

School of Computing Science and Engineering

Course Code : BCSE3065

Course Name: Mobile Computing



GPRS

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GPRS

- Introduction
- QoS in GPRS
- GPRS Network Architecture
- GPRS Network Operation
- Data Service, Application, Limitation In GPRS
- Billing and Charging In GPRS

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Introduction

- General Packet Radio Service
- Step to efficiently transport over the current GSM and wireless network infrastructures.
 - Deployment of GPRS networks allows a variety of new applications ranging from mobile e-commerce to mobile corporate VPN access.
 - GPRS allows for **data speeds of 14.4 KBps to 171.2 KBps**, which allow for comfortable Internet access.

Key Features

- **The always online feature** - Removes the dial-up process, making applications only one click away.
- **An upgrade to existing systems** - Operators do not have to replace their equipment; rather, GPRS is added on top of the existing infrastructure.
- **An integral part of future 3G systems** - GPRS is the packet data core network for 3G systems EDGE and WCDMA.

QoS in GPRS

- Allows definition of QoS profiles using the parameters of
 - **Service precedence**
 - **Reliability**
 - **Delay**
 - **Throughput**
- **Service precedence:**
 - The priority of a service in relation to another service which can be either high, normal or low

□ **Reliability :**

- Indicates the transmission characteristics required by an application and guarantees certain maximum values for the probability of loss duplication, mis-sequencing and corruption of packets.
- **Delay :** Parameters define maximum values for the mean delay and the 95-percentile delay
- **Throughput:** Specifies the maximum/peak bit rate and the mean bit rate

GPRS Network Architecture

- GPRS uses the GSM architecture for voice
- To offer packet data services through GPRS, a new class of network nodes called **GPRS support nodes (GSN)** are introduced
 - ▣ GSNs are responsible for the **delivery and routing of data packets between the mobile stations and the external packet data networks (PDN)**
- Two main GSNs.
 - ▣ Serving GSN (SGSN)
 - ▣ Gateway GSN (GGSN)

SERVING GSN

- SGSN is at the same hierarchical level as the MSC and so, whatever MSC does for voice, SGSN does for packet data.
- SGSN's tasks
 - ▣ Packet switching
 - ▣ Routing and transfer
 - ▣ Mobility management
 - ▣ Logical link management
 - ▣ Authentication and charging functions

SGSN

- SGSN processes registration of new mobile subscribers and keeps a record of their location inside a given service area.
- Location register of the SGSN stores location information (like current cell, current VLR, etc.) and user profiles of all GPRS users registered with this SGSN.
- SGSN sends queries to HLR to obtain profile data of GPRS subscribers.

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Gateway GSN (GGSN)

- GGSN acts as an interface between the GPRS backbone network and the external packet data networks and functions like a router in a LAN
- GGSN maintains routing information that is necessary to tunnel Protocol Data Units (PDUs) to the SGSNs that service particular mobile stations

