EDI/ETI distribution over satellite – scenarios and best practice

Tork Niendorf

9th Seminar on DAB+ signal distribution

March 9th 2023, Geneva

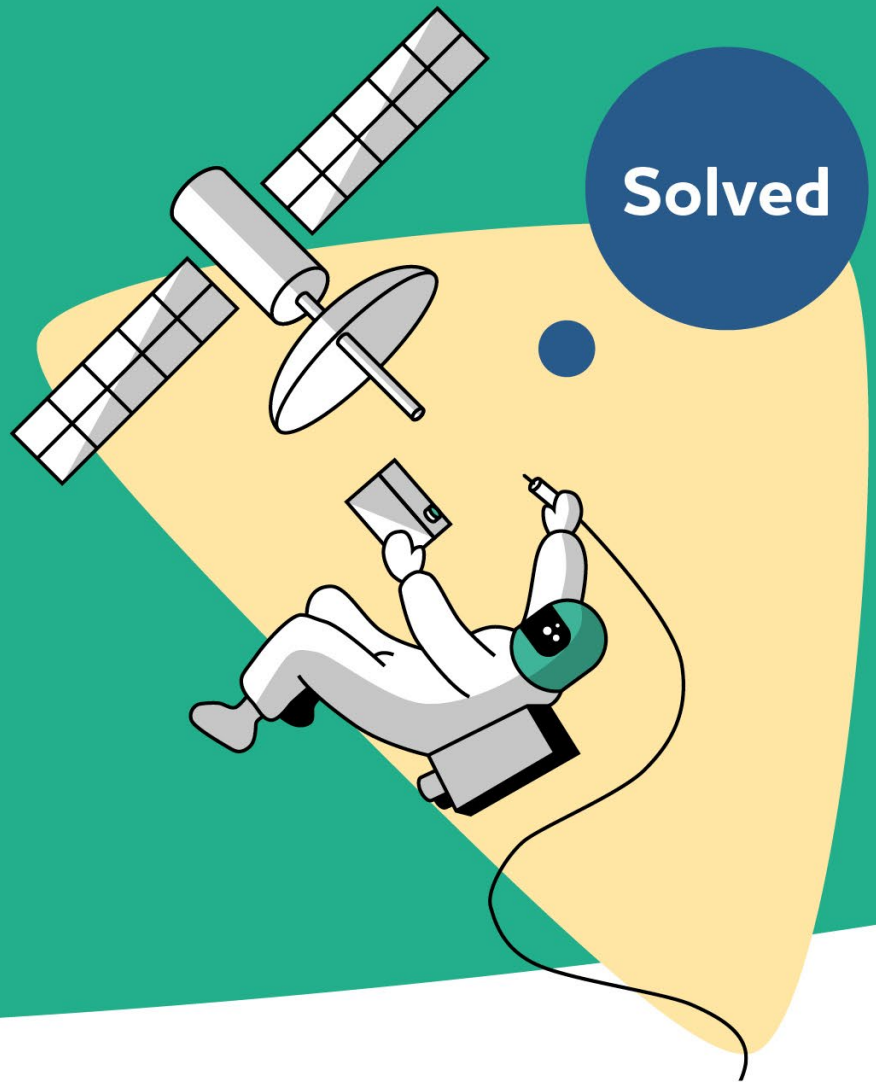

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Table of Content

Introduction - who we are

- **Broadcast technology driven** company in Flensburg, close to Danmark.
- **More than 25 years experience.**
- **Manufacturer**, supplier and system integrator.
- **In-house expertise in standards**
  Audio over IP, DVB-S/S2, DAB+, FM und RDS, Cloud, Kubernetes
- **75 % engineers:**
  Development, support

2wcom team @ IBC2019

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EDI/ETI Introduction

Ensemble Transport Interface (ETI)

- ETSI 300 799
- For transport of the DAB multiplexer output to the transmitter network
- Physical interface: telecom E1 lines with fixed bitrate of 2 Mbit/s

Encapsulation of DAB Interfaces (EDI)

- TS 102 693
- Distribution of ETI (and STI) data streams over IP networks
- UDP/IP multicast or simulcast

Why is there a need for DAB distribution over satellite?

Example Norway

- High number of transmitter stations
- Large country with very remote locations
- Many low-power gap-fillers

Satellite distribution enables…

- Cost-efficient feeds to remote transmitters without or with unstable IP connection
- Backup feeds for IP-based distribution

