

DAB+ Digital Radio - Technical Workshop

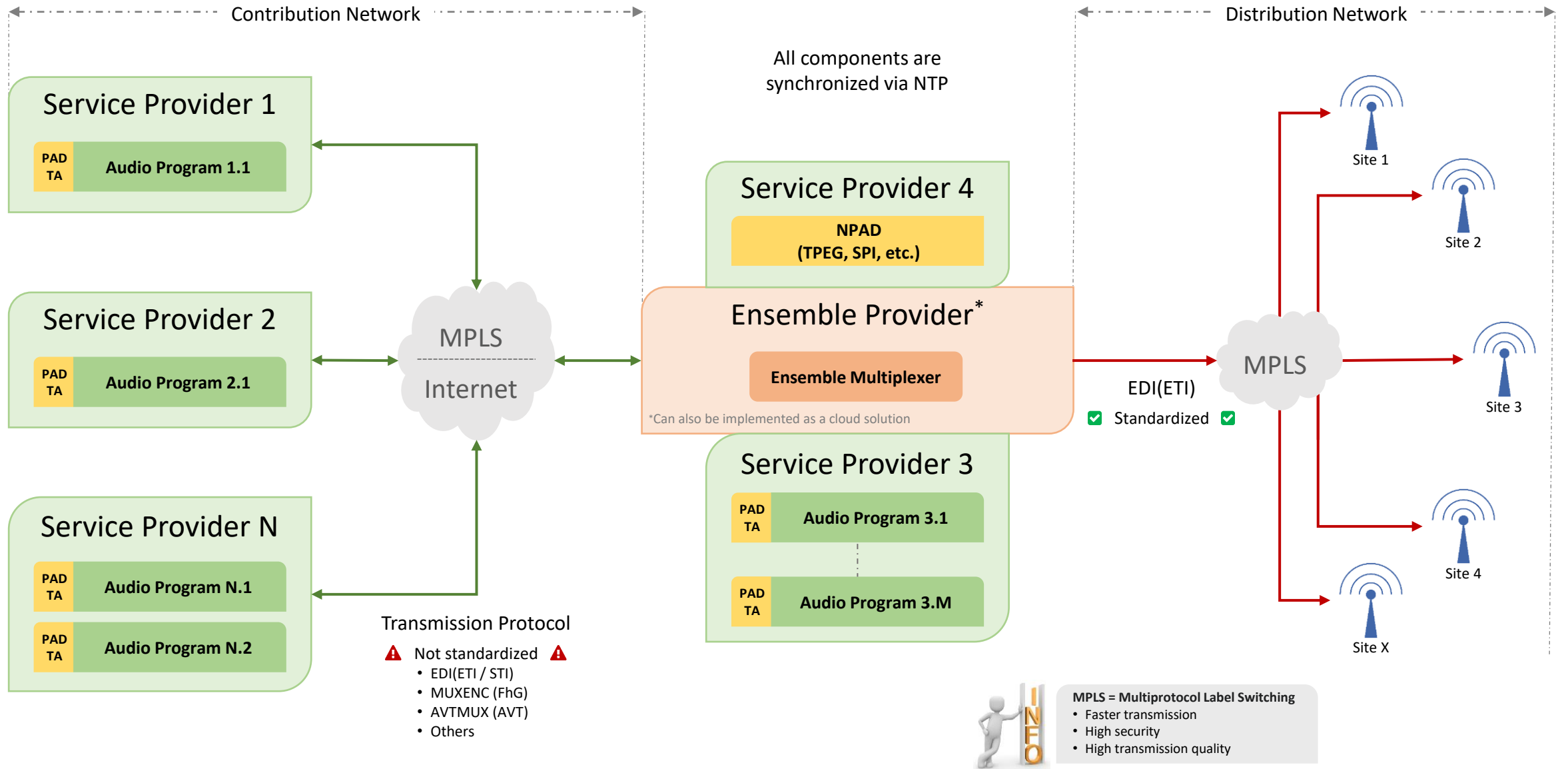
New developments for DAB+ systems

Wolfgang Peters

DAB+ Headend Systems

Encoding & Multiplexing

Principle structure of a DAB+ Headend

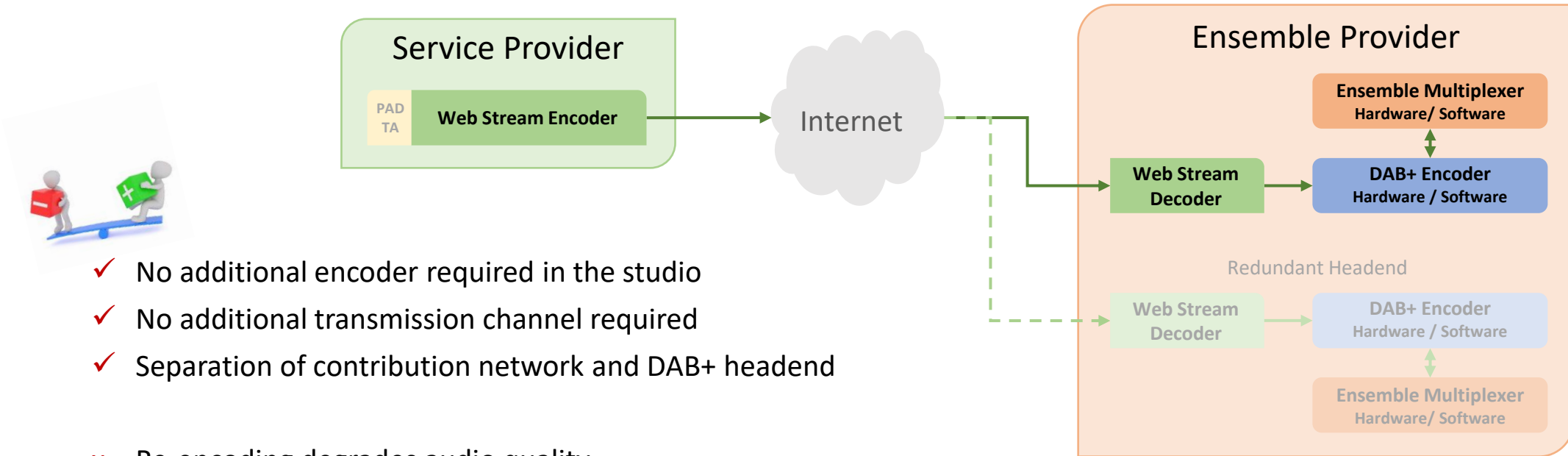




How can I transmit
my audio program
