Exam 2011/2012 Part 2

Question 1

GSM makes use of a combination of TDMA and FDMA, which means that it assigns a time frame and a frequency to devices to transmit. It is therefore not a continuous transmission necessarily, hence the term burst.

There are however multiple types of bursts depending on the information to transmit.

A normal burst is the typical one to transmit data. Its structure is defined and expected by the receiving station. As the stations are already synchronized, there is a smaller need for access coding, and therefore more space for data.

Random access burst is smaller with a bigger guard time to ensure that it fits in the slot regardless of timing issues. Once the systems are aligned again, there is no need to use this burst type again.

In general, guard bands ou guards-times are used to reduce the risk of interference between transmissions. The more synchronized the systems are, the smaller the need for guard-intervals.

Question 2

The hidden node problems consists on a scenario where A and B see to common receiver but no each other. Therefore, with no regulations, their packets would collide with each other and non of the transmission would be successful.

One way to solve the problem is to use RTS/CTS packets. When a station wants to transmit, it sends a RTC packet to the receiver. The receiver then sends a CTS if it is ready. This CTS will be listened by both stations, including the one that did not request anything. Therefore, that station knows that another station in range is transmitting an therefore holds its transmission, avoiding collision.

Question 3

OLSR stands for Optimized Link State Routing Protocol and is a pro-active protocol, which means that despite routes being always available, it uses significant network resources to maintain a continuous network control traffic. This messages are HELLO messages, meant to signal neighbours of their presence. It makes use of MPR to minimize traffic in the network.

MPR (MultiPoint Relays) are special nodes used to limit the number of nodes transmitting packets and reduce the number of duplicated transmissions.

Each node selects its MPR which must be at 1 hop distance. They must me minimum and enable communication with every 2-hop-away nodes.

Question 4

GSM to GPRS

The main objective was to simplify the access to the Internet and improve the network efficiency, achieved by adding packet switching to GSM, where data is transferred as packets.

Two new network elements were added_

- SGSN, Serving GPRS Support Node, for authentication, switching, mobility and accounting.
- GGSN, Gateway GRPS Support Node, for IPv4/IPv6 internet routing.

GPRS to UMTS

The main objective was to provide a standard way for personal communications to support large quantities of users. Makes use of WCDMA, where all users share the same time and frequency domain.

Two new components where added:

- UTRAN, Provides and manages the air radio interface for entire network.
- Core Network, Provides all management and central processing of the System (new Network switching subsystem).

UMTS to HSPA

Routing Information Protocol

HSPA to LTE

Routing Information Protocol

Question 5

Mobility management is applied in mobile network topologies. In this scenarios, stations are always moving and my require to change their AP at some point. In general terms, there needs to be a transference from communication with the PAP to the NAP.

One way would be to stop communicating with the PAP when the connection stop being strong enough, and setup a connection on the PAP. This method would case severe disruption, as PAP as to setup the only upper hierarchy of communications and routing before being able to forwards the UE packets.

One method would be for the UE to communicate with the NAP and PAP at the same time. When the connection with the PAP was establish, a tunnel would redirect the traffic to the NAP, where all the connections are established while the PAP does the new configuration. Once the system is stable, the tunnel would be closed, and the PAP would start to forward by itself the UE packets.