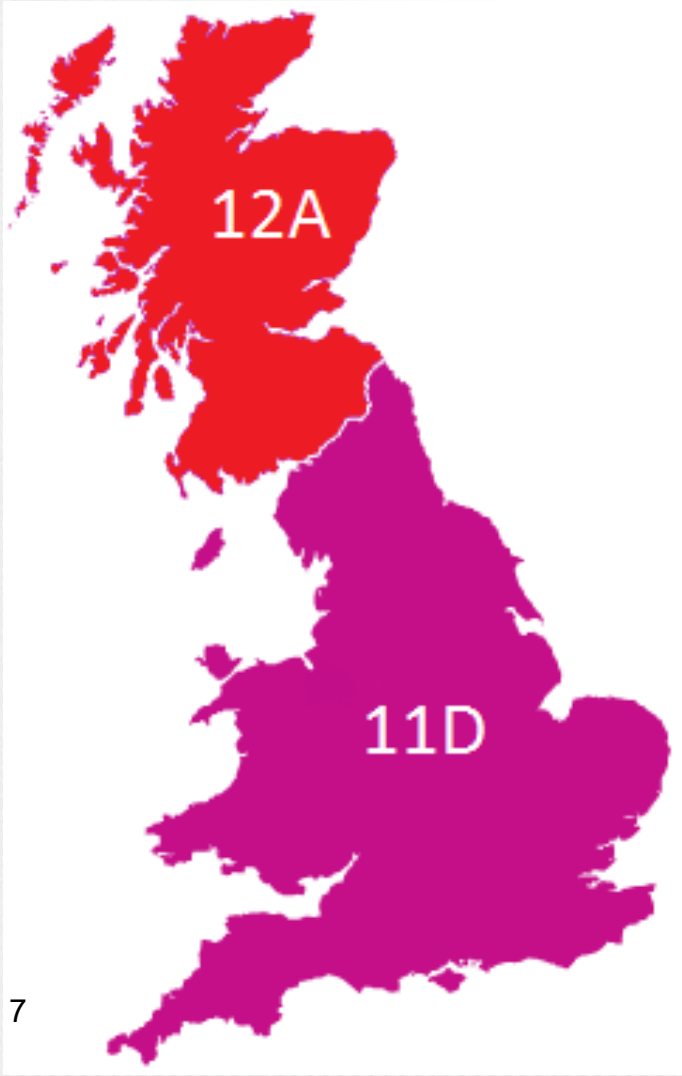
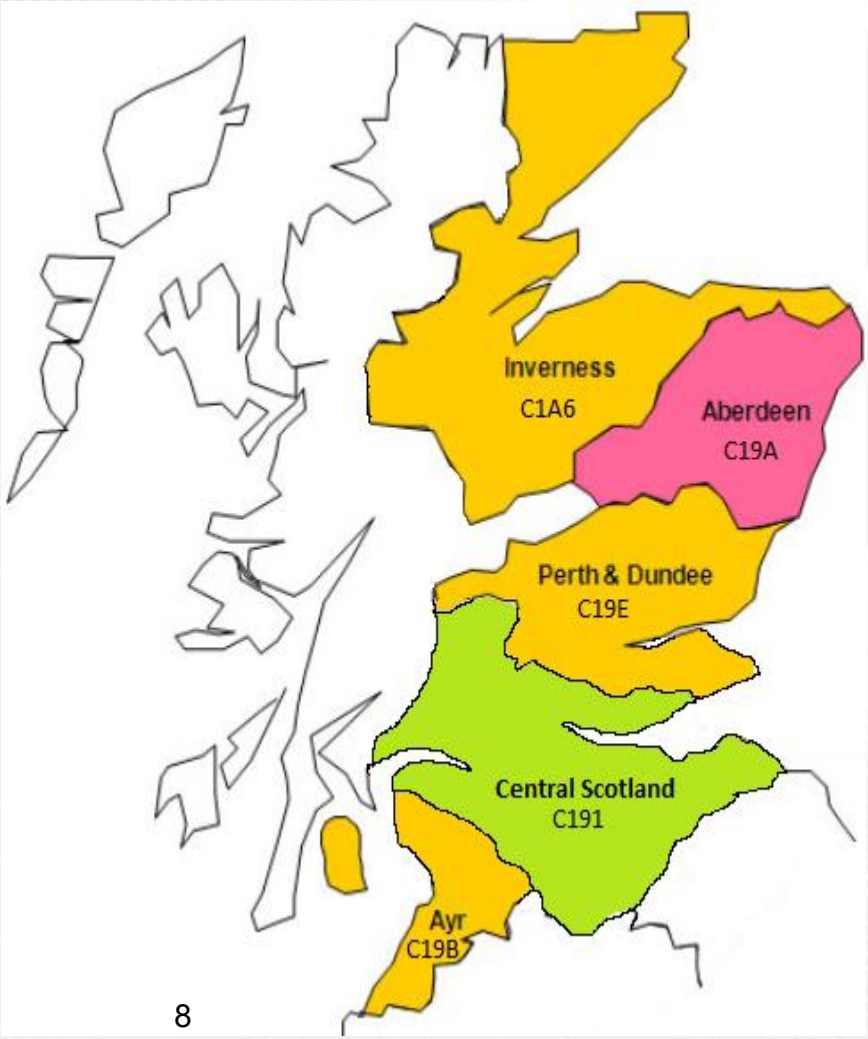
# Different frequencies

