CHAPTER

4

CONCEPT OF HANDOFF LATENCY

4.1. Estimation of Latency by Co-Ordinate Evaluation Method

We reduce handover latency by reducing the number of APs scanned by the MN during the handover process. We utilize Global Positioning System (GPS) to implement our mechanism. The selection of the most potential AP by the MN effectively reduces the scanning delay, as the number of channels scanned will be lower. We assume hexagonal coverage area of an AP with the AP situated at the center. We consider a mechanism that is started after a certain period of initialization. The GPS response time as been discussed is low as 10 ns with an error of at the most 30 cm. The distance between two APs in urban area is of the range 200 m to 500m. So the initialization phase must be as low as possible. We set the initialization phase to be a maximum of 60 ms. At every 5 ms it records the distance travelled by the MN and adds it with the distance traveled in the previous 5 ms period. So there will be a summation of 12 distances. It can be considered that we can get the distance roughly by this method with an error of approximate 30 cm owing to the use of GPS server. The most important parameter is the average speed of the MN, denoted by the symbol 's_{avg}'. It can hence be determined by the sum of the distances calculated in period of 5ms divided by the total time of evaluation i.e. 60 ms. If Δx_i is the distance traveled in the i^{th} instance then the speed s_{avg} is given by:

$$s_{avg} = (\sum \Delta x_i)/ 60$$

Where 'I' ranges from 1 to 12. This is the initial speed which is required for the further evaluation of other parameters. Note that this average speed changes from time to time as the s_{avg} is calculated in a similar way after the initialization phase. So s_{avg} is a variable quantity. Now, this has an error of approximately 0.5 meters per second to the maximum, because of the distance error of the GPS method. This is very nominal for fast moving vehicles.

Let the approximate maximum handoff delay in the scanning, authentication and re-association phase of a single AP be t_{delay} ms as per the latest proposed algorithm. The potential AP searches can be made up to a certain distance after which the MN performs the handover process. The distance 'd' which is required for the rest of handover procedure. $d = t_{delay} * s_{avg}$. In paper 'G' we have discussed the detail procedure of latency estimation by using co-ordinate evaluation method. Here 'd' is a variable parameter.

4.2. WLANs Based Neighbor Graph Information

By pre-scanning method to reduce the scanning time as this delay contributes 90% of the total handoff delay [6]. 1, 6 and 11th channel are non overlapping and in a well configured wireless network all or most of the APs will operate on these three channels. Selective scanning algorithm is based on this idea. We use selective scanning (a well selected subset of channels will be scanned) with the help of Neighbor Graph to find the best APs in the old AP's neighborhood region when the STA moves out of its old AP. In paper 'H' we have use pre-scanning method to reduce handoff delay.

4.3 Handoff Latency Calculation by Distance Measurement Method

Due to fading of signal strength (fast fading due to scattering from interfering objects & slow fading due to long term spatial and variations, inversely proportional to the square of the distance) we consider that each base station services a circular area (depending on the height of the antenna and power of its signal) beyond which signal strength becomes lower than usable levels. In an idealized model we approximate the overlapping circular cell areas by hexagonal cells that cover the entire service region through frequency reuse concept where every cell marked similarly can use the same frequencies.

The signal strength being primarily a function of distance, and the geometry of the coverage area being known, we can think of some new criteria for the selection of the most suitable AP in terms of best signal strength. In most cases, the best AP is the one which is nearest to the STA and since from the geometry of the situation we already know the distances to the neighboring. Also refer to [23] for more on nearest APs having better signal strengths due to their advantage in competing for the wireless channel. Thus we can use a new algorithm to connect to the nearest AP and save scanning time. In paper 'I' we derived how distance can be measured and using this theory we calculate the handoff latency.

4.4 Handoff latency Calculation by Cell Sectoring Method

We reduce the handover latency by reducing the number of APs scanned by the MS during the handover process. We utilize Global Positioning System (GPS) to implement our mechanism. The selection of the most potential AP by the MN effