**CS 6097 Wireless and Mobile Networking**

**Homework No. 7 dated Wednesday October 15, 2014**

**P10.15.** What is the operational difference between standard ACKs used in conventional TCP and SACKs used in wireless TCP? What improvement in performance does it provide for wireless networks?

[Solution]

Conventional TCP uses cumulative acknowledgements wherein an ACK for a particular segment can be used cumulatively to acknowledge all the preceding segments. In SACKs used in wireless TCP, the ACKs can be used to acknowledge segments selectively rather than cumulatively. The advantage of this is that if a particular segment in a transmission is corrupted, then the sender needs to retransmit only that particular segment, thereby saving precious bandwidth that would have been wasted due to the retransmissions of the succeeding segments that have been received correctly.

**P10.19.** How many iterations are needed to calculate the shortest path to all nodes from node 3? Determine the shortest distance to each node and the path used for each one of them.



Figure 10.8 Figure for Problem 10.19.

[Solution]

2 iterations are required to calculate shortest paths from node 3. The shortest paths from node 3 are:

|  |  |  |
| --- | --- | --- |
| Destination Node | Distance | Path using Nodes |
| 1 | 2 | 3-1 |
| 2 | 5 | 3-2 |
| 4 | 3 | 3-4 |
| 5 | 3 | 3-5 |
| 6 | 9 | 3-5-6 |
| 7 | 10 | 3-5-7 |

**P11.2.** How do you differentiate between different types of handoffs? Explain.

**[Solution]**

Handoff can be classified into two different types: hard handoff and soft handoff. Hard handoff is also known as break before make and is characterized by releasing current radio resources from the prior BS before acquiring resources from the next BS. Both FDMA and TDMA employ hard handoff. The feature of soft handoff is that two base stations are connected to the same mobile station during the handoff. Soft handoff can be used only in CDMA. In CDMA, the same channel is used in all the cells, if the code is not orthogonal to other codes being used in the next BS, the code could be changed. It is possible for an MS to communicate simultaneously with the prior BS as well as the new BS for some short duration of time, during the process of handoff.

**P11.7.** How do you compare AMPS and GSM systems in terms of coverage area, transmitting power, and error control? Explain.

**[Solution]**

AMPS, the advanced mobile phone service, refers to the analog cellular system that is widely available today, operating at 800 MHz in North America (824 MHz - 849 MHz) for reverse link and 869 MHz - 894 MHz for forward link . This analog cellular system has been in place since 1983. AMPS has poor performance for data transfer. The transition to digital began with the formation of Groupe Speciale Mobile or GSM. Today, GSM stands for .global system for mobile communications.. GSM was created in 1982 and the .rst commercial GSM systems went into operation in 1991. GSM standards are based on the TDMA digital technology, versus AMPS which uses analog systems. PCS refers collectively to three new digital cellular services (GSM, TDMA, and CDMA) now operating in North America at 1900 MHz.

* TDMA (Time Division Multiple Access), also known as IS-136 or D- AMPS, is used by North American carriers such as AT&T Wireless, BellSouth, and Southwestern Bell to offer PCS services.
* CDMA (Code Division Multiple Access), also known as IS-95, is used by North American carriers such as AirTouch, BellAtlantic/NYNEX, GTE, Primeco, and Sprint PCS to offer PCS services.
* GSM, previously known as PCS 1900 or DCS 1900, originated in Europe but has since become an international standard and is deployed in North America today. GSM uses TDMA in its systems.

Sources: <http://www.handytel.com/technology/gsm05.html>

**P11.10.** A cellular system employs the CDMA scheme. Is it possible to use a composite TDMA/CDMA scheme? If not, why not; and if yes, what may be the potential advantages? Explain clearly.

**[Solution]**

Yes, a TDMA scheme can replace a CDMA scheme if the appropriate modifications are considered. The potential advantages would be that we would have less complexity involved in the system. Smaller bandwidth allocation is needed and power control is not a problem as the near-far problem is greatly minimized. However, the number of users in a TDMA system is lower than in a CDMA.