Hands-On

DVB-S2 and DVB-RCS for VSAT and Direct Satellite TV Broadcasting

Course Description

This course will examine DVB-S2 and DVB-RCS for Digital Video Broadcast and the rather specialised application of carrying IP and other data streams over DVB-S2 and DVB-RCS satellite systems.

The contents of this course have been designed to avoid any product specific or proprietary elements except for the last chapter on product comparisons. The majority of the course works from ETSI standardized mechanisms for DVB systems.

This course also aims to show the relationship between the family of DVB standards necessary to achieve IP data transfer. It finally compares these with alternatives, particularly patented proprietary systems that are used on some military applications used to overcome issues with carrying TCP over satellite networks. Details of these performance issues are explained and alternative performance solutions considered.

Students Will Learn

- **Describe The Evolution And Architecture Of Modern Second Generation Digital Video Broadcast (DVB) For TV Delivery**
- **Identify How DVB-S2 And DVB-RCS Can Be Used For Data Transfer**
- **Compare Over-Air Terrestrial With Cable, Satellite And Internet Delivery Systems**
- **Discuss Appropriate Broadcasting/Multicasting Strategies For DVB Delivery**
- **Identify How Second Generation DVB-S2 Radio Transmission Is Implemented**
- **Identify And Analyze DVB Multiplex Channels Deployed Over MPEG-2 Transport**
- **Describe The ETS Approach To DVB-RCS**
- **Appreciate The Trend In The Technologies And Compare DVB-S2/RCS With Other Approaches**
- **Identify And Solve The Problems Of Carrying TCP Traffic Over Long Delay Links**
- **And Much More**

Target Audience

This course is aimed at engineers who already have basic satellite communications knowledge but who need to understand ETSI DVB concepts in order to undertake further advanced detailed training in particular vendor technology.

Course Outline

Module I: Television Architecture and Evolution

Colour Television

NTSC, PAL, SECAM

Analogue vs. Digital Systems

Interlaced vs. Progressive

Introduction to Digital Video Broadcasting

Formats:

4:2:2, 4:2:0, CIF, QSIF

The Signals

Satellite vs Cable delivery

Components of a modern Digital TV Service Network

Video Head End

Streamers

Encoders and Transcoders

Multiplexers

Set-top Boxes

Service Types and Issues

Channel Zapping

Encoder Classification: MPEG-2, MPEG-4, H.264

Hands-on Exercise Viewing TV services at different rates

Module II: DVB Concepts and Standards

Evolution of DVB for DVB.org

ETSI Digital Video Broadcast Standards

DVB publications grouping

Transmission

Multiplexing

Source Encoding and Subtitling

Interactivity

- MHP
- Interfacing
- Internet protocol
- Conditional Access
- Measurement

Example Applications

- DVB-C
- DVB-S/S2
- DVB-T
- DVB-IPI
- DVB-H
- DVB-DATA

ETSI Digital Video Broadcast Standards

DVB-C, DVB-S/S2, DVB-T, DVB-H, DVB-IPI

Hands-on Exercise Receiving DVB service onto a PC

Module III: **MPEG Encoding DVB Services**

Encoding in MPEG-2

Source Encoding

MPEG Compression Concepts

Discrete Cosine Transforms

Prediction and Interpolation

Reordering

Motion: Prediction, estimation and compensation

I, P and B Pictures

MPEG Levels and Profiles

Framing Formats

Multiplexing of Signals

Packetized Element Stream(PES)

Decode Time Stamp (DTS)

Presentation Time Stamp (PTS)

System Clock Reference (SCR)

Quantization of Program and Transport Streams

Encoding Sound

MPEG-2 layer 3

AAC and AC3

Hands-on Exercise Receiving Analyzing I, P and B pictures in MPEG Stream

Module IV: **MPEG Transport Streams and Packets**

Transport stream format

Packetized Elementary Streams (PES)

MPEG Packets and headers

Service Information (SI), Program Specific Information (PSI)

Data Broadcasting DSM-CC

MHP Signalling

Program Allocation Table (PAT)

Program Map Table (PMT)

Conditional Access Table (CAT)

Network Information Table (NIT)

Service Description Table (SDT)

Event Information Table (EIT)

Effect on STB Behaviour

MPEG standards for Channel Coding and Forward Error Recovery

Energy Dispersal

Reed-Solomon Coding

Convolutional Coding

Interleaving

Trellis Decoding

Hands-on Exercise Analyzing an MPEG-2 transport stream

Module V: **DVB-DATA for carrying data over DVB**

EN 301 192

Using PES to carry data

Multi-protocol Encapsulation (MPE)

Using PSI and SI for data streams

IP MAC Notification Table

Time Slicing and MPE Forward Error Correction (MPE-FEC)

Data carousels

Object carousels

Module VI: **DVB-IPI for IP Interfaces**

ETSI TR 102 033 IPI Architecture

System Structure

DVB-IPI Home Reference Model

ETSI TS 102 034 MPEG 2 Transport over IP

Protocol stack for DVB-IP services

Service Discovery and Selection (SD&S)

Transport of MPEG-2 TS

Network Provisioning

Clock Recovery using RTP

Carrying IPTV over DVB-DATA channels

Overcoming Packet loss and jitter

Hands-on Exercise Converting Live DVB stream into IPTV stream

Module VII: **DVB-S2**

EN 302 307

Functional block diagram of the DVB-S2 System

Comparison with DVB-S

Encoding of User Packets

Bit Interleaving scheme

Optional pilots

Scrambling

Example of IP services using a DVB-S2 ACM link

TR 102 376 Guidelines for DVB-S2

DVB-S2 constellations before physical layer scrambling

C/N versus spectrum efficiency

Adaptive Coding and Modulation

Null Packets and their deletion

Air interface architecture of the DVB-S2 using ACM for IP services

Module VIII: **ETSI Approach to DVB-RCS For VSAT Operation**

TR 101 790 Guidelines for the use of EN 301 790

Interaction channel for satellite distribution systems

Architecture with single or multiple feeders

Architecture with regenerative satellites

Spectrum spreading in the forward link

Return Channel Satellite Terminals

Synchronization

Coding

FEC

Turbo Coding

Comparison between Turbo coding approaches

Multiple access

Fixed MF-TDMA

Dynamic MF-TDMA (Optional)

Segmentation of the return link capacity

Frames, Superframes and Timeslots

Capacity request categories

Synchronization procedures

Queuing strategy

Control and management

Configuration parameters between RCST and NCC using SNMP

Supported MIB-II groups

Coding of SI for forward link signalling

Mobility Management

Security and Cryptographic primitives

Modulation

System performance

User network guidelines

Multicast Handling

Star/Mesh regenerative networks

Module IX: **DVB-S2 Comparisons, Configurations and Other Issues**

COTS VSAT Systems

SCPC and MCPC systems

Linkstar

iDirect D-TDMA

Aloha Networks Spread Aloha

DVB/SCPC

DVB-S2/SCPC

Dual Redundant

VSAT System Solutions

VSAT VPN

Performance Issues of TCP over long delay

Performance Solutions

Evaluation and Review

Delivery Method

Instructor led with numerous Hands-On labs and exercises.

Equipment Requirements

(This apply's to our hands-on courses only)

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

Course Length

3 Days