to an
ensemble multiplexer?

Pros and cons of the possible
solutions

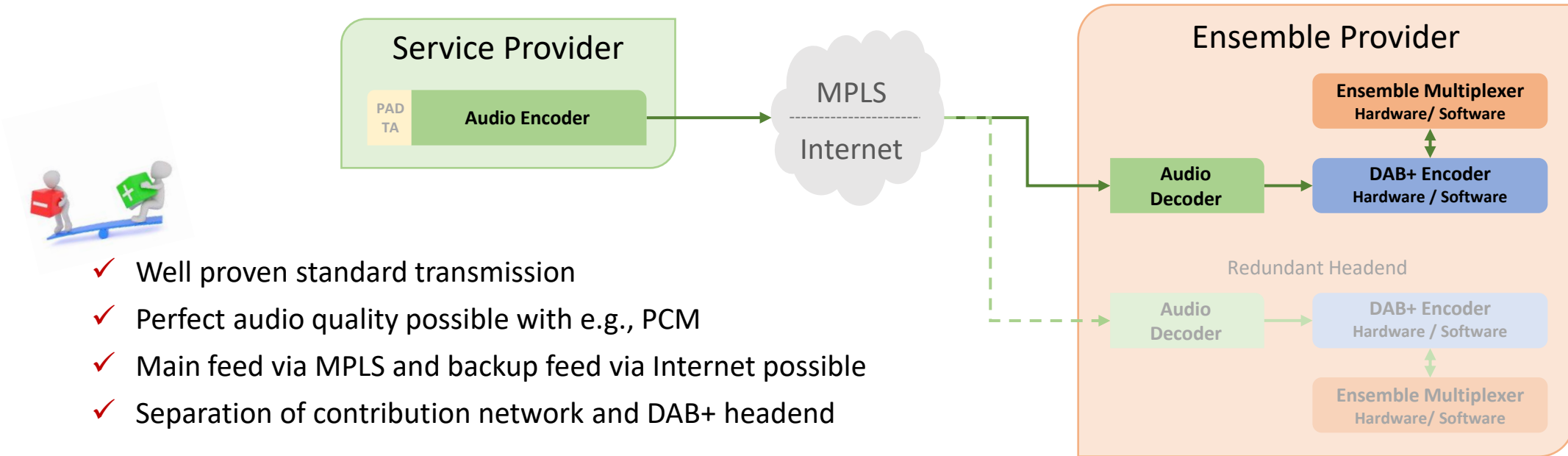
Via Web Stream Encoder



- ✓ No additional encoder required in the studio
- ✓ No additional transmission channel required
- ✓ Separation of contribution network and DAB+ headend