- Absolute Radio
- D1 ensemble



# Different ensembles

- BBC Radio Nan Gaidheal
- 5 Ensembles
- 3 Frequencies



# Different services

- At certain times of day, different services carry common content, at other times the content is different on each
  - When it is common, all are suitable alternatives
  - DAB uses **linkage** to connect services with the same content

# Different bearers

- The same service may be available on DAB, DAB+, and FM
  - With common content, all are suitable alternatives
  - DAB uses **linkage** to connect services with the same content

# Development of the standard

- Key requirements
- Process
- Output

# Key requirements

- Core DAB spec EN 300 401 mustn't change
- Current implementations considered
  - but cannot fix the outcome
- Consistent and clear rules needed
  - Broadcaster obligations
  - Receiver behaviours

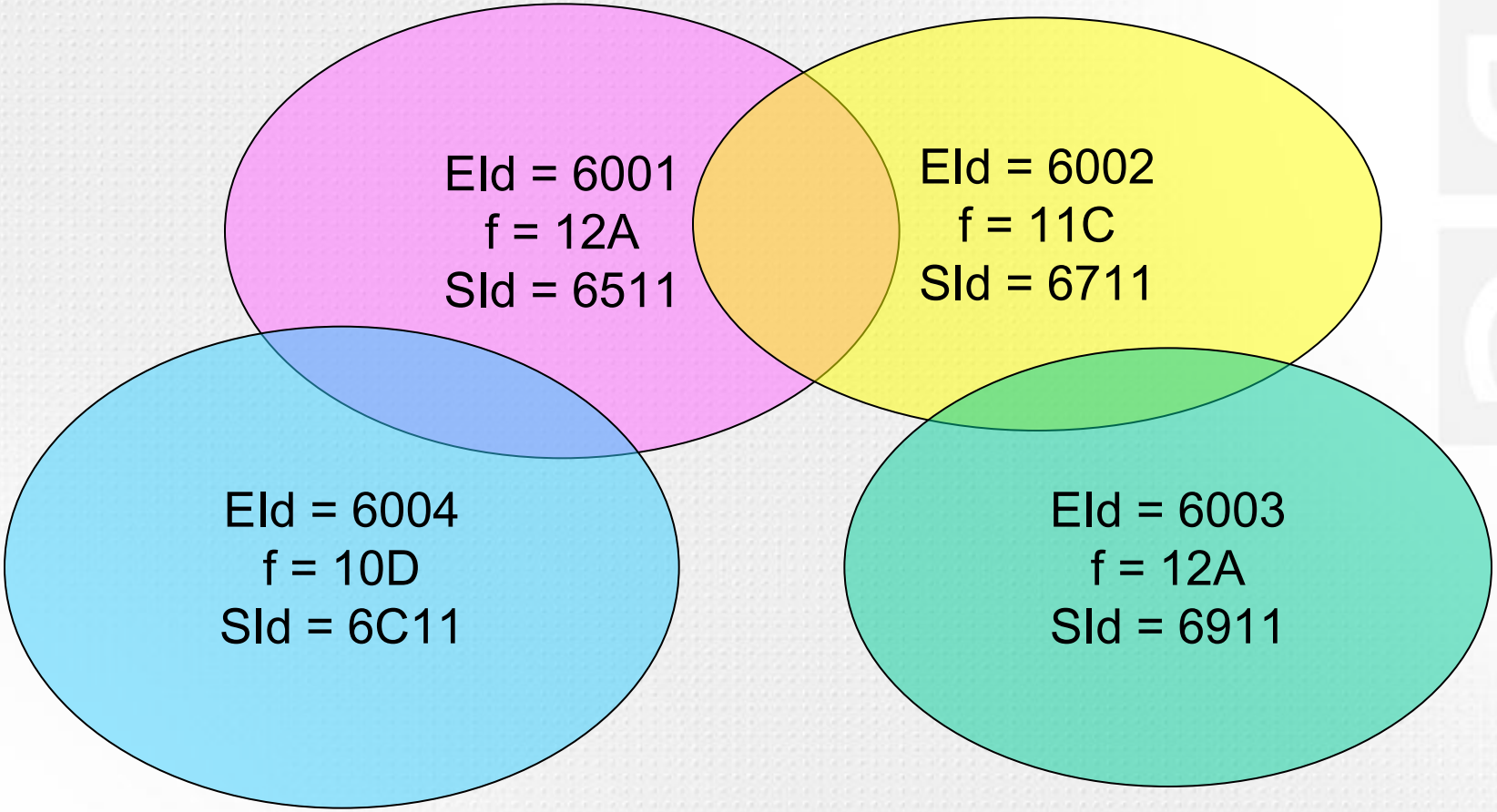
# Process

- TC Task Force created
- Collected and agreed use cases
- Analysed to find common requirements
- Developed consistent interpretation of FIGs
- Developed consistent model of linkage set usage
- Deprecated use of things that cause confusion

# Key elements

- Realisation that a linkage set is a model of a transmission network
  - So does not change quickly
- Realisation that dynamic changes for audio content can be achieved by changing which linkage set is active and so which transmission network is “live”

