Adax GTP

Protocol acceleration for high capacity and performance in 3G, 4G, 5G, IoT and M2M networks

Introduction

GTP (GPRS Tunnelling Protocol) is a UDP/IP based tunnelling protocol used within the core radio control network of 2.5G (UMTS), 3G (GPRS) and 4G (LTE) and 5G cellular networks. GTP is used at various places within the network core, typically between the BSS and SGSN and in the GGSN in 3G networks, and between the eNodeB and SGW and in the PGW in 4G networks. See Fig's 1-2.

GTP consists of two separate protocols: GTP-U is the data plane protocol which tunnels data packets within the core network and GTP-C is the control plane protocol, responsible for setup and teardown of GTP-U tunnels.

As network capacity increases so does the need for performance, security and reliability. Adax GTP software, and its sister product, SCTP/T (see separate datasheet), are designed to meet the exploding capacity demands of cellular networks, especially from IoT and M2M. This particularly impacts GTP-U and the encapsulation and de-encapsulation of packets, PDP context requests and responses, and packet header insertion and enhancement.

Accelerating GTP tunnels and offloading GTP data traffic is a critical requirement in the performance of cellular networks, especially for traffic management, policing and load balancing in the core network. Removing bottlenecks in the network increases performance and traffic policing improves Quality of Service.

Figure 1 – Control Plane for S1-U and S5-S8
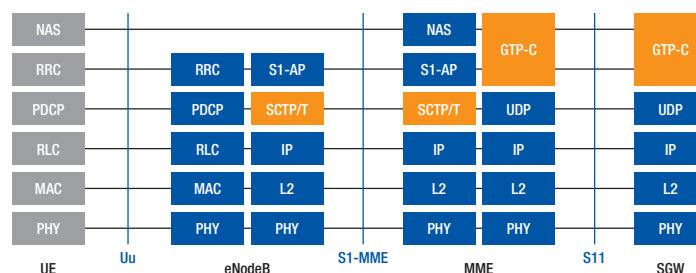
Figure 2 – Control Plane for S1-MME and S11

GTP Application Areas

- Core Network Performance Acceleration
  - 4G PGW, SGW and MME enhancement
  - 3G SGSN and GGSN enhancement
  - ePDG for secure access to 4G core network
  - Load Balancing, Backhaul & Aggregation
  - QoS Traffic Management and Policing
- IoT and M2M for Cellular networks
  - Vehicle telematics 'connected car'
  - Industrial automation, monitoring and control
  - Intelligent transport systems
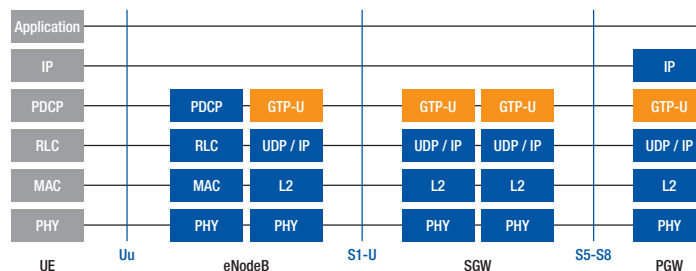 - Smart homes and buildings
  - Healthcare

Adax GTP User Library

The GTP User Library is linked with the user's application and provides the C-language functions for the application to construct and decode GTP Remote library packets. The GTP user's programming interface supports all of the functions necessary for an external GTP-C implementation to set up and tear down GTP Tunnel Endpoints and GTP PDP contexts. The GTP User Library is a loosely coupled application interface. This means that instead of communicating with the Policy Manager via C-language function calls, the user's application or GTP-C protocol stack communicates with it via UDP packets which contain data structures to control the GTP-U data plane. This allows for a convenient RPC method enabling user applications and GTP-C stacks to be implemented on the same machine as the GTP-U data plane or on a different virtual machine "in the cloud".

Adax GTP Protocol Software Features

- Can be deployed as a virtual network element on a variety of different commercial cloud computing providers

- Support for Multiple APNs and for Overlapping Addresses for MS devices

- Interworking between IP and GTP-U (GTP Tunnel termination)

- Termination and Relay per PDP context for Mobile Data Offload (GTP Bypass)

- Interworking between two separate GTP tunnels (GTP Relay)

- GTP-U Echo Requests/Responses can be terminated to the host, relayed to another GTP tunnel, processed automatically, or discarded

- GTP User Library provides loosely coupled application interface enabling user applications and GTP-C stacks to be implemented on the same machine or on different virtual machines in the cloud

- Traffic Policing support for ingress and egress packets. Including DSCP copying and/or remarking and six different Token Bucket Traffic Policing algorithms.

- Support for millions of PDP contexts subject to system configuration

- Support for PDP context statistics indications

- Support for PDP context lifetime indications

- IPsec to GTP interworking

- Supports GTPv1-U (GPRS Tunneling Protocol User Plane Version 1) as specified in 3GPP TS 29.060 and TS 29.281

GTP and SCTP Capacity and Reliability for Massive M2M and IoT Connections

IoT and M2M communications represent a significant growth opportunity for the 3GPP ecosystem. Millions of low speed, low data volume, M2M and IoT devices will be deployed on a massive scale and they will all need to be connected to the core mobile network. This huge increase in the number of devices connecting to the core network over the S1 and Gb interfaces will require highly efficient, high capacity data and control plane protocol implementations such as Adax GTP and SCTP/T.

Adax GTP and SCTP/T protocol products deliver the capabilities and performance to handle this massive number of connected devices securely and reliably without impacting overall network performance and Quality of Service, thus improving the user experience.

3GPP and NarrowBand IoT

3GPP is moving ahead with the standardization of NB-IOT. 3GPP TR 45.820, 'Cellular system support for ultra-low complexity and low throughput Internet of Things (CIoT)', defines a new narrowband radio technology to address the requirements of the IoT. The new technology will provide improved indoor coverage, support a massive number of low throughput devices, low delay sensitivity, ultra-low device cost, low device power consumption and optimized network architecture. As well as enhancements to the S1 interface to the core network the NB-IOT standard includes the option for the large number of connected devices to use the Gb interface to the base station on a new Cooperative Ultra NarrowBand (C-UNB) and then be interworked in an SGSN to GTP.

GTP – IPsec Interworking

Adax GTP is integrated with the Adax IPsec package allowing interworking between IPsec and GTP-U tunnels in applications such as ePDGs which provide secure access to the mobile network core for untrusted WiFi gateways. GTP-C traffic can also be encapsulated into IPsec tunnels to secure the control plane signaling, allowing untrusted networks to be used for networking signaling traffic. As the Adax software terminates the IPsec and then encapsulates the GTP-U in one operation it can remove the need for a separate IPsec gateway.

GTP 1117/03

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Legacy to LTE