2 G Architecture– GSM, GPRS and Others

Lesson 11

GPRS

Two switching modes

- Circuit Switching
- Packet switching

Circuit switching

- A connection first sets up
- Then the entire data transmits through the path that has been set up during the connection

Packet switching

- Packets of data at any given instant can take multiple (time slots or channels or paths or routes) [Internet Packet size 16384 B]
- Depending on the idle slots at that instant
- Receiver assembles the packets into the original sequence in the data

General packet radio service (GPRS)

- **A** packet-oriented service for mobile stations' data transmission and their access to the Internet
- A speed enhanced data transmission service designed for GSM systems
- Speed enhanced data transmission– by packetizing data and simultaneous transmission of packets over different channels

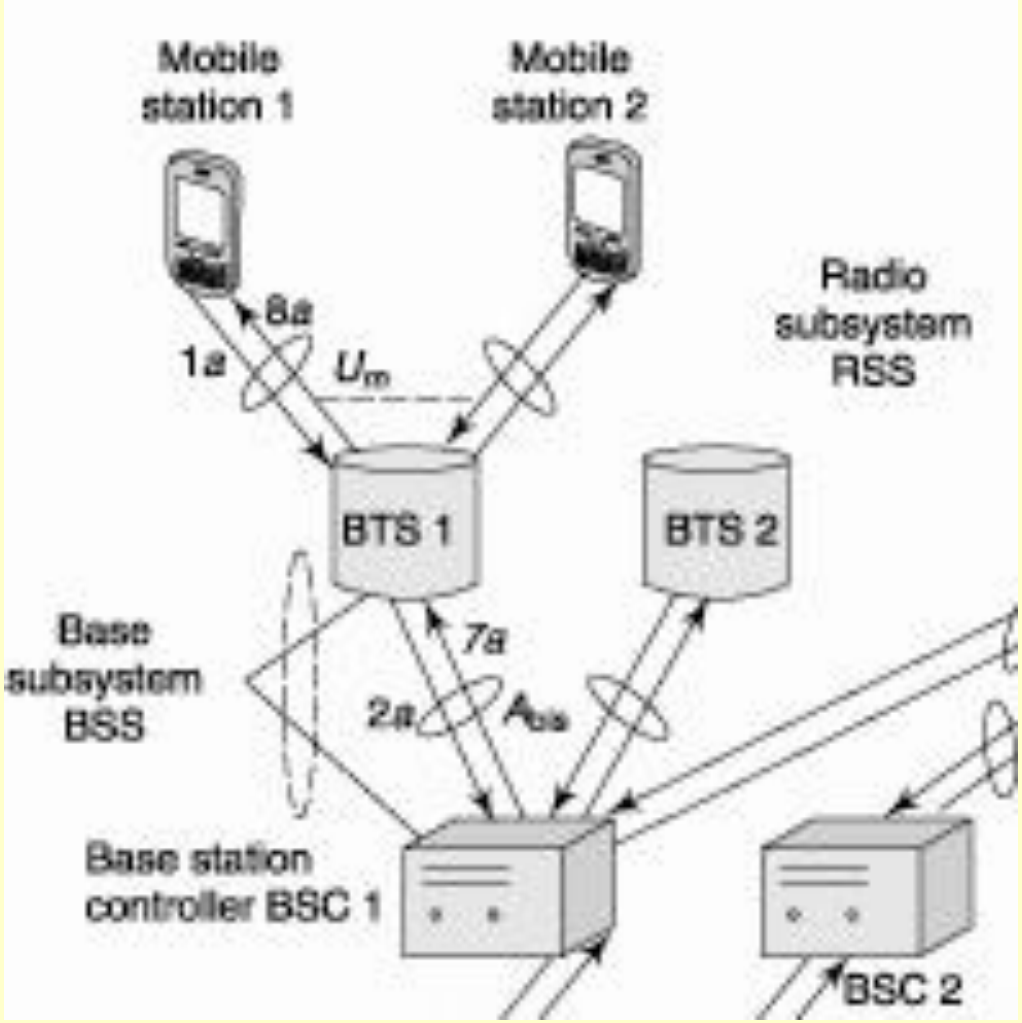
GPRS

- Uses the unused slots and channels in TDMA mode of a GSM network for packetized transmission from a mobile station
- Data-packets of a single mobile station transmit through a number of time slots