# Linkage example



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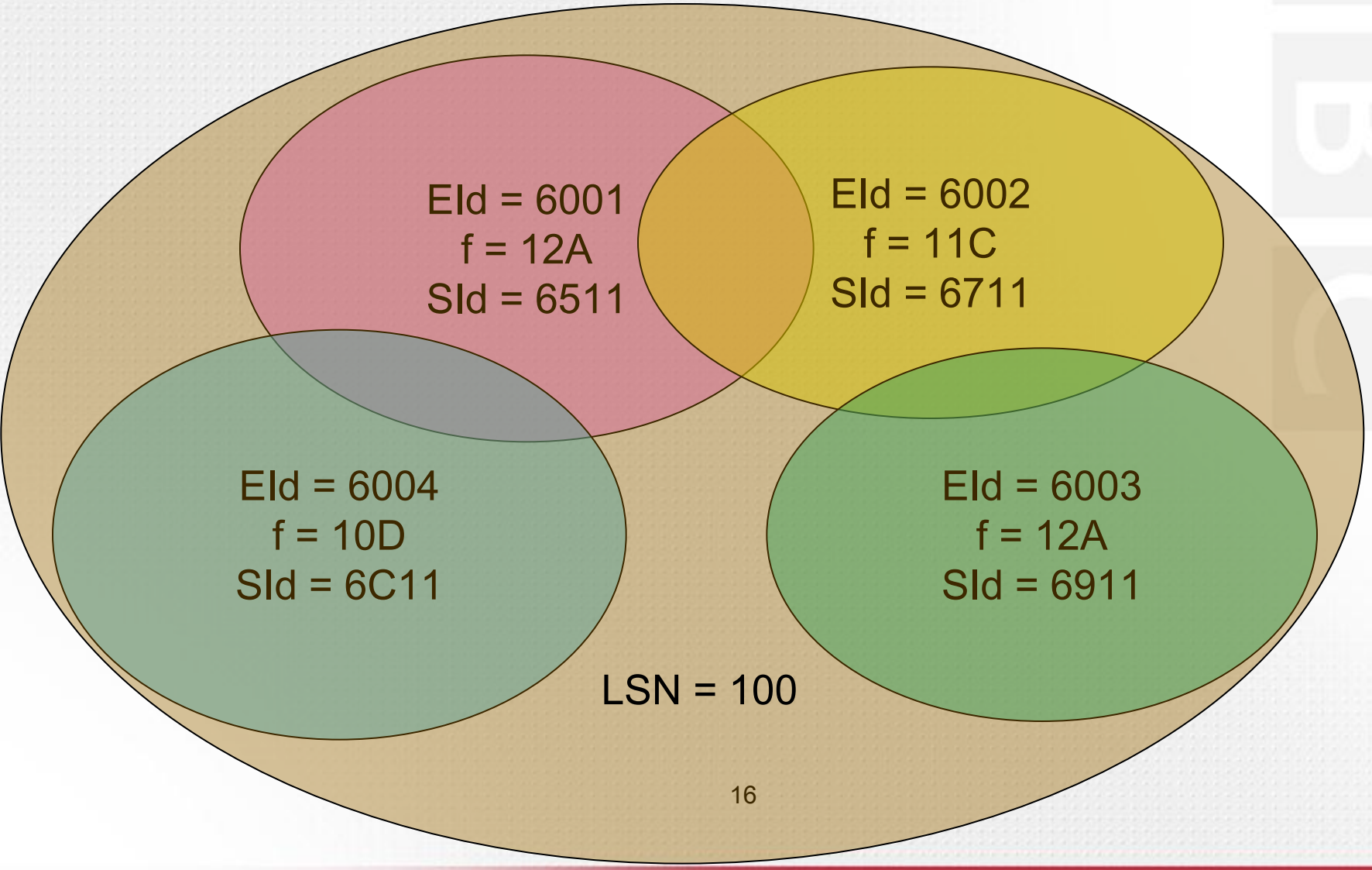

