ETSI: Sending/receiving BTP packets through UDP

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General

The network library supports an UDP for sending and receiving of BTP messages.
exampleETSI and ETSA are providing this interface.
ETSA is the ETSI network library linked with a wrapper as a standalone program

Sending/receiving BTP packets through UDP

The stack offers an UDP interface for sending and receiving BTP packets.
The BTP packets needs be created and interpreted on an external computer and handed over through UDP to the ETSA.

The network layer handles processing like:

- Security
  Signing of outgoing packets and verification of incoming packets.
  Incoming packets which fails the security verification are typically dropped.
- Distributed Congestion Control
  The channel load must be constantly monitored and if certain limits are reached the output power and the sending frequency is reduced
- Packet Hopping

- Packet Hopping
  Received packets are resend, depending on broadcast mode, hop count, destination area ...

Limitations of ETSA

- Protected Zones
  For Protected Zones CAMs needed to be decoded and the transmit power reduced.
  Decoding of CAMs is done in the facility layer which is missing in the ETSA and there is no API transferring protected zones to the network layer.
- ID change locking and notifications
  With security active, IDs like StationIDs in CAM and DENMs must be changed regularly. There is no sync/locking mechanism between the changes in the Network Layer (done by ETSA) and the changes in the CAM/DENM done by the application
- SSP checks
  SSP checks needs to be performed in the facility layer by the ETSA user
- Distributed Congestion Control (DCC)
  The DCC detects radio channel overload situations and one measurement is reducing the CAM frequency from 10HZ to 1Hz. There is no API for reproting this situation to the ETSA user

The UDP configuration (IP address, ports) is defined in the .conf file

- The UDP BTP interface is enabled by
  ItsFacilitiesShellEnabled = 1
- For forwarding BTP indications from the MK5 to the external computer the MK5 needs to know the IP address and UDP port of the external computer
  ItsUdpBtpIfHostName = 192.168.5.197
  ItsUdpBtpIfIndPort = 4400
  The BTP messages can be filtered with the parameter ItsBtpShellDestPort
  - = 2002 only messages to BTP port 2002 (DENM) are forwarded
  - = 0 no messages are forwarded
  - = 65535 all messages are forwarded (default)
- The external computer must send BTP request to the MK5 to the configured port
  ItsUdpBtpIfReqPort = 4401

DATA Request/Indication Header

Data Requests and Data Indications are preceded by an header. All numbers in the header are in big endian. After the header the BTP message starts at the field Data[0] ...

For each message to be send out from the MK5x the PC must send an UDP with the Data Request Header and the payload to the MK5. There is no repetition mechanism build in.
For each received message the MKx sends an UDP packet to the PC with the Data Indication Header and the received payload

Data Request

0	*1*	*2*	*3*
BTP Type	GN Packet Transport	GN Traffic Class	GN Max Pkt Lifetime
BTP Destination Port		BTP Destination Port Information	
GN Destination (Latitude for GeoBroadcast, top part GN Address for GeoUnicast)			
GN Destination (Longitude for GeoBroadcast, bottom part GN Address for GeoUnicast)			
GN Destination (Distance A for GeoBroadcast)		GN Destination (Distance B for GeoBroadcast)	
GN Destination (Angle for GeoBroadcast)		GN Destination (Shape)	Reserved
GN Comms Profile	GN Repeat Interval	GN Security Profile	GN Sec SSPBits Length
GN Security ITS-AID			
GN Sec SSPBits[0]	GN Sec SSPBits[1]	GN Sec SSPBits[2]	GN Sec SSPBits[3]
GN Sec SSPBits[4]	GN Sec SSPBits[5]	Data Length	
Data[0]	Data[1]	Data[2]	Data[...]

Data Length: Length of following data for payload, or use 0xFFFF to indicate that length should be set to as much data as is available
Data: Typically PER-encoded facilities layer message

Data Indication

0	*1*	*2*	*3*
BTP Type	GN Packet Transport	GN Traffic Class	GN Max Pkt Lifetime
BTP Destination Port		BTP Destination Port Information	
GN Destination (Latitude for GeoBroadcast, top part GN Address for GeoUnicast)			
GN Destination (Longitude for GeoBroadcast, bottom part GN Address for GeoUnicast)			
GN Destination (Distance A for GeoBroadcast)		GN Destination (Distance B for GeoBroadcast)	
GN Destination (Angle for GeoBroadcast)		GN Destination (Shape)	Reserved
GN Security Profile	GN Security Parser Res	GN Security Verify Res	GN Sec SSPBits Length
GN Security ITS-AID			
GN Sec SSPBits[0]	GN Sec SSPBits[1]	GN Sec SSPBits[2]	GN Sec SSPBits[3]
GN Sec SSPBits[4]	GN Sec SSPBits[5]	GN Sec CertId[0]	GN Sec CertId[1]
GN Sec CertId[2]	GN Sec CertId[3]	GN Sec CertId[4]	GN Sec CertId[5]
GN Sec CertId[6]	GN Sec CertId[7]	Data Length	
Data[0]	Data[1]	Data[2]	Data[...]

