Grps and 3g networks report example

Technology, Internet

INTRODUCTION

With increasing emergence of cellular computing and internet, cellular wireless technologies have found its way into the limelight to supplement the increasing demand for wireless data services. Existing data services pose a challenge for the delivery of quick easy and cheap connections. The current wireless technologies are based on circuit switched radio transmission. This transmission process allocates a channel to a single user in a network for an entire communication period and when the traffic levels reach a certain threshold inefficient resource utilization is likely to be observed. Therefore the transmission method is ineffective and in order to satisfy the user demands, better methods should be utilized.

Packet switched bearer methods is one such transmission channel that effectively utilize data traffic. The channel is called upon whenever a need arises and terminated after the tyransmission of the packets has been completed. This allows for the sharing of pool of resources by multiple users through statistical multiplexing.

General Packet Radio Services is a digital technology originally intended for GSM but later integrated within other technologies. GRPS significantly improves the wireless transfer and access of data packet networks such as the internet. The technology uses the principle of packet radio transmission to efficiently relay data packets between GSM devices (mobile stations and external packet data networks). Packet routing is done between the GRPS mobile stations and packet switched networks. The current GRPS version supports the Internet Protocols and X. 25 networks. The following are the advantages of GRPS over previous technologies;

- Shorter access times and greater data rates. Session establishment rates are below a second while data rates are higher defined by tens of kilobits per second.

- GRPS packet transmissions have user friendly billing services in contrast with circuit switched services. Billing is determined by the amount of data transmitted in the period of communication. Therefore volume-based billing is superior and efficient compared to time-based billing.

GSM ARCHITECTURE

A GSM Public Land Mobile Network consist of GSM mobile stations and base transmission receiver (BTS). A group of BTS are controlled by BSC and the combination of BTS and BSC forms a base station subsystem BSS. Mobile Switching Center MSC is responsible for the routing of traffic in the cells. Cal controls are managed b y the home location register HLR and visited location register VLR. Other data basesd include authentication center AUC and equipment identification register EIR. AUC is tasked with the generation and storage of security features.

GRPS Architecture

GSN are GRPS network support nodes responsible for the physical delivery and routing of data packets. A serving GRPS node SGSN is tasked with the delivery of data packets from and to stations in a given service area. It essentially conducts packet routing and transfer mobility management, authentication, local link management and charging functions. Location register of the SGSN keeps location data and user profiles of the entire user within reach.

A gateway support node GGSN acts as a link between THE GRPS backbone network and external packet data networks. It converts the packets originating from the SGSN into the required data protocol such as IP and forwards it to the corresponding data packet network. Therefore, GGSN keeps a record for the current SGSN address of the user and his profile. In addition it performs authentication and charging functions. Gn and Gp interfaces are utilized for SGSN and GGSN located in the same and different PLMN respectively. There are Intra-PLMN and Inter-PLMN backbone network connections for GSNs on the same and different PLMN and a roaming agreement is required between two GRPS network providers. Border gateways exist between PLMNs and inter-PLMN to give a security check against unauthorized users and access. GN and Gp interfaces provide much of the communications for the GRPS networks. Gd connections define the interface for the exchange of SMS through the SMS-GMSC gateways while Gs connection is responsible for the databases of the SGSN and MSC/VLR.

The bearer services of GRPS are offered on an end-to-end packet switched data transfer mechanism. The two different kinds being utilized include point-to-point and point-to-multipoint services. PTP services are used in the transfer of data between two users while PTM offers the transfer of data between one user to multiple user. PTM exist in multicast PTM-M and group call service. The former broadcast messages in a geographical area while the later address a group of user who might not be located in a geographical area.

Quality of Service in GRPS is defined by such parameters as precedence, reliability, delay and throughput. Precedence defines the priority given to a

service while reliability indicates the features of transmission required by the application. In a GRPS/GSM network, classes of mobile stations are classified into A, B and C to signify the attachment of GRPS to the conventional GSM transmission services.

GRPS technology allows for the integration and interconnection with IP-based data networks such as internet and intranet. It also supports security protocols such as IPv4 and IPv6. In conclusion, the operation of the GRPS takes place in a way that before a GRPS mobile station creates a PDP context for the characterization of packet data connection, it must gets an address. The GRPS mobility management collaborates with the GSM management to give an efficient paging mechanism for mobile stations utilizing both technologies. Dynamic PDP address such as DHCP aides the GRPS provider in the support of multiple users. Likewise, the GRPS multislot capability that diverges from one to eight slots per TDMA frame can be allocated to a single user. Moreover, uplink and downlink are allocated separately while the physical channels are only given when data packets need to be transferred and are terminated thereafter.