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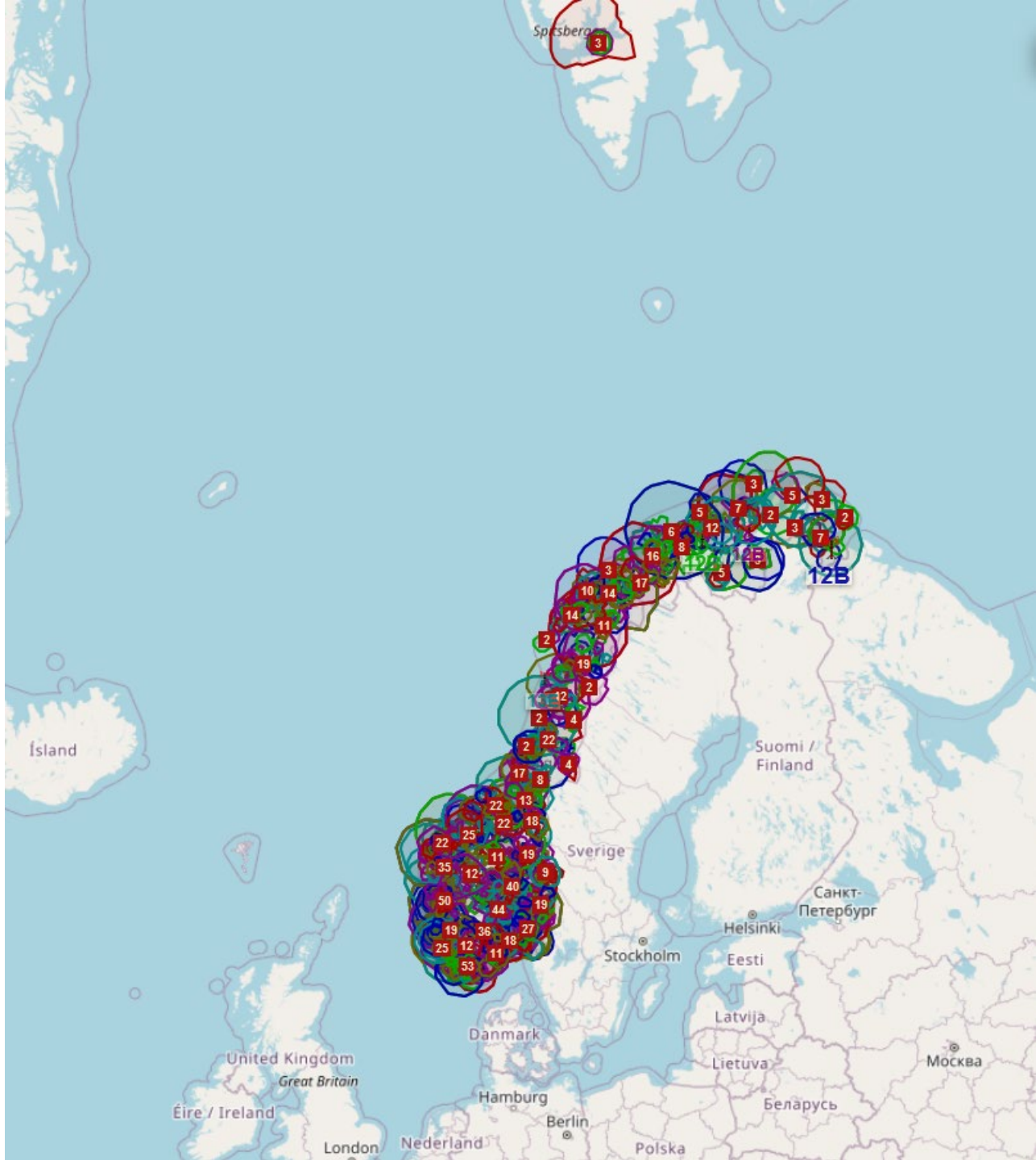
Map source: data from https://fmscan.org/ © OpenStreetMap contributors

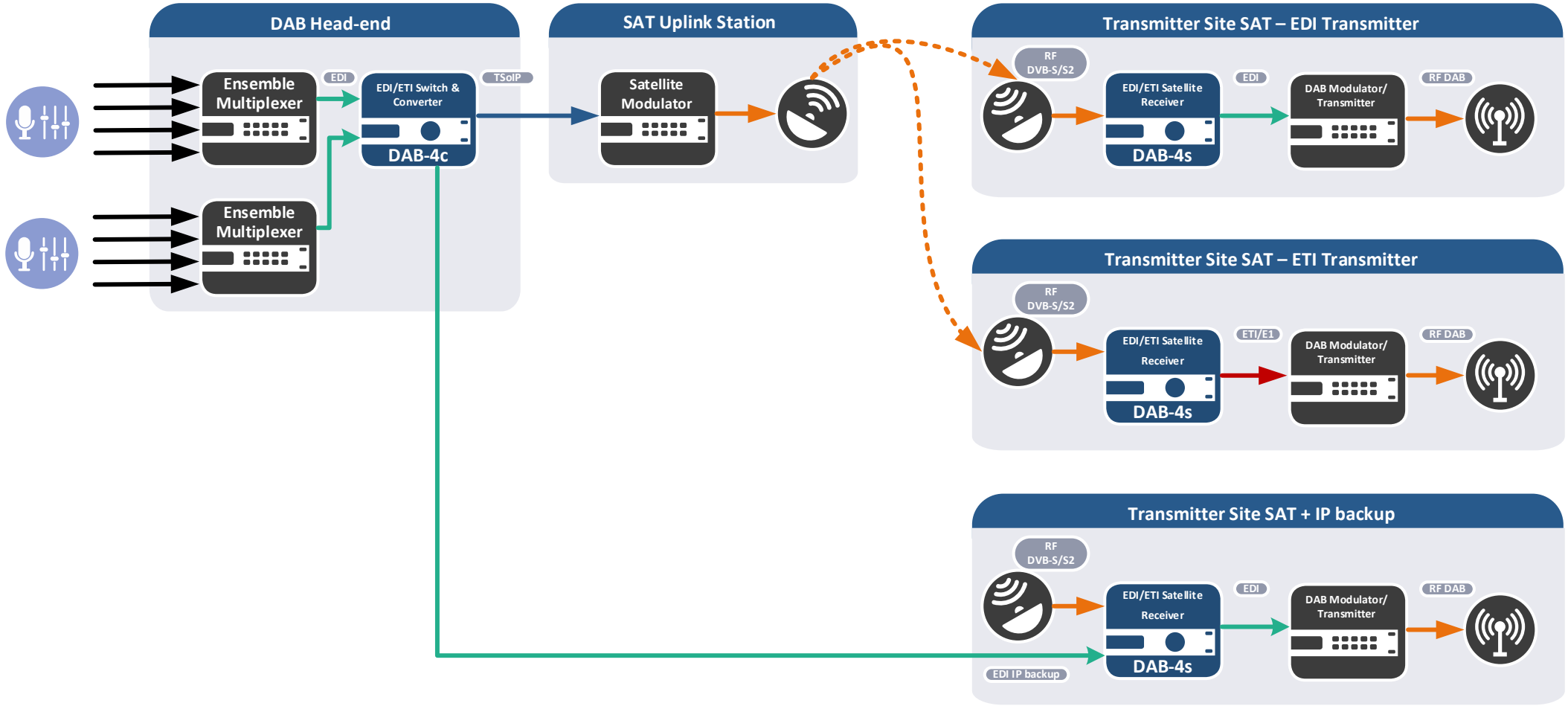


Use-case: Norkring

Norkring/Telenor, Norway (Service provider)

- Development of a DAB+ Radio System
- Complete uplink and around 1.200 satellite receiver for DAB distribution operating in SFN mode
- The satellite receiver includes EDI to ETI converter and DVB-S2 GSE Deencapsulation.