- ✗ Re-encoding degrades audio quality
 - ✗ If standard web stream is used (MP3 / AAC)
- ✗ Very high delay (typ. 30 sec)
- ✗ PAD insertion only possible with additional effort
- ✗ Announcements only possible with additional effort
- ✗ Feed via internet = no guaranteed service
- ✗ Feeding into redundant multiplexer is almost useless

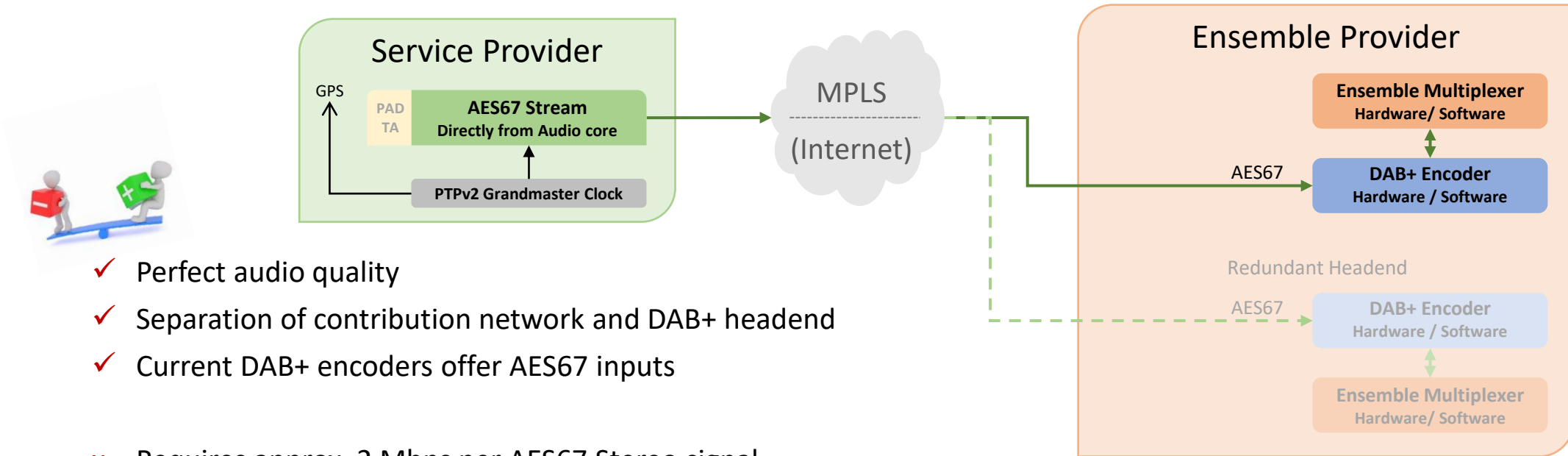
Via conventional Audio Encoder / Decoder



- ✓ Well proven standard transmission
- ✓ Perfect audio quality possible with e.g., PCM
- ✓ Main feed via MPLS and backup feed via Internet possible
- ✓ Separation of contribution network and DAB+ headend

- x Requires additional audio codec equipment
 - x More components → more possibilities for defects
- x Re-encoding degrades audio quality
 - x if high-compression codec is used (e.g., AAC)
- x PAD insertion only possible with additional effort
- x Announcements only possible with additional effort