3G TECHNOLOGY

3G is the third generation of wireless mobile network whose object is to give a worldwide standard and a universal frequency band for cellular networking. Third generation networks almost utilized in daily working standards make available of data rates of up to 200kbps for mobile users and 2Mbps for stationary users.

The ITU conceptualized the process in 1992 with the aim of developing a new network infrastructure termed as IMT-2000 by the beginning of the 21st

century. The core aims of IMT-2000 include the following ;

The third generation partnership established in 1998 gave specifications for UMTS technology based on Universal Terrestrial Radio Access (UTRA) radio interface and the extended GSM/GRPS network. A second radio interface called IMT-MC supported by 3GPP2 organizations and backward compatible made it possible for a faultless transition to the 3G or CDMA2000 technology .

3G

Third generation systems contain two proposed system; UMTS comprising of CDMA-direct (FDD) and CDMA-TDD and CDMA 2000 (evolution of CDMA-1).

UMTS infrastructure is the current 3G application developed for the GSM/GRPS network and UTRA radio frequency. To get an understanding of the 3G we consider the network infrastructure.

The 3G network is comprised of two parts;

- The Radio Access Network (UTRAN)

- The Core Network (equivalent to GRPS NSS)

The RAN is made up of the GRPS / GSM system joined to the Packet Switched Network and to the Circuit Switched Network. The PS-CN system in the long run connects to the UTRAN as a requirement for full 3G integration (Ralph Stair, 2011). UTRAN is made up several interconnected RNS which subsequently consist of RNC and at least one node B.

CDMA 1

It is based on spread spectrum technology that was initially utilized by the U. S military. CDMA1 allow many users of up to 64 to share 1. 25MHz channels by attaching a pseudo-random code to each user. Therefore all base stations are synchronized to transmit the same pseudo-random code in the 850MHz and 1900MHz.

TDMA systems are designed to work with AMPS systems by dividing a 30KHz channel into three portions for equal users to utilize a single radio channel. TDMA has been integrated into the GSM systems since 2000.

UTRAN is made up of subsystems each containing one Radio Network Controller connected to many Base Transceiver Stations (BTN). Alcatel introduced the Work item in 3GPP to classify IP-based solution for the ULTRAN transport mechanism that substituted the ATM-based solutions. The concentration function of the RNC is transferred to the IP transport network. IP-based ULTRAN offers a range of advantages in terms of flexibility in the mapping between node B and RNC servers to utilize transport resources. On the other hand the core network is made up of PS-CN and CS-CN.

Evolution towards NGN architecture commenced in 1999 with the evolution of CS domain and the split of MSC into media gatewayy and the server control. Release 5 introduced the IP transport support technology that was driven by enhanced end user services.

PS-CN is the information server containing the SGSN and the GGSN. Every SGSN link is made up one or more RSC and BSC with the PS-CN. (Ralph Stair, 2011) Its functionality includes;

- Access control

- Mobility management. Resides in the control panel and manages states such as attach, detach, idle and RAN mobility. Others include authentication, paging, roaming and bearer management functions.

- Paging and root management.

SGSN is the platform used to deliver data packets to and from mobile base stations within a regional area. Other services such as packet routing, mobility management, authentication and charging are performed by this node (Ralph Stair, 2011).

3G infrastructure requires a substantial amount of data as compared to its predecessor (2. 5G). The UMTS Radion Access Network replaces the GSM EDGE Radio Access Network. The UTRAN consist of Node B and RNC elements. (Mishra, 2007) argues that the voice transmission components of 3G networks maintain the MSC, HLR/VLR applications and the GRPS packet switching infrastructure (SGSN and GGSN). In addition to its overlay network 3G GRPS network is based on ATM technology (Sauter, 2011).

According to , the security protocol used in the 3G to access to the internet is called WAP . It is an open specification protocol that is not dependent on the fundamental network. WAP2 permit mobile devices direct communication with the servers.

Therefore 3G has evolved with the technical specification work performed on the FDD and TDD standardizations are evolving within the 3GPP as per the releases. 3GPP release 3 is based on ATM specifications in the radio access network. 3GPP release 4 defines new version for FDD and TDD to improvement modes. 3GPP release 5 includes and IP-based transport within the RAN.

The proposed UMTS core network architecture comprise of the following elements.

Call center control function, media gateway, media gateway control function (MGCF) and home subscriber server (HSS).

Internetworking and wireless technologies such as WLAN emerged and some argue that it is a replacement of 3G network technologies that will offer effective delivery of services. Current wireless technologies include the 2. 4 GHz unlicensed band such as HomeRF which is a combination of 802. 11b and DECT and the 5MHz (802. 11b). Three seamless network layers are evident; cellular layer, hot spot layer and personal network layer.

Reference

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