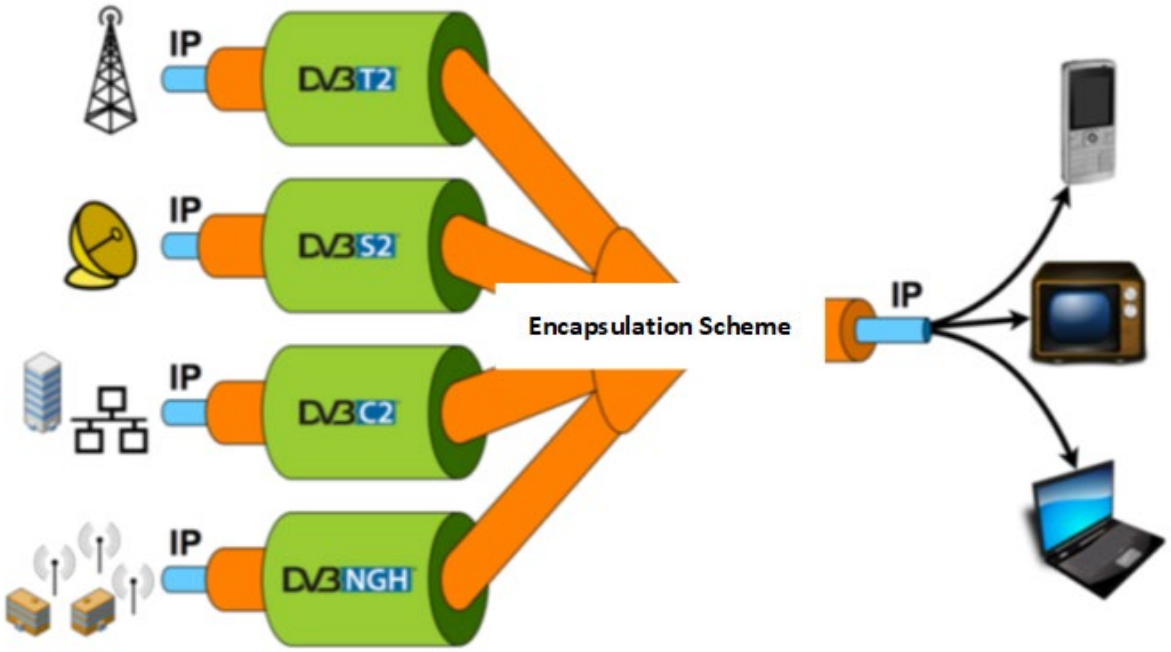
EDI Satellite Distribution



Introduction to DVB-S2

- DVB-S2 is the second generation standard for satellite broadcasting, developed by the Digital Video Broadcasting Project as a successor of the DVB-S standard.
- This architecture is designed for broadband satellite applications such as digital television or radio, as well as interactive services such as Internet access or content distribution.
- The first generation DVB-S has adopted a MPEG-2 data structure, which is optimized for the broadcast delivery of digital television data.

Introduction to DVB-S2

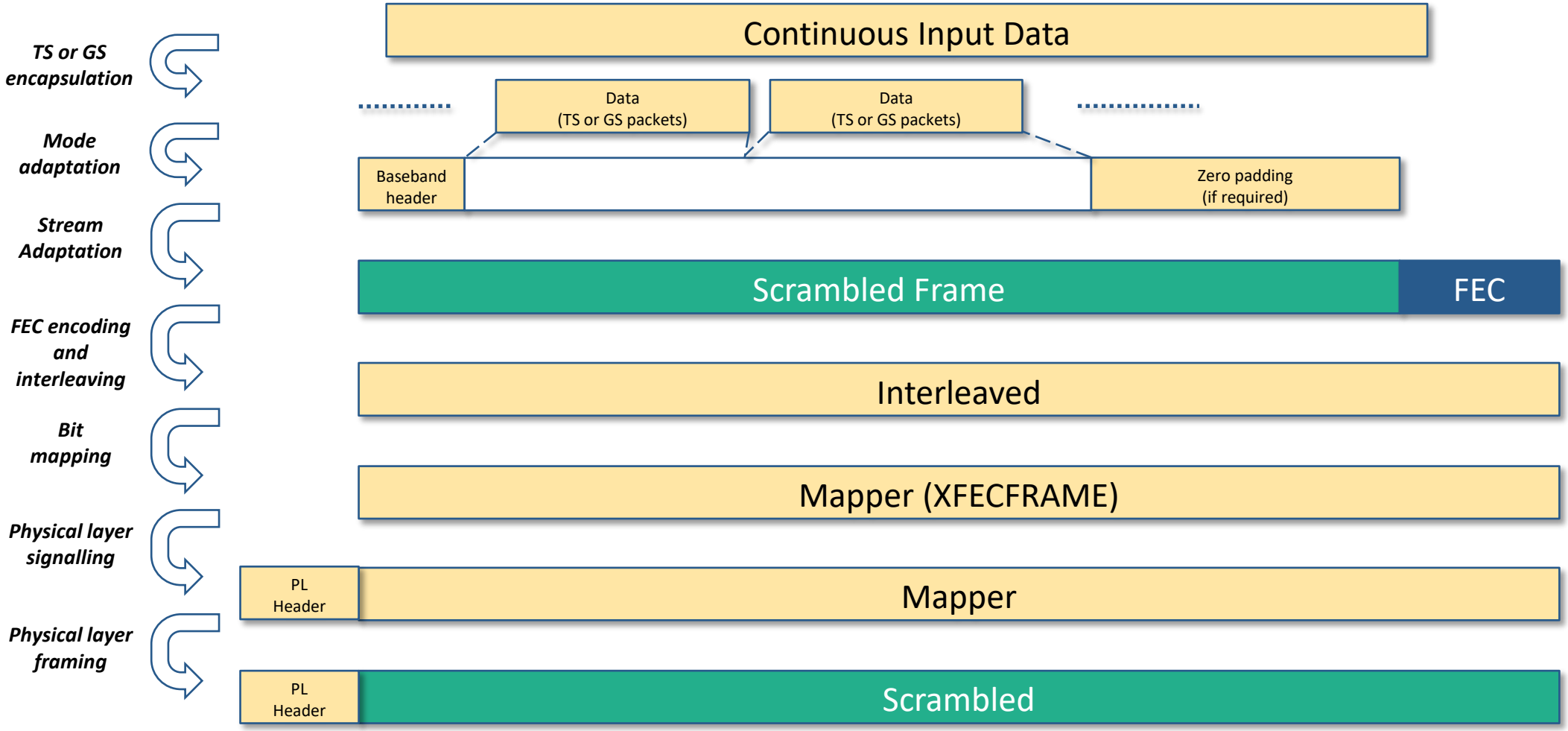


- There are several Encapsulation Schemes available for transport of IP packets over DVB-S2.

EDI/ETI Distribution over DVB-S2

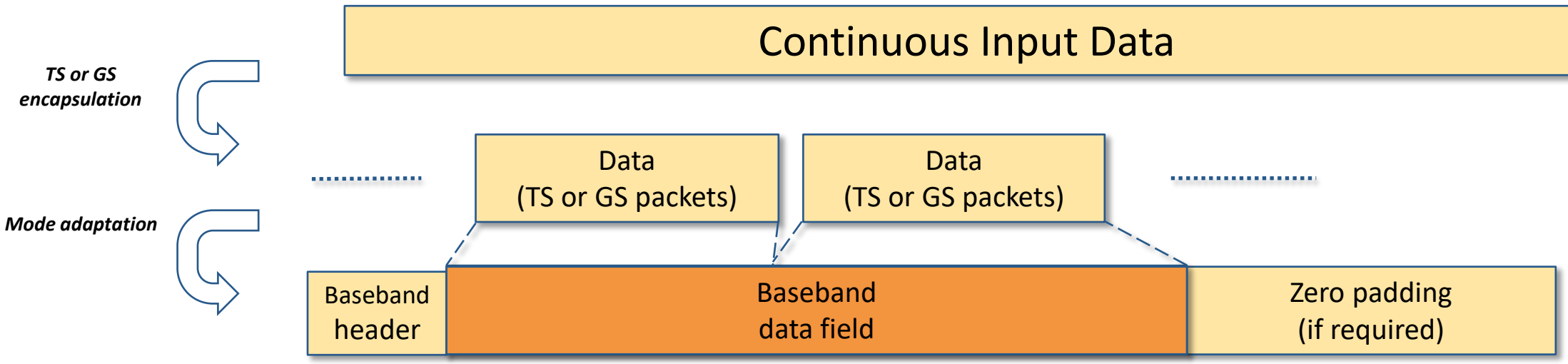
- Encapsulation schemes enable the carriage of network layer packets over DVB networks.
- Depending on the scheme the transport efficiency (protocol overhead) can be higher or lower.

DVB-S2 Framing Structure



Adapted from: Ghadge et. al.; *Analysis and Implementation of Encapsulation Schemesfor Baseband Frame of DVB-S2 Satellite Modulator*; International Journal of Computer Applications; Volume 120 – No.1, June 2015

DVB-S2 Framing Structure



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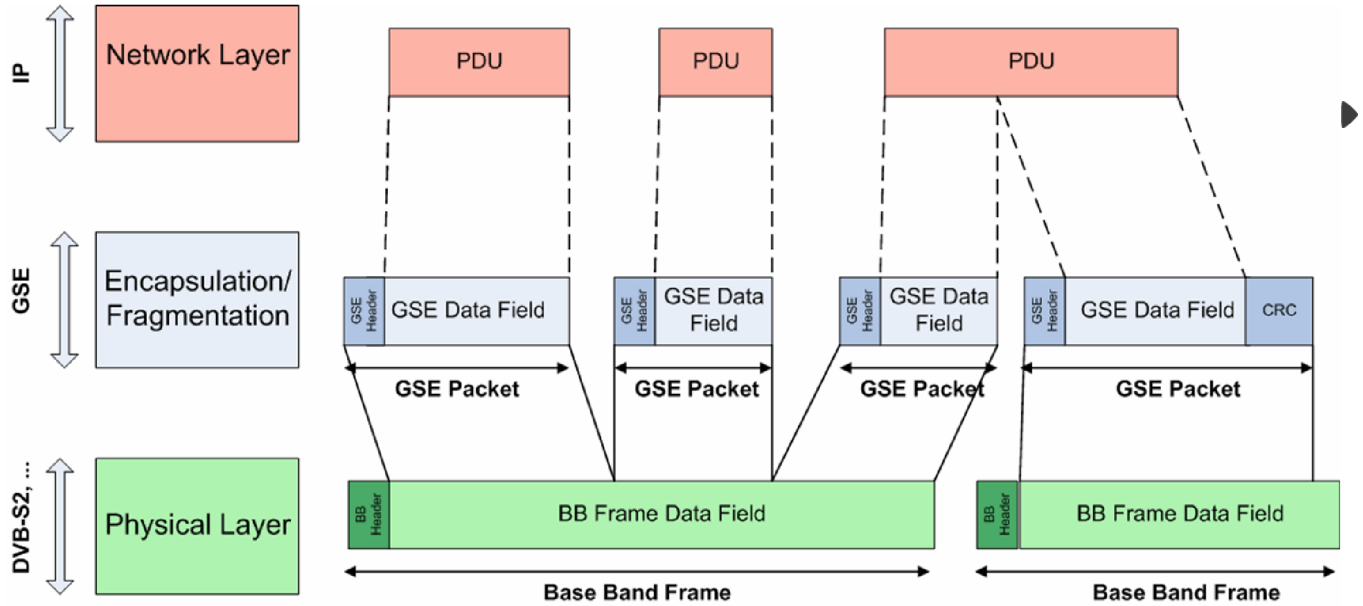
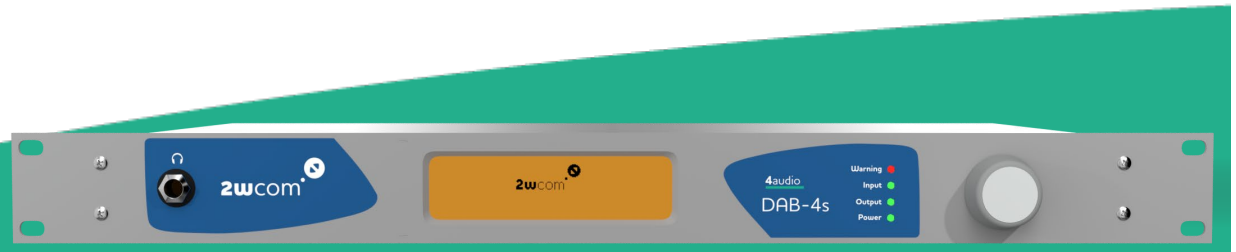
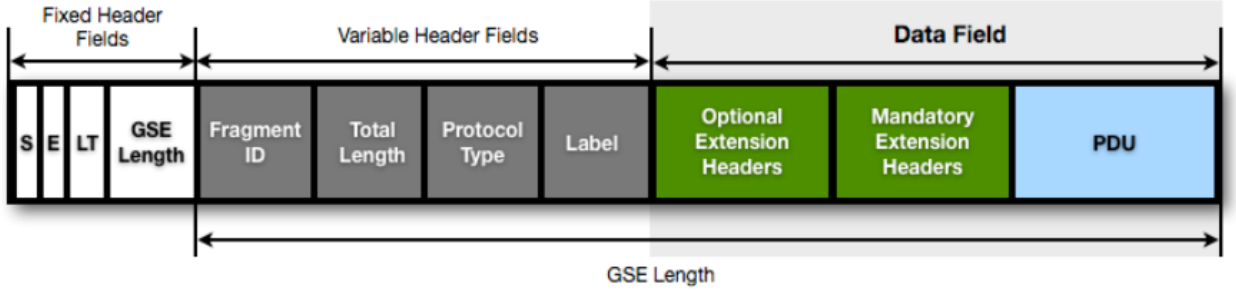
GSE – Generic Streaming Encapsulation

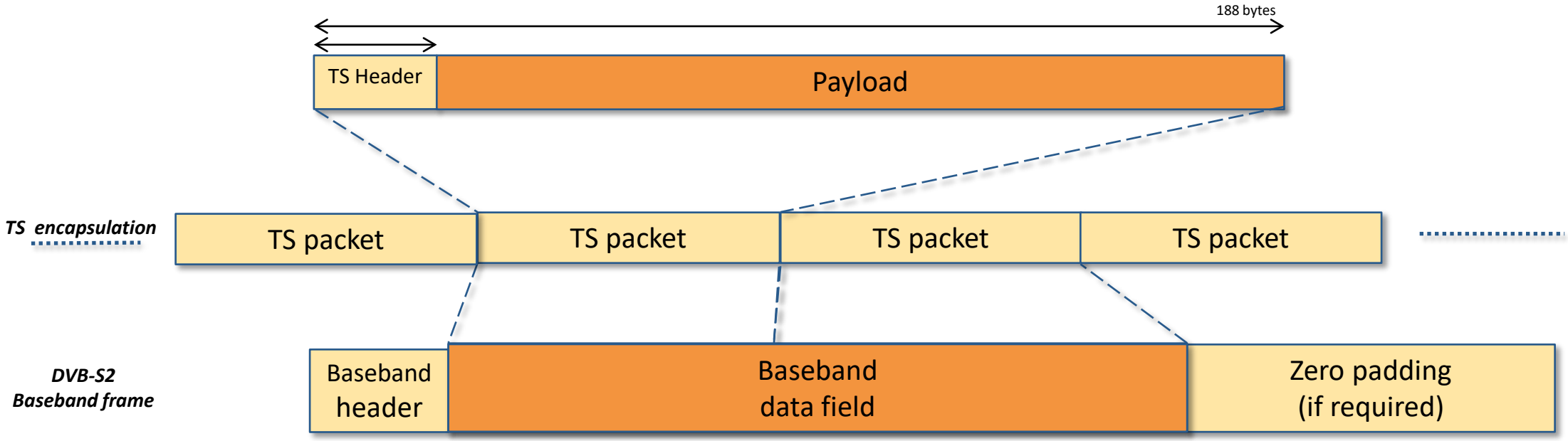


- IP Packets are directly copied into the PDU field of the GSE packet. The protocol overhead is minimal.





MPEG-2 Transport Stream



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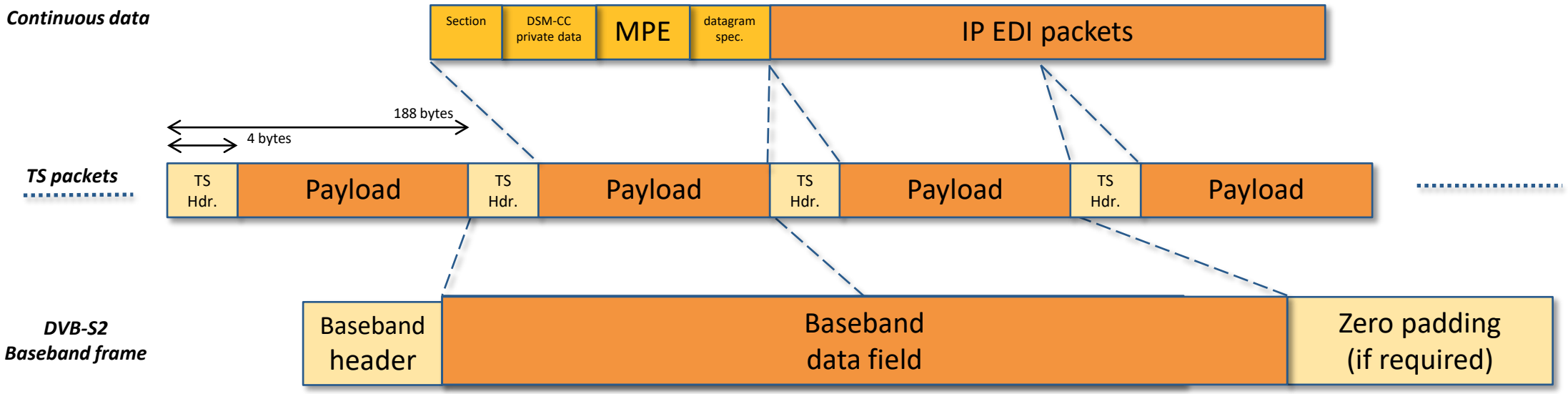
MPEG-2 TS – Multiprotocol Encapsulation

- Multi-Protocol Encapsulation (MPE) protocol is a standard method to carry IP packets over MPEG-2 TS. It inherits section data structure with a default header size of 12 bytes.
- The header includes various fields.