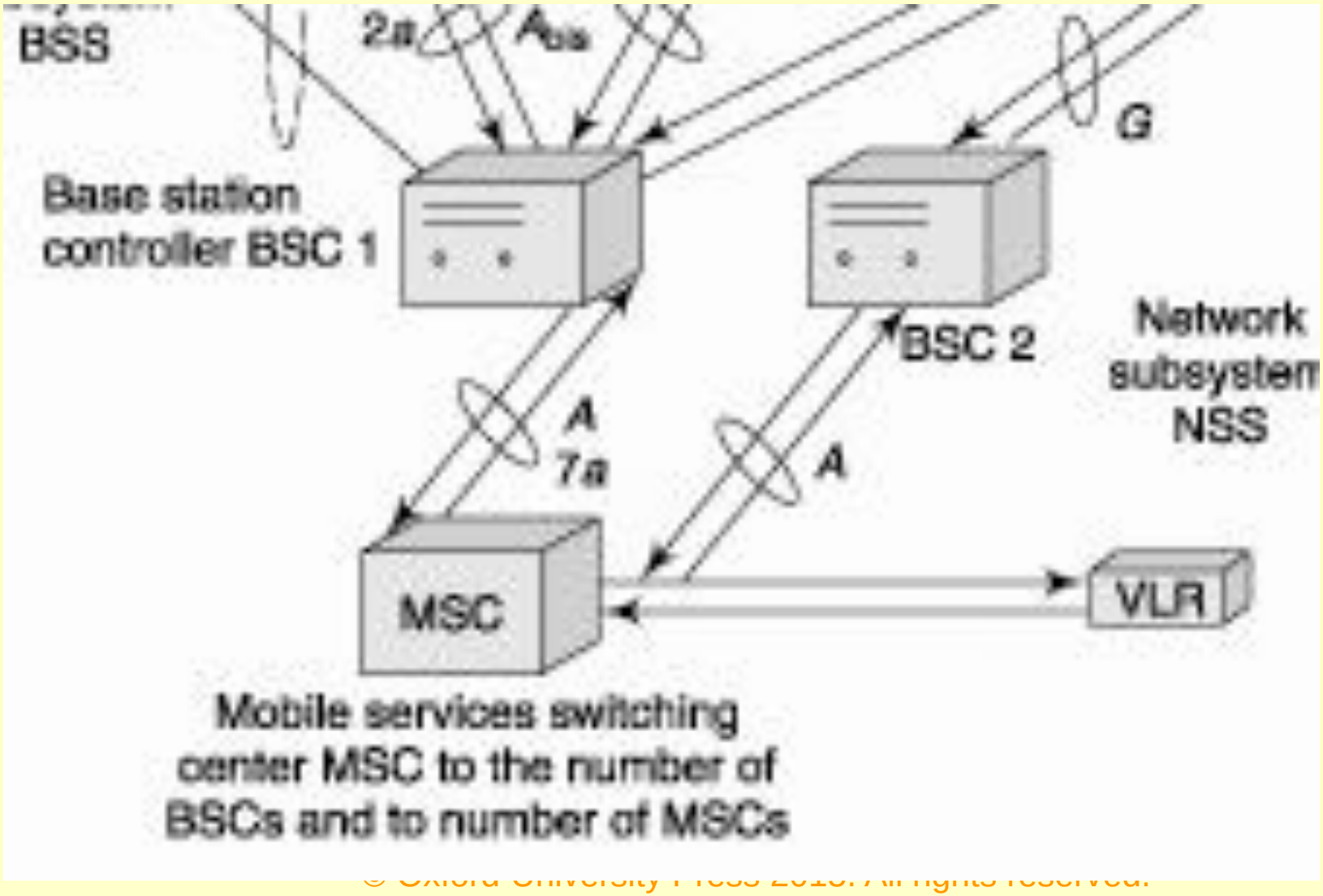
GSM system— a subsystem of a GPRS system

- GPRS employing the GSM physical layer
- Connects mobile stations for voice-data transmission
- Connects the mobile stations to the Internet
- Packet data networks at higher data rates

GPRS system architecture—Mobile to BSCs (Like GSM)



GPRS system architecture—BSCs to MSC (Like GSM)



GPRS deploying SGSNs (serving GPRS support nodes)

- SGSN interfaces to BSCs (base station controllers) on one hand and to other SGSNs on the other hand

GPRS GGSN (Gateway GPRS Support Nodes) Interface

- To the SGSN on one hand
- A packet data network like the Internet on other hand
- The BSCs also connect to the MSCs (mobile services switching centres) as in case of the GSM system