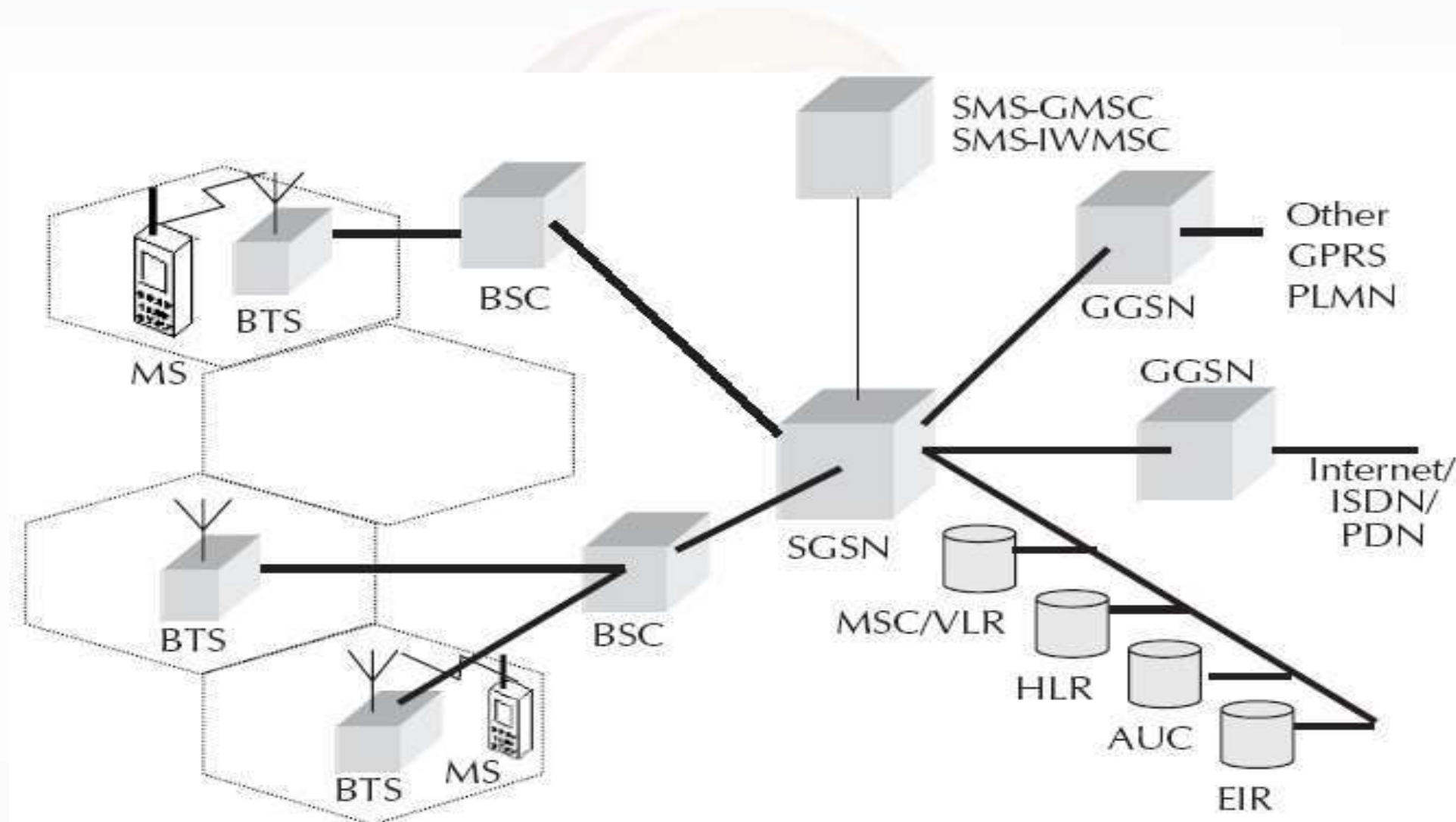
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GGSN

- GGSNs convert the GPRS packets coming from the SGSN into the appropriate packet data protocol (PDP) format for the data networks like Internet or X.25
- GGSN stores the current SGSN address of the user and user's profile in its location register while performing authentication and charging functions related to data transfer

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GPRS Architecture



GPRS Architecture

□ Base Station System (BSS) :

- Needs enhancement to recognize and send packet data and this includes BTS upgrade to allow transportation of user data to the SGSN. BTS, too, needs to be upgraded to support packet data transportation between BTS and MS (mobile station).

□ HLR:

- Needs enhancement to register GPRS user profiles and respond to queries originating from GSNs regarding these profiles.