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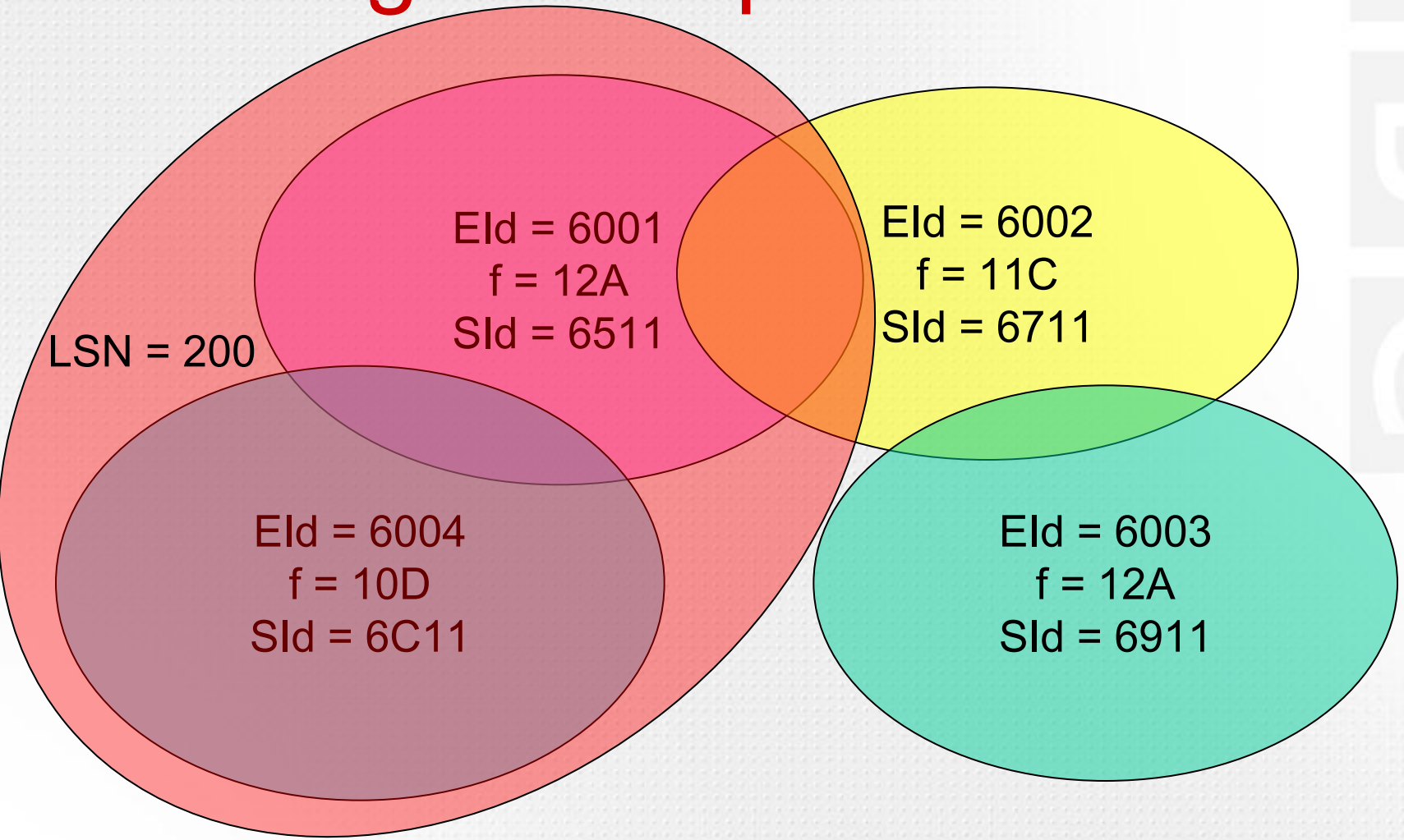

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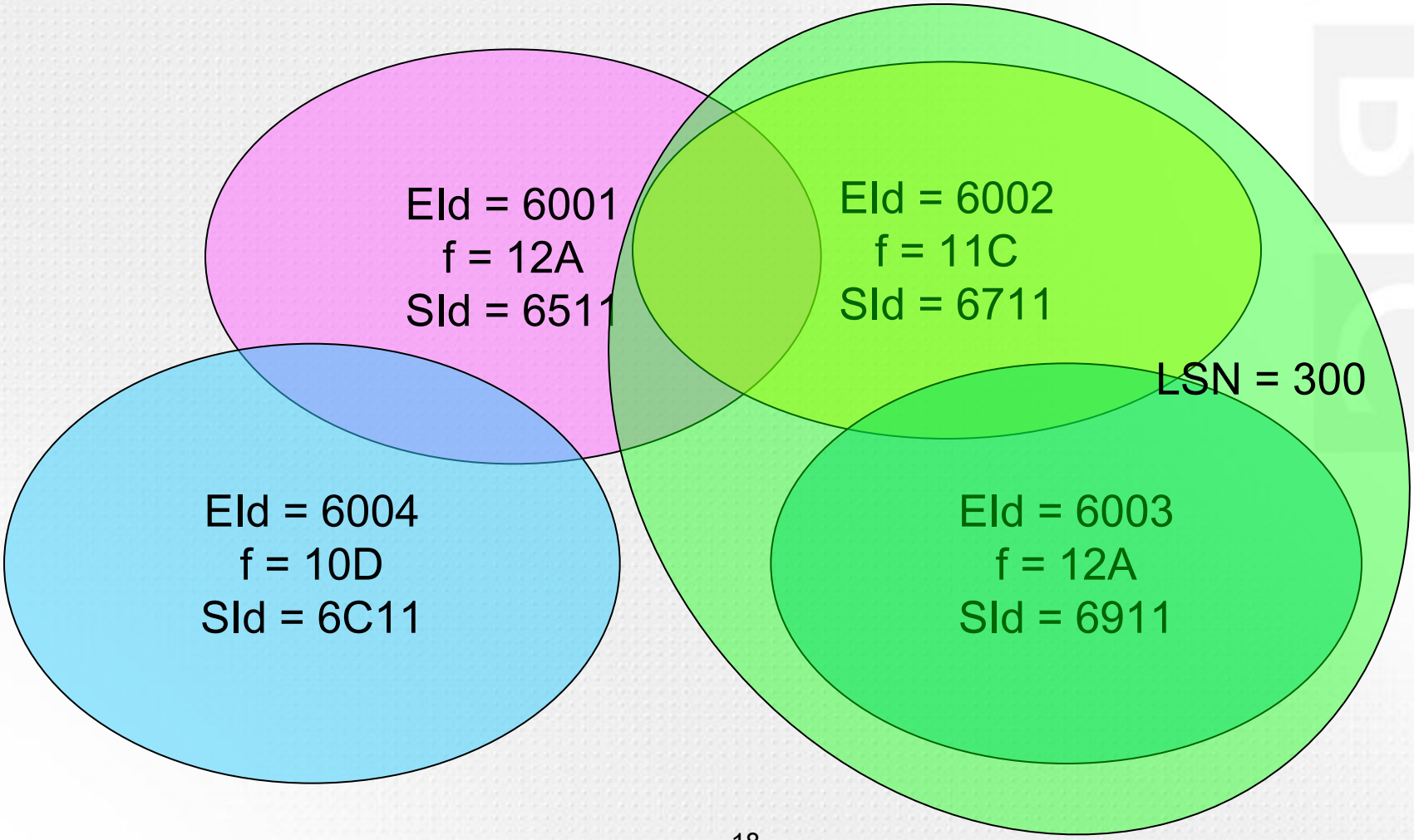