Via AES67 streams



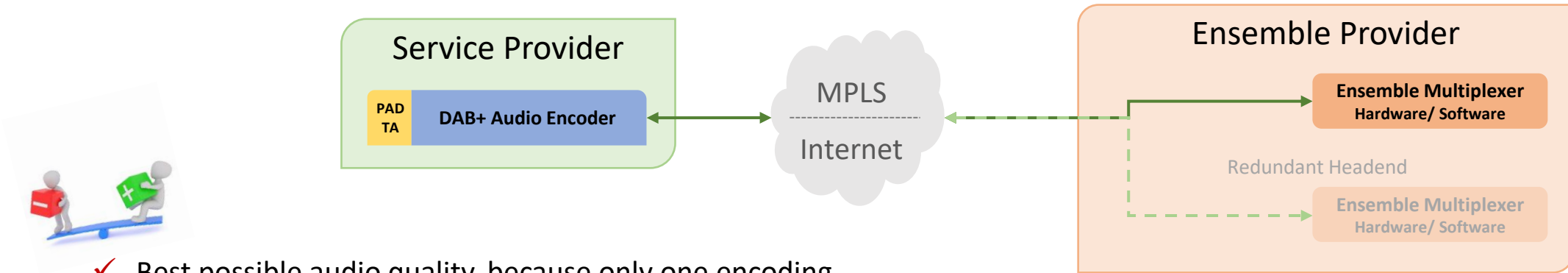
- ✓ Perfect audio quality
- ✓ Separation of contribution network and DAB+ headend
- ✓ Current DAB+ encoders offer AES67 inputs
- ✗ Requires approx. 2 Mbps per AES67 Stereo signal
 - ✗ If unicast → doubling of bandwidth in case of redundant headends
 - ✗ Use of AES67 results in high bandwidth at the ensemble provider site
- ✗ GPS Grandmaster clock for PTPv2 is highly recommended
- ✗ PAD insertion only possible with additional effort
- ✗ Announcements only possible with additional effort



AES67 = Audio Transmission over IP

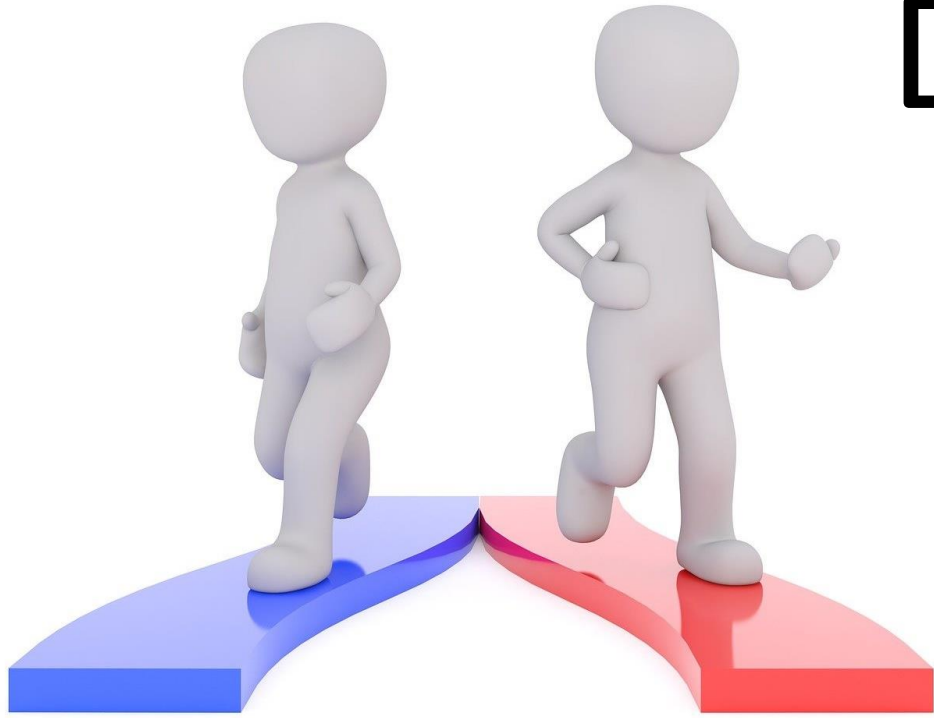
- High-quality Audio
- Compatible with DANTE® / Ravenna / Livewire

Via DAB+ Encoder in Studio



- ✓ Best possible audio quality, because only one encoding
- ✓ Bandwidth-saving transmission to the multiplexer (≈ 100 kbps)
- ✓ Current DAB+ encoders allow complete control from the multiplexer site
- ✓ Direct PAD insertion (e.g., via FTP) into the encoder
- ✓ Transmission of announcements (e.g., via GPI) without additional effort
- ✓ Main feed via MPLS and backup feed via Internet possible
- x No separation of contribution network and DAB+ Headend

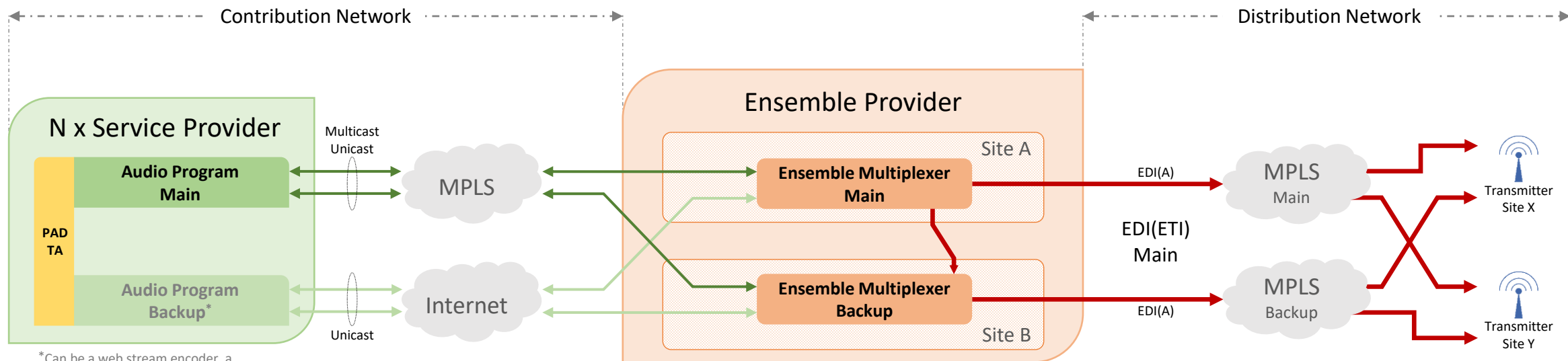
DAB+ Headends with redundancy



Why redundancy is important?

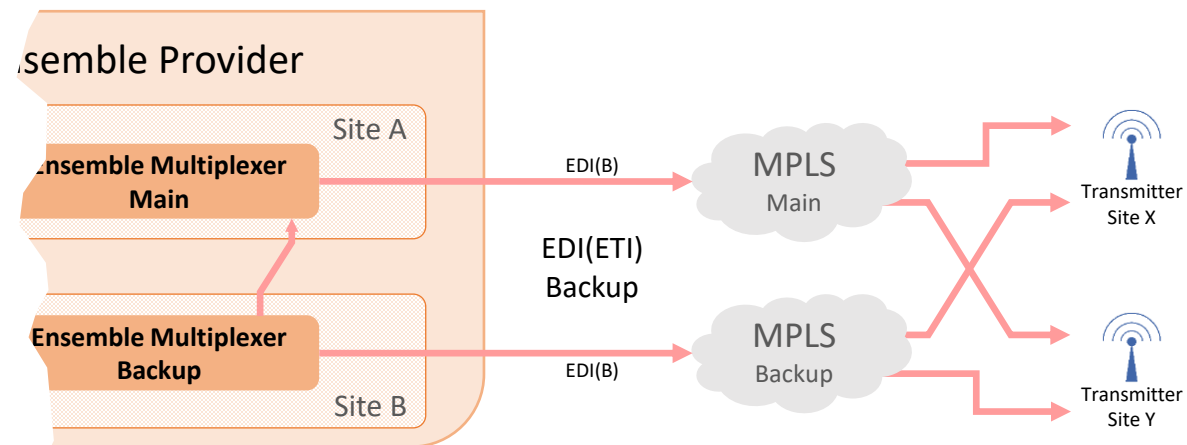
- A DAB+ Headend is a Broadcast System
 - An availability of 99.99% already means a failure of 53 minutes per year
 - Typical causes of downtime
 - Power failure
 - Error in distribution network
 - System update
- If a non-redundant multiplex fails, all programs in an ensemble are interrupted
- High availability can only be achieved with a redundant system

Ideal redundant DAB+ Headend

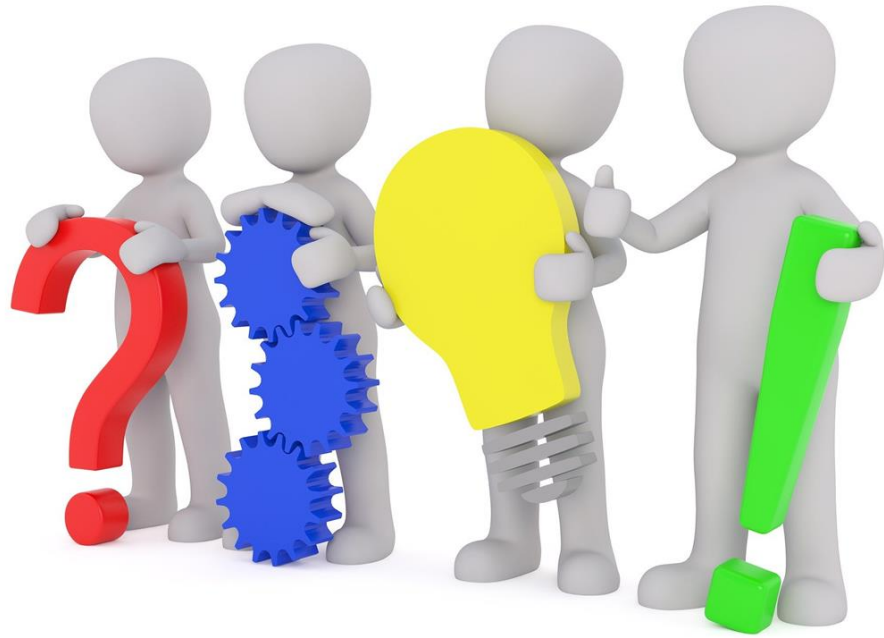


*Can be a web stream encoder, a conventional encoder or a DAB+ encoder (AES67 not recommended as backup)

OR



To avoid interferences in the SFN, **all** transmitters must receive the signal from the main or backup multiplexer. In this example from Site A or Site B

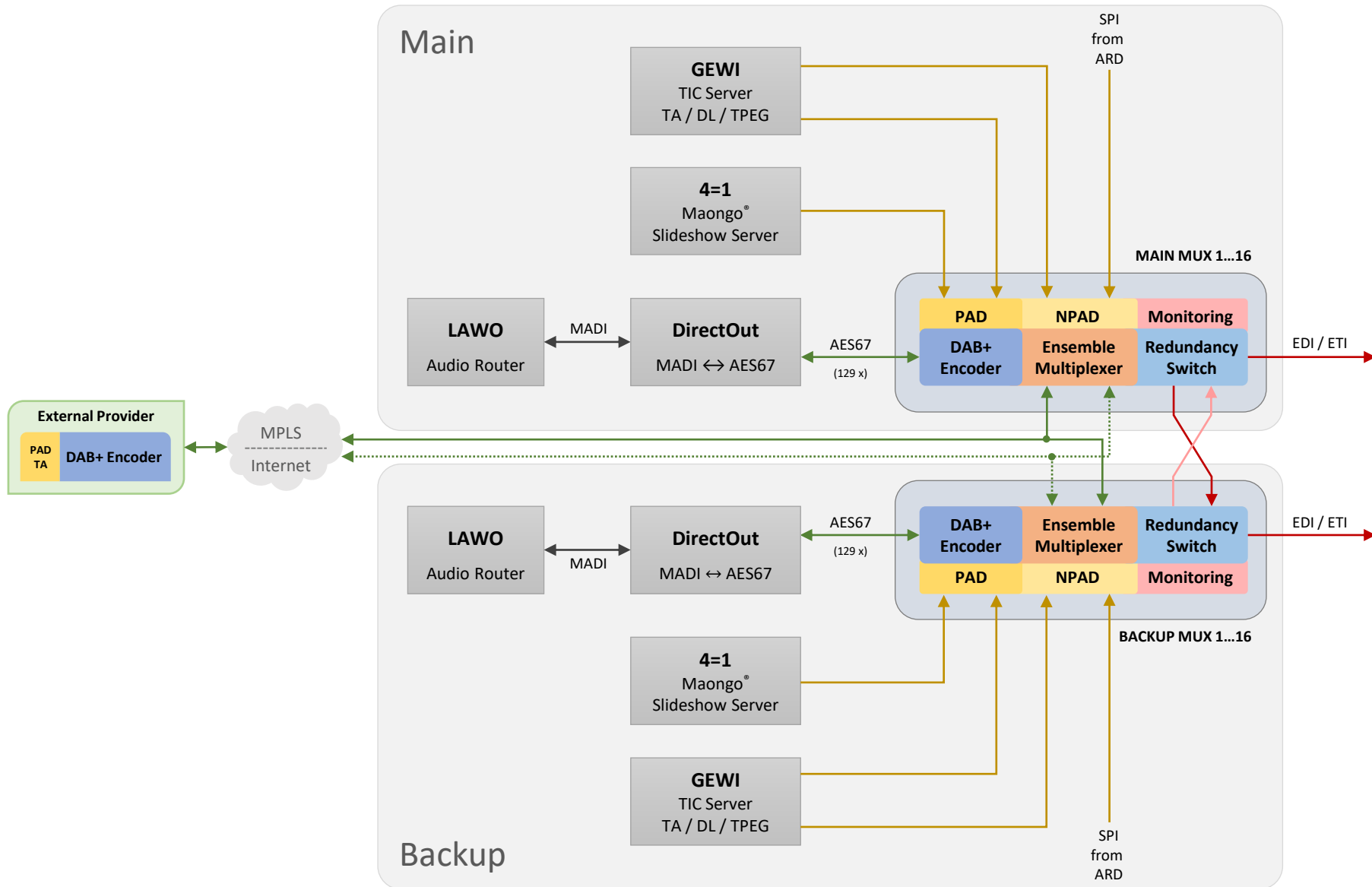


Two examples of complex DAB+ Headends

Example 1: Public Broadcaster NDR / Germany

- 16 fully redundant encoder & multiplexer DAB+ Headends
- Each multiplex contains 8 - 9 audio programs
 - Total of $2 \times 129 = 258$ DAB+ encoders required
- Each program has its own PAD channel (DL+ / SLS)
- Each multiplex has its own
 - NPAD channel (TPEG / SPI)
 - DAB ↔ DAB / DAB ↔ FM service linking, activation via linkage sets
- Possibility of connecting external commercial broadcasters

Block Diagram NDR

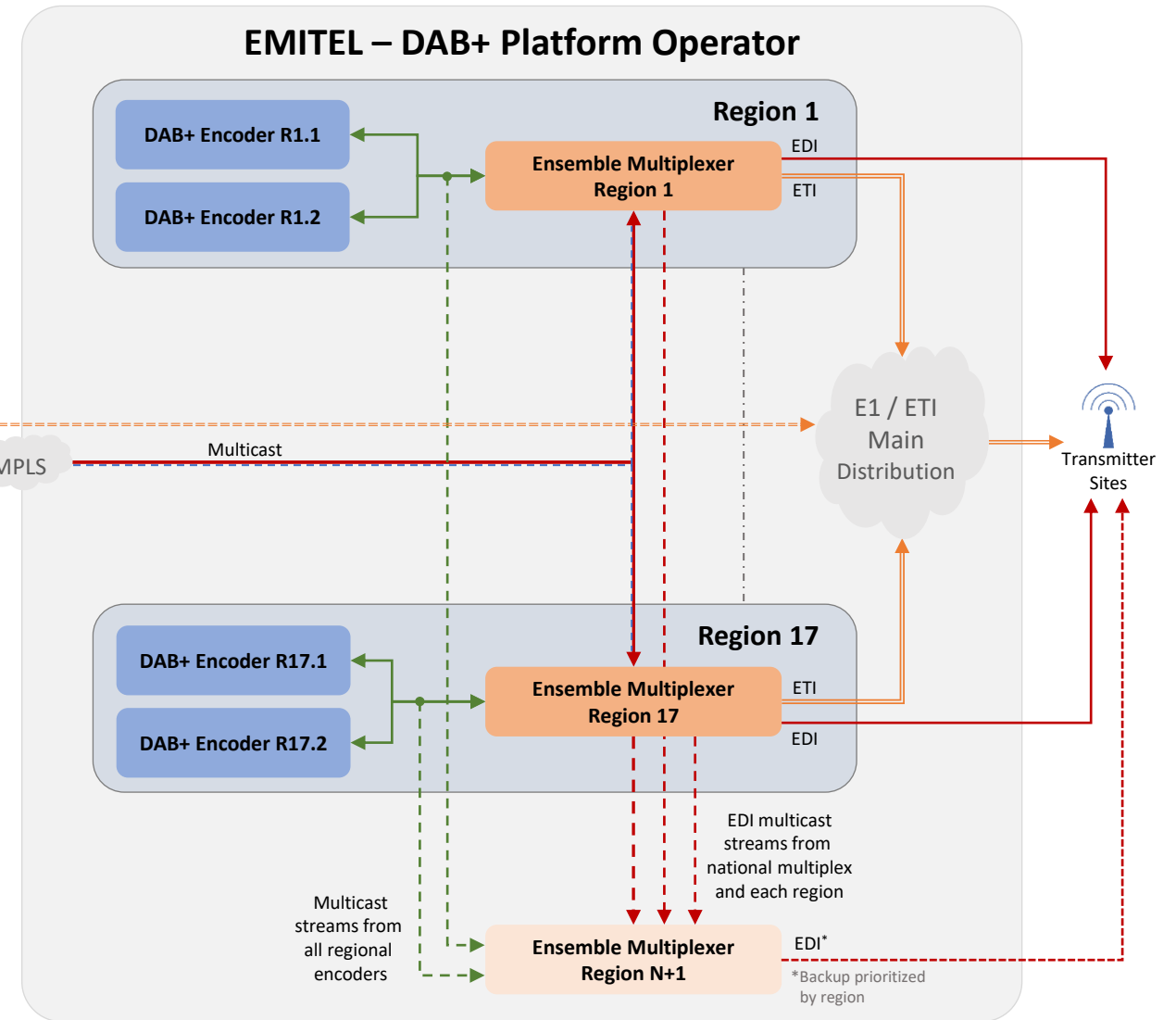
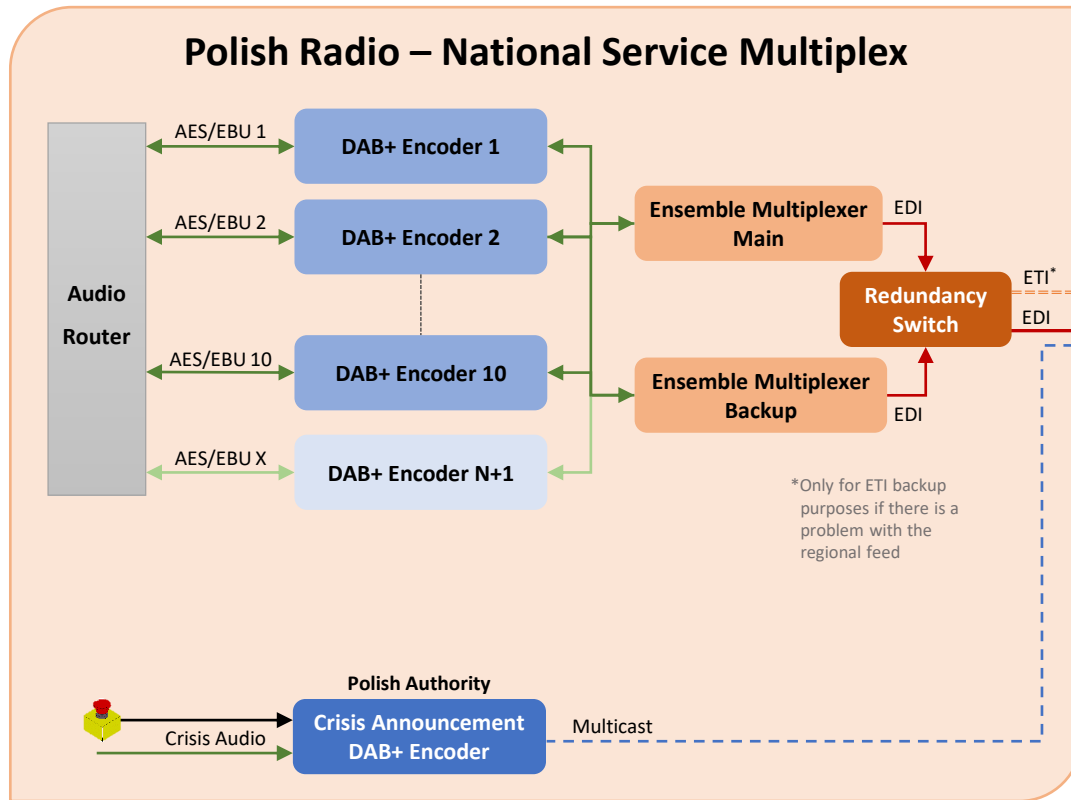


Fully redundant Multiplex Center with 258 DAB+ Encoders at NDR

Example 2: Polish Radio & EMITEL / Poland

- 1 redundant national DAB+ pre-multiplex with 10 programs (+1 backup encoder)
- 17 regional multiplexes containing the national multiplex + 2 regional programs
 - Total of 10 national + 17 x 2 regional programs = 44 programs
- N+1 multiplex redundancy for regional headends
- Parallel ETI and EDI distribution
- Data services: SPI (logo only), TA, TPEG, DLS and SLS
- Special requirement:
 - Nationwide "crisis announcement" simultaneously in all ensembles and programs

Block Diagram: Polish Radio / EMITEL



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Thank YOU!

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