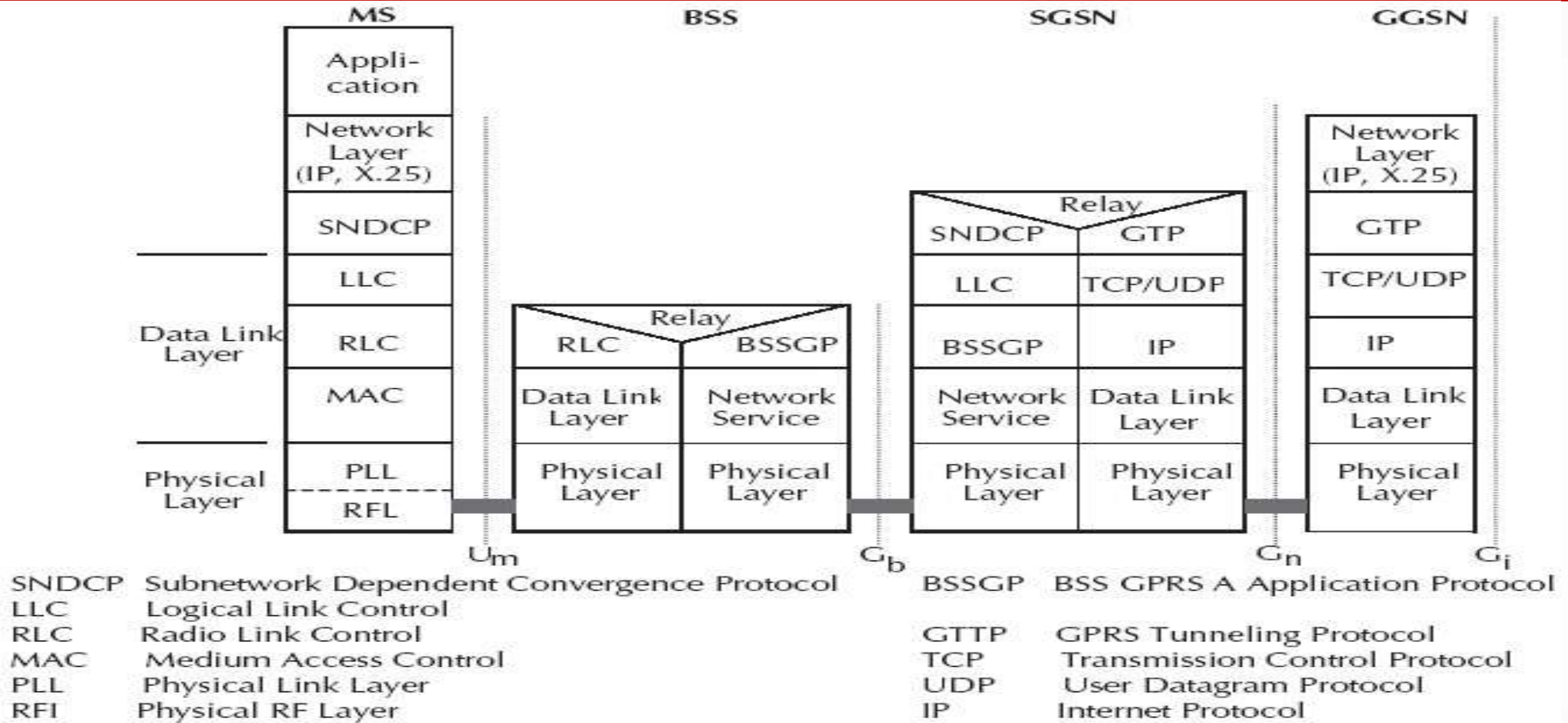
□ MS (mobile station) for GPRS is different from that of GSM.

□ SMS-GMSCs and SMS-IWMSCs are upgraded to support SMS transmission via

Channel Coding

- Channel coding is used to **protect the transmitted data packets against errors**
- Channel coding technique in GPRS is quite similar to the one employed in conventional GSM
- Under very bad channel conditions, reliable coding scheme is used where redundant bits are added to recover from burst errors
- Under good channel conditions, no encoding scheme is used resulting in a higher data rate

GPRS Protocol Architecture



Air Interface

- Air interface of GPRS comprises data link layer and physical layer.
- Data link layer between MS and BSS is divided into three sub layers:
 - I. logical link control (LLC) layer
 - II. Radio link control (RLC) layer
 - III. Medium access control (MAC) layer.
- Physical layer between MS and BSS is divided into two sub layers:
 - I. Physical link layer (PLL)
 - II. Physical RF layer (RFL)

Data Link Layer

- Logical Link Control (LLC) layer provides a reliable logical link between an MS and its assigned SGSN as its functionality is based on HDLC (High Level Data Link Control) protocol and includes sequence control, in-order delivery, detection of transmission and retransmissions.
- Variable frame lengths are possible and both acknowledged and unacknowledged data transmission modes are supported.

Data Link Layer

□ RLC Layer:

- ❑ Radio Link Control (RLC) layer establishes a reliable link between MS and BSS.
- ❑ It also does segmentation and reassembly of LLC frames into RLC data blocks and ARQ of uncorrectable data.

□ MAC Layer:

- ❑ Medium Access Control (MAC) layer controls the access attempts of an MS on the radio channel shared by several MSs by employing algorithms for contention resolution, multi-user multiplexing on a **packet data traffic channel (PDTCH) and scheduling and prioritizing based on the negotiated QoS.**

Physical Layer

□ PL Layer :

- ❑ Physical Link Layer (PLL) provides services for information transfer over a physical channel between the MS and the network.
- Its functions include data unit framing, data coding and detection and correction of physical medium transmission errors.
- ❑ Physical Link Layer uses the services of the Physical RF Layer.

□ PRF Layer:

- ❑ Physical RF Layer (RFL) performs the modulation of the physical waveforms based on the sequence of bits received from the Physical Link Layer above.
- ❑ It also demodulates received wave forms into a sequence of bits that are transferred to the Physical Link layer for interpretation.

GPRS Applications

- Chat
- Multimedia Services
- Virtual Private Network
- Personal Information Management
- Job Sheet Dispatch
- Unified Messaging
- Vehicle Positioning
- Location based services and Telematics



Thank You