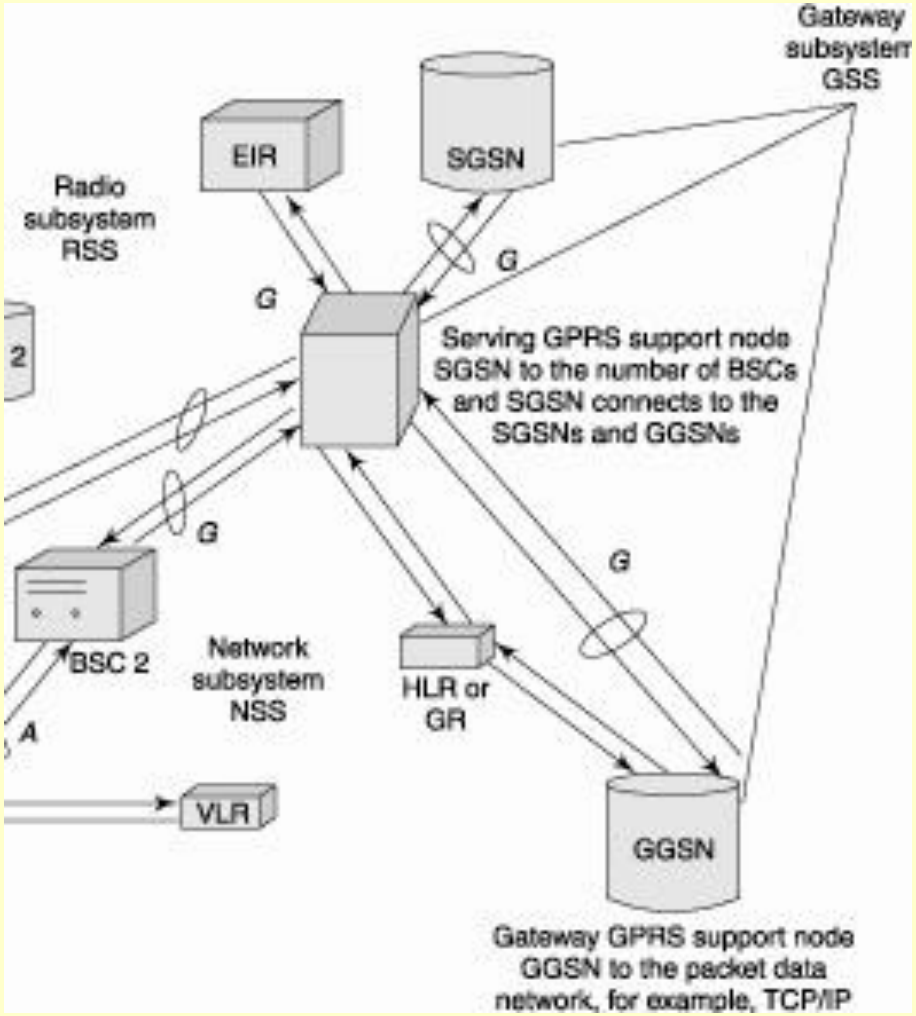
NSS and RSS layers

- Each SGSN and each MSC in the NSS layer connects to a number of BSCs at the RSS layer
- The SGSNs use the frame relay protocol for connection to BSCs

GSS (GPRS subsystem)

- Consists of the SGSNs and GGSNs
- Provides GPRS connections to the Internet and other PDNs (public data networks)

GPRS system architecture — BSCs to SGSN at GSS



GPRS system context

- Creates and stores in the Mobile station as well as in the SGSN
- Has information of the status of Mobile station, data compression flag, identifiers for the cell and channel for the packet data and routing area information

EIR (GPRS equipment identity register)

- Stores the equipment data through the SGSN
- Helps the authentication, operation, and maintenance subsystems

GPRS Protocol Mobile station (Mobile Station) Layers

- GPRS protocol layers similar to the GSM protocol layers
- The Mobile station has four layers—physical, data link, network, and application
- Session presentation and transport layer issues are taken care of by the lower layers