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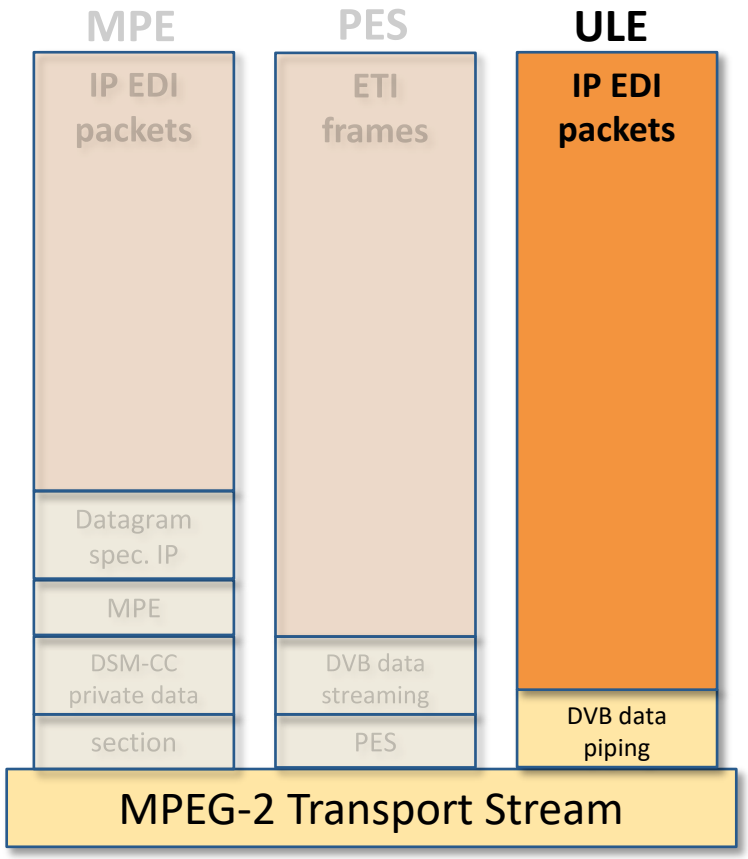
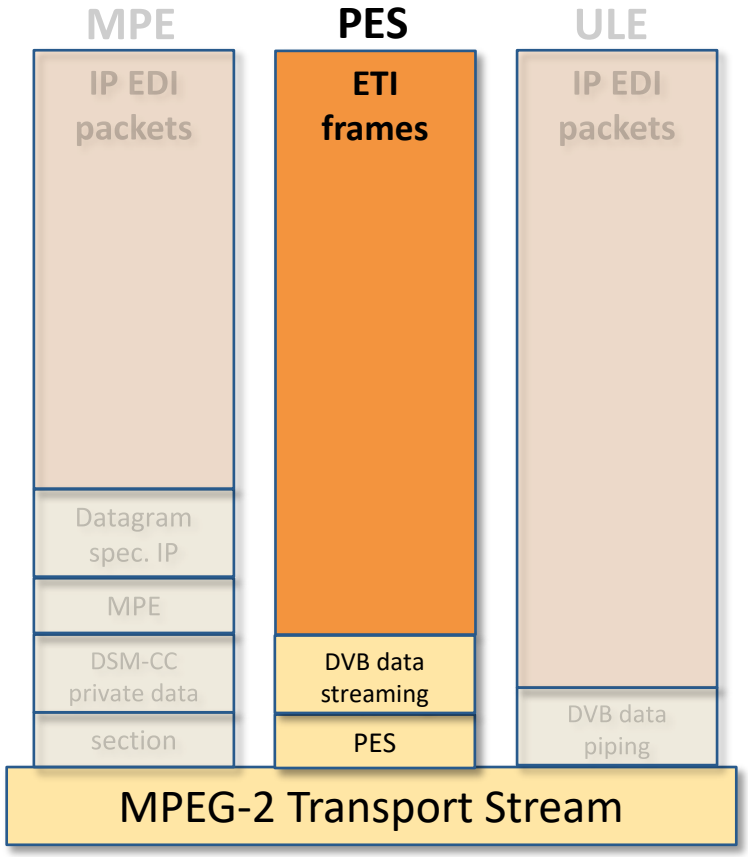
Unidirectional Leightweight Encapsulation



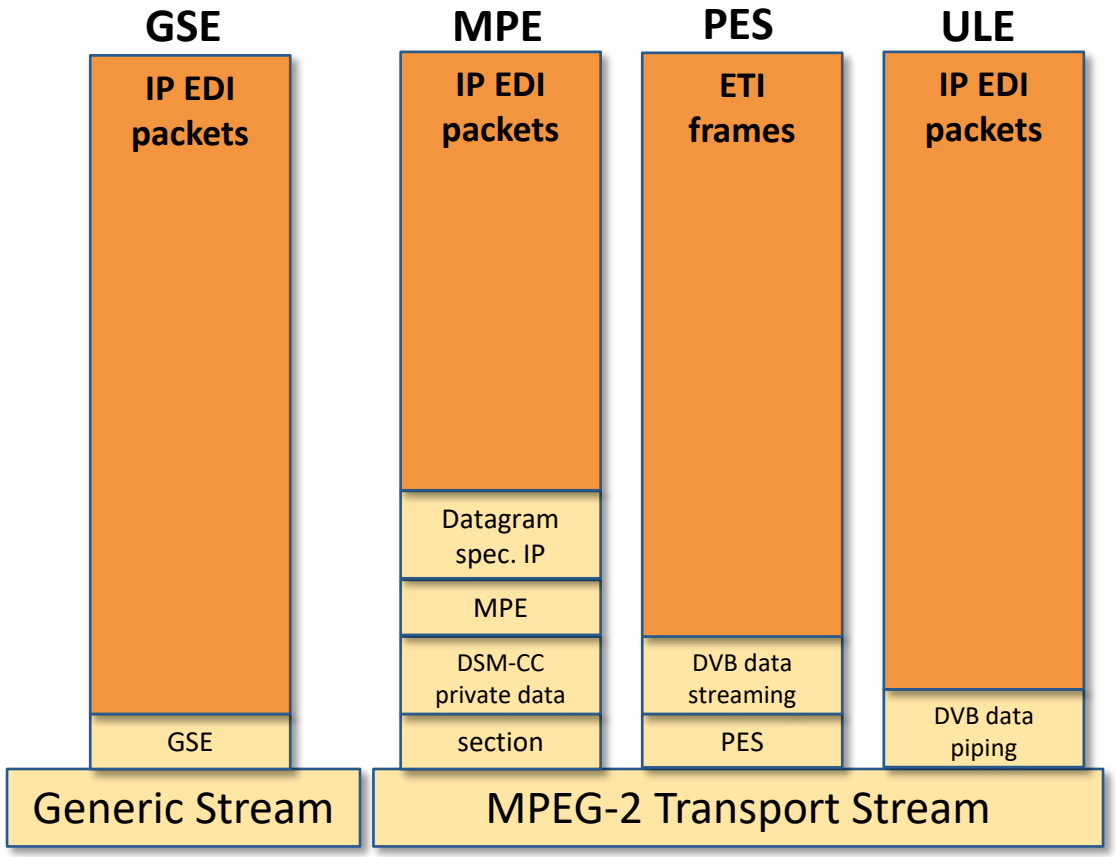
- The Unidirectional Lightweight Encapsulation (ULE) protocol is an alternative to MPE which is a lightweight and extensible solution for carrying IPv4, IPv6 and Protocol Data Units (PDUs) over MPEG-2 transmission networks.
- ULE has been engineered by the IP over DVB (ipdvb) working group of the Internet Engineering Task Force (IETF) and has been standardized in RFC 4326.

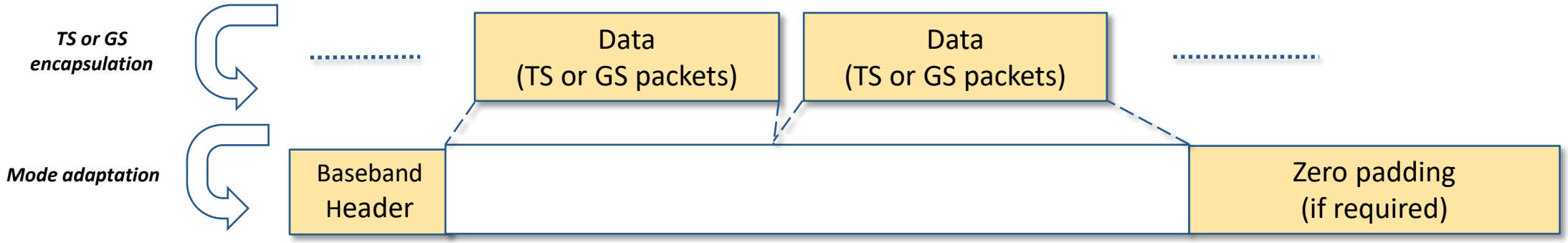
MPEG-2 TS – DVB Data Streaming – ETI



- For transmission of ETI Frames (uncompressed or compressed) when no IP EDI is available a Packetized Elementary Stream (PES), similar to audio and video distribution, can be used.

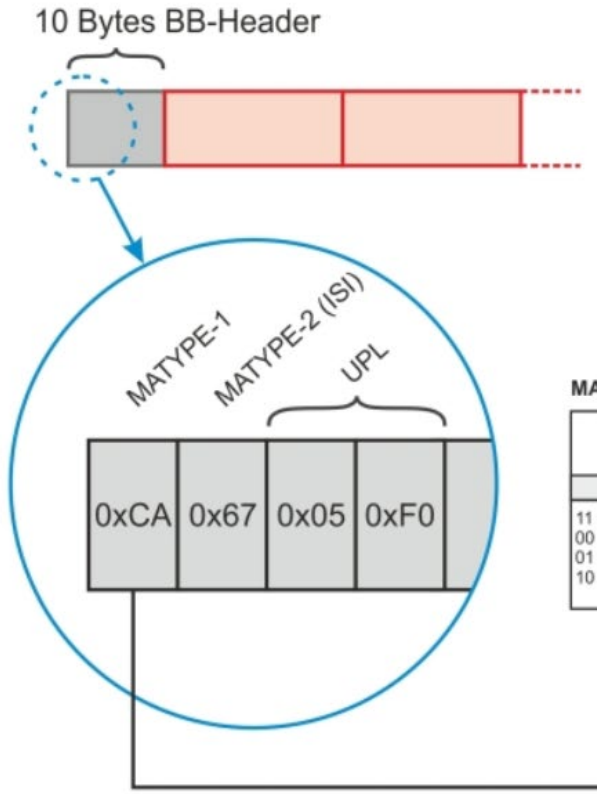
Overview of Encapsulation schemes





DVB-S2 Multistreaming

- Multistream technology includes a mechanism in the underlying baseband frame structure that merges multiple transport and generic data streams.
- On the basis of the ISI, the demodulator is capable of separating each stream.