The fields are described below. Fill unsed fields with 0

BTP Type

2 = BTP-B, used for CAM, DENM ...

ETSI EN 302 636-5-1 v1.4.1

ETSI TS 102 636-5-1 v1.1.1

GN Packet Transport

2 = GeoUniCast (GUC), used for IPv6

4 = GeoBroadCast (GBC), used for DENM, MAP, SPAT and IVI

7 = Single Hop Broadcast (SHB), used for CAM, SAEM

7 = SingleHopBroadcast (SHB), used for CAM, SAEM

ETSI EN 302 636-4-1 v1.4.1

ETSI TS 102 636-4-1 v1.1.1

GN Traffic Class

CAM = 0x02 (DP3), DENM = 0x01, MAP, SPAT, IVIM, SAEM = 0x03

If set to >= 0x09 the packet is sent via SCH

ETSI TS 102 724 v1.1.1

GN Max Pkt Lifetime

Maximum packet lifetime in seconds

0 = use ItsGnMaxPacketLifetime parameter from .conf file.

ETSI TS 102 636-5-1

BTP Destination Port

Identifies protocol

2001 = CAM, 2002 = DENM, 2003 = MAP, 2005 = SPAT, 2006 = IVIM

ETSI EN 302 636-5-1 v2.2.1

ETSI TS 103 248 v1.3.1

BTP Dest Port Info

= 0, defined as a field in the standard, but no usage defined yet

ETSI TS 102 636-5-1

GN Destination

additional information needed for GUC and GBC

Latitude in 1/10 of a microdegree

Longitude in 1/10 of a microdegree

Distance A in meter

Distance B in meter (only for rectangle or eclipse)

Angle in degrees (only for rectangle or eclipse)

Shape, Circle = 0, Rectangle = 1, Eclipse = 2

ETSI EN 302 636-4-1 v1.4.1

ETSI TS 102 636-4-1 v1.1.1

ETSI EN 302 931 v1.1.1

GN Comms Profile

0 = G5, other profiles are not yet supported

GN Security Parser Res (Data Indication Only)

0 = OK

0 != Error, details are structure eC2XSEC_ParserResult of c2xsec.h

GN Security Verify Res (Data Indication only)

0 = OK

!= 0 Error, details are structure eC2XSEC_VerificationResult of c2xsec.h

GN Repeat Interval (Data Request only)

0, not yet support

GN Security Profile

0 = Security disabled, the remaining security parameters are ignored

1 = Security enabled

GN Security ITS-AID

ITS-AID

CAM = 0x24, DENM = 0x25, MAP = 0x08a, SPAT = 0x89, IVI = 0x8b, SAEM = 0x84081, CPM = 0x27F

ETSI TR 102 065 V1.1.1

GN Sec SSP Bits Length

Length of used SSP bits in Bytes, e.g. 4 for DENM

GN Sec SSP Bits

SSP bits left aligned, e.g. DENM with 0x01FFFFFF the settings are

SSPBITs[0]=0x01, SSPBITs[1]=FF SSPBITs[2]=FF SSPBITs[3]=FF, SSPBITs[4]=00, SSPBITs[5]=00

ETSI EN 302 637-2 for CAM

ETSI EN 302 637-3 for DENM

ETSI TS 103 301 for MAP/SPAT/IVI/SSEM/SREM/RTCMEM

ETSI TS 102 890-1 and IEEE 1609.3 for SAEM

ETSI ETSI TS 103 324 Draft for CPM

GN Sec Cert Id

Hash8 ID of the signing certificate

Requires that the .conf parameter Cohda_Crypto_Verify_Stats = 1 or higher

Data Length

Length of payload in bytes

Data[0]...

Payload

Example

Attached is the example DataIndication.pcapng file which shows the usage of the header for data indications. Please open it with the Cohda Wireshark, otherwise the Data Indication header is not understood.

Starting ETSA is done by the command `etsa -c /opt/cohda/test/receiver_ets.conf`

DataIndication.pcapng

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c2xsec.h

10 KB · Download

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