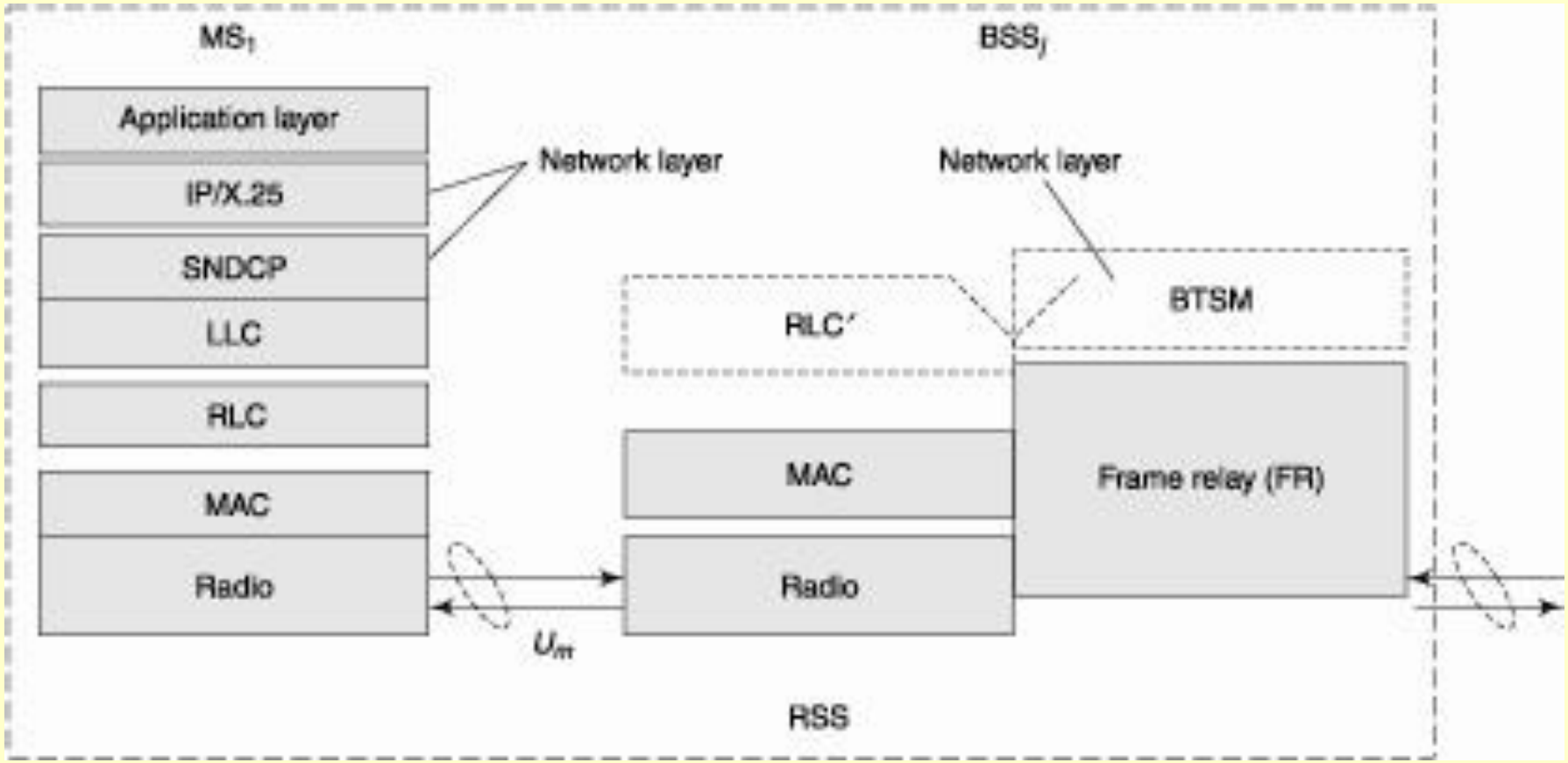
BSS

- Has just three layers — physical, data link, and network
- Transport and session layer functions taken care of by network layer protocols

The SGSN and GGSN four layers

- Physical, data link, network and transport
- Presentation layer functions are performed by the lower layers