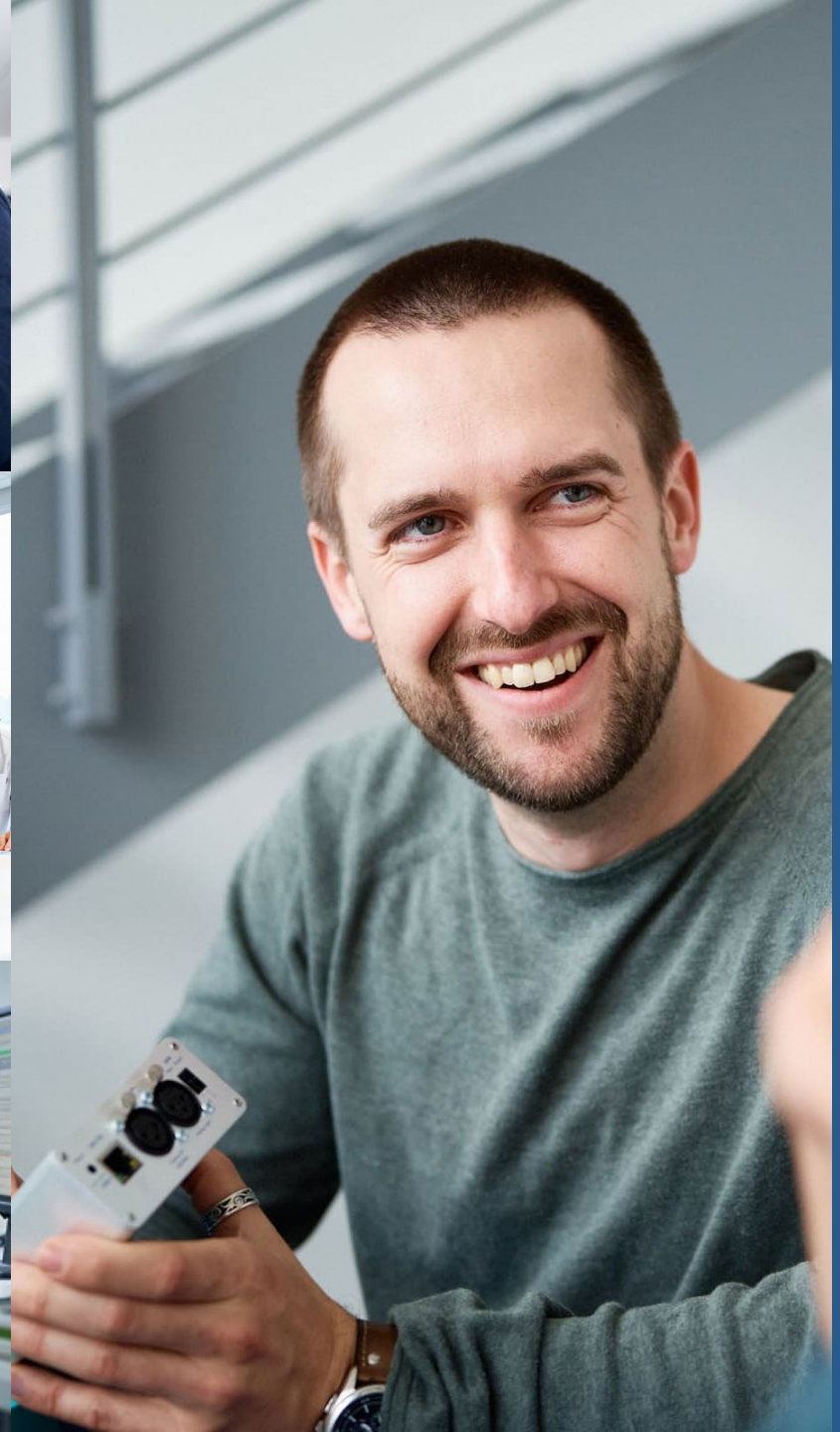


MATYPE-1 field mapping

7	6	5	4	3	2	1	0
TS/GS		SIS/MIS	CCM/ACM	ISSYI	NPD	RO	
11 = Transport 00 = Generic packetized 01 = Generic continuous 10 = reserved		1 = single 0 = multiple	1 = CCM 0 = ACM	1 = active 0 = not active	1 = active 0 = not active	00 = 0.35 01 = 0.25 10 = 0.20 11 = reserved	

Summary

- DVB-S/DVB-S2 MPE (Multiprotocol Encapsulation, IP EDI)
  - Protocol overhead is higher compared to GSE
  - Highly supported
  - Easy Integration into existing deployments
  - Deployments in : Germany, France, Italy, Australia
  - An alternative could be ULE (Unidirectional Leightweight Encapsulation)
- DVB-S2 GSE (Generic Streaming, IP EDI)
  - Bandwidth efficient due to absence of MPEG2-TS overhead
  - High transport efficiency
  - Combinable as Multistream with a TS on a different ISI (Input Stream Identifier)
  - Deployments in Norway
- DVB-S/DVB-S2 MPEG-2 TS (DVB Data Streaming - ETI)
  - For ETI Transmission (Compressed or Uncompressed) to DAB Transmitter that only have ETI interfaces.



Thank you!

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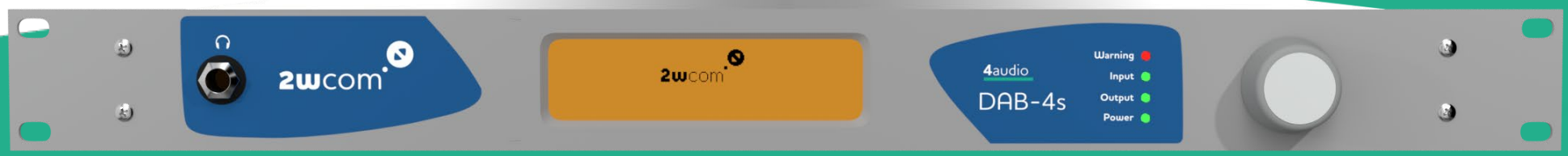
GSE–Lite / GSE– HEM

- GSE-Lite profiles for GSE encapsulation are specified in ETSI TS 102 606-1 standard Annex D.
- In order to reduce the memory and processing requirements at both transmitter and the receiver, the GSE-Lite profile has been conceived to provide a simple yet completely functional sub-set of GSE.

- The GSE-HEM (High Efficiency Mode) is specified in the EN 302 307 part 2 standard
- A high-efficiency BBFRAME mode (GSE-HEM) is introduced, similar to the T2 and C2 systems, to transport GSE/GSE-Lite packets



ETI and ETI Distribution (examples)