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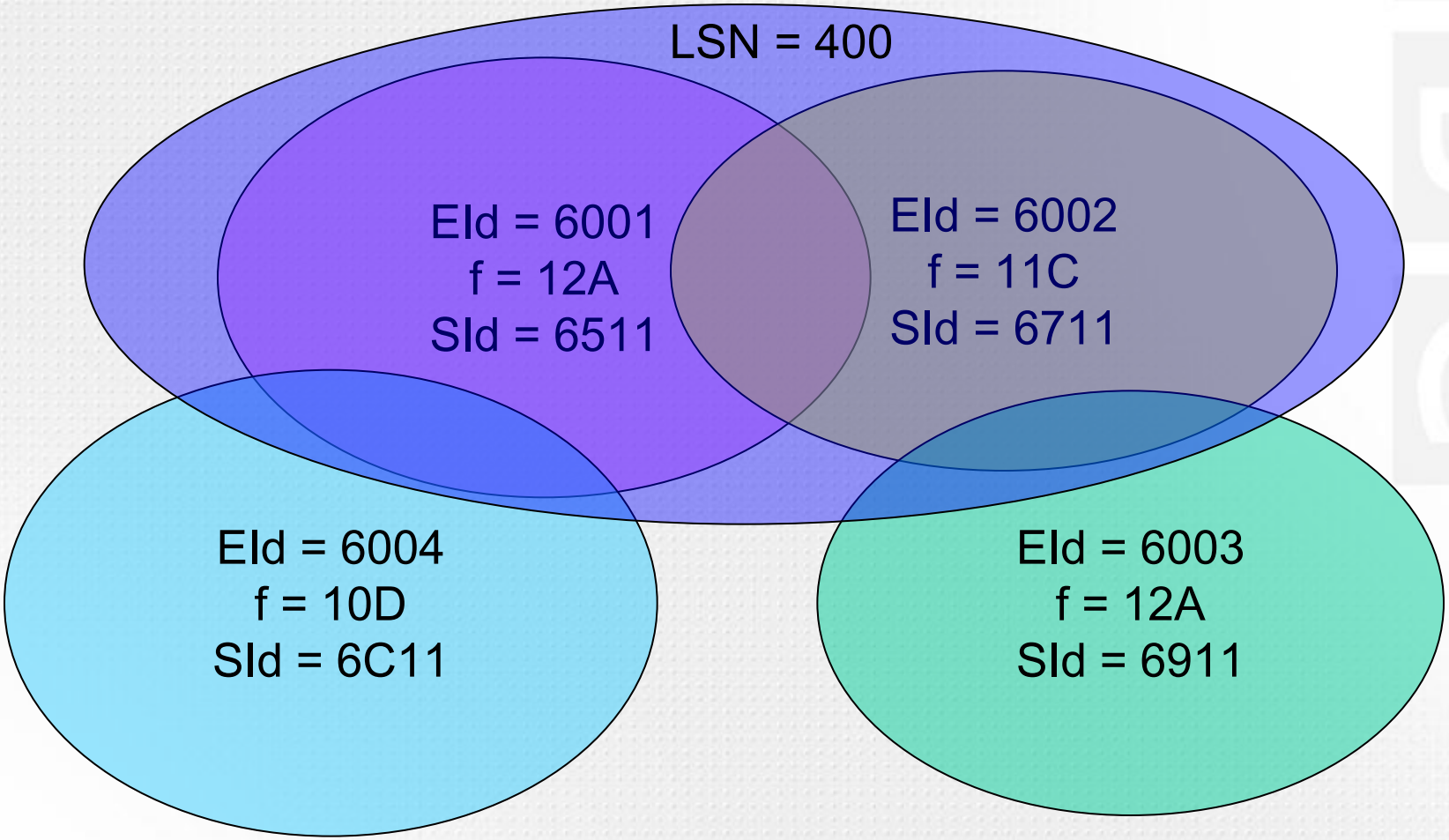

# Linkage example

- Coding of linkage sets
- LSN 100 = SId{6511, 6711, 6C11, 6911}
- LSN 200 = SId{6511, 6C11}
- LSN 300 = SId{6711, 6911}
- LSN 400 = SId{6511, 6711}

- 0 or 1 linkage set may be active and defines the network configuration

# Outputs

ETSI TS 103 176 V1.1.1 (2012-08)
ETSI
Technical Specification
Digital Audio Broadcasting (DAB);
Rules of implementation;
Service information features
European Broadcasting Union
Union Européenne de Radio-Télévision
EBU·UER
DAB

# Regulatory issues

- All identifiers need to be properly coordinated at national level to ensure that behaviour is as intended
  - LSNs must be allocated so that no ambiguities possible
  - The “linkage flags” must also be set and decoded correctly
- PI codes and SIds must be allocated bearing in mind the “implicit link” mechanism

# Broadcaster issues

- Think of the end user
  - Design the information for the benefit of listeners, not as an exhaustive engineering exercise
- Ensure all identifiers are properly allocated and used consistently
- Update the signalling in line with engineering (transmitter network) changes and editorial changes

# Receiver issues

- Think of the end user
  - Design the internal algorithms for the benefit of listeners, not as an exhaustive engineering exercise
- Essential for automotive receivers, but useful too for others
- Maintain the stored information and augment with signal quality and other metrics
- DAB reception has priority over FM

# DAB-DAB; DAB-FM

- DAB to DAB is the most important
- DAB to FM is a transitional case
  - Once digital networks are mature, no requirement to fall back to FM
  - Not all digital services have FM equivalences
  - Switching between DAB and FM is more disturbing to listeners because of timing issues and sound quality differences (dynamic range, noise, etc)

# Future

- Broadcasters will be bringing their service following signalling into line with the new standard
- Receiver manufacturers will be bringing their service following functionality into line too
- World DMB will be considering where further standardisation of service information functionality can help

# Thank you

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