Protocol layers between the Mobile station and BSS



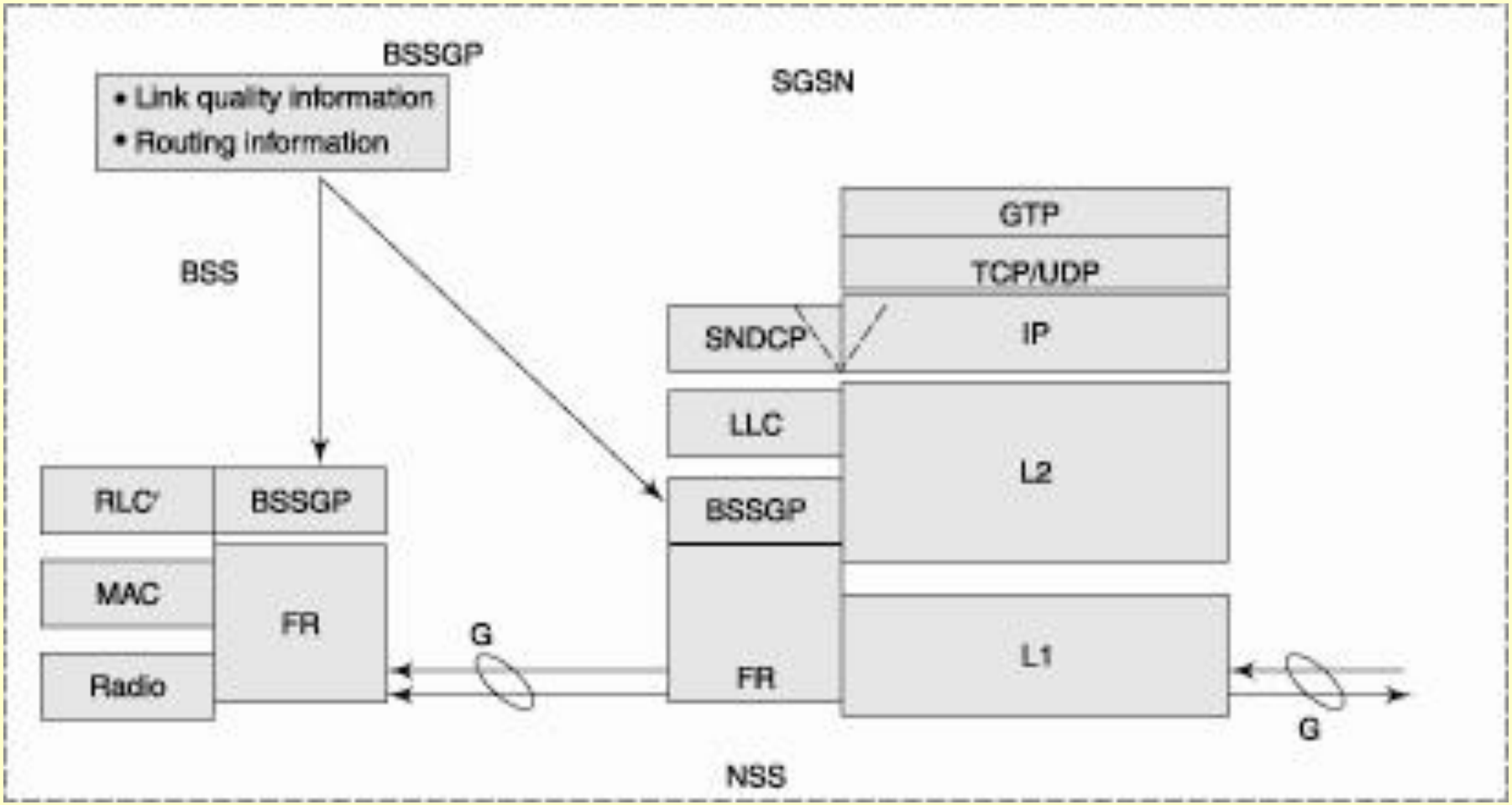
Application layer at the Mobile station

- Provides end-to-end applications like voice and Internet

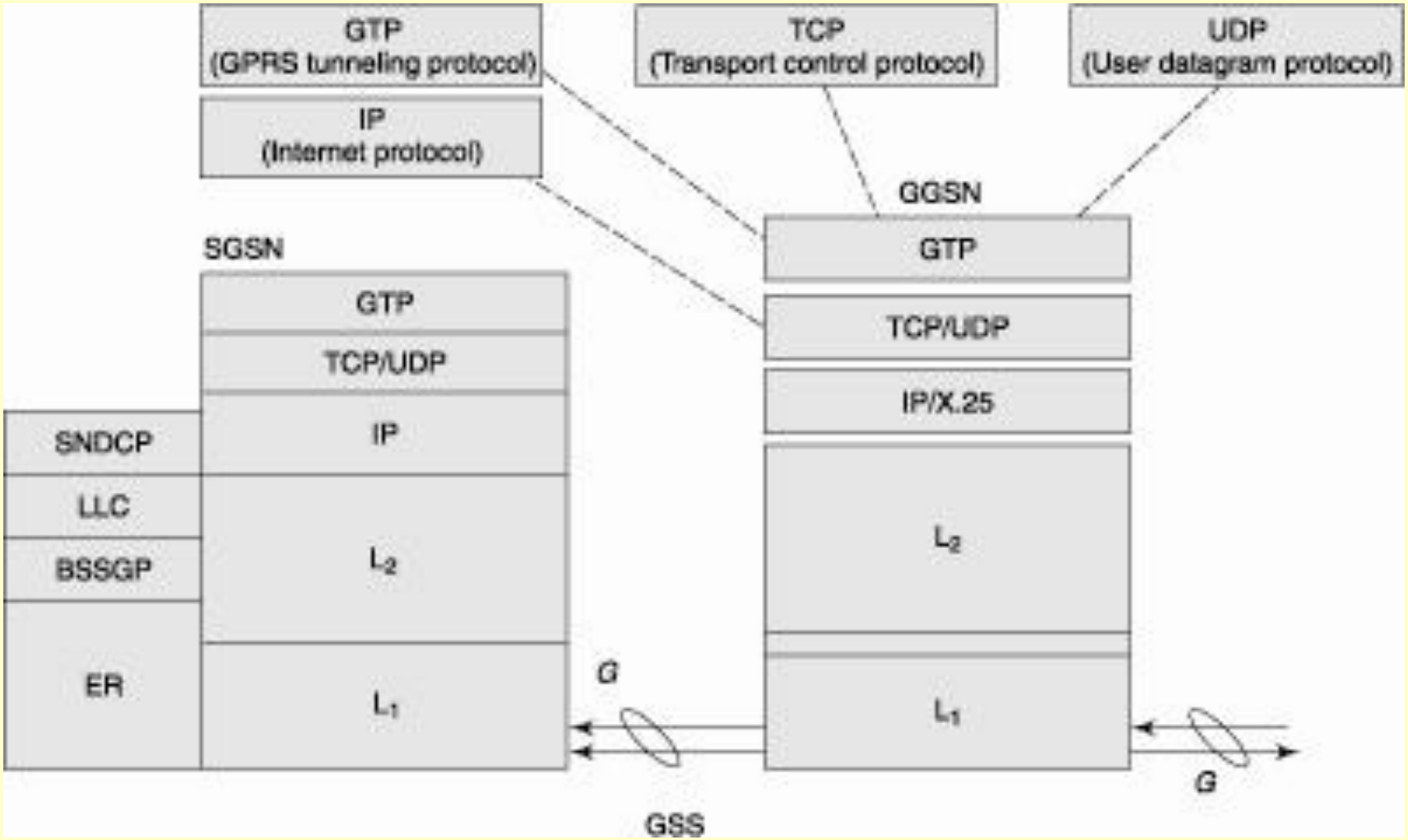
FR (Frame relay) Physical layer for data and network

- For transmission and reception of data and network information between the BSS
- and SGSN
- Also implements several functions for the data logical link
- Physical interface between BSS and SGSN employs a wired or fibre network

Protocol layers between the BSS and SGSN



Protocol layers between SGSN and GGSN



Data link layer protocol layers between SGSN and GGSN

- Layer 2 (L2) protocols of the Internet or other PDN (PSTN, ISDN, and PSPDN)

Network layer protocol layers between SGSN and GGSN

- IP layer 3 (L3) protocols of the Internet or other PDN

Two transport layer protocol layers at the SGSN

- TCP (or UDP) and GTP (GPRS tunnelling protocol)
- TCP for X.25 protocol at layer 3
- UDP for the IP protocol at layer 3

Tunnelling protocol

- Uses another protocol to transmit and receive the data and information
- The information for tunnelling protocol is hidden in other protocol data

GTP (Gateway Tunneling Protocol)

- Uses TCP and IP or UDP and IP
- The GTP facilitates flow of packets from multiple protocols
- GTP information of TID (Tunnel ID) helps in transmitting and assembling the packets for each session of the Mobile station

Summary

- GPRS– a speed enhanced data transmission service
- Packetizing of data
- Simultaneous transmission of packets over different channels
- RSS, NSS and GSS subsystems

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… Summary

- SGSNs– serving GPRS support nodes
- GGSNs – gateway GPRS support nodes
- Signalling Protocol layers

End of Lesson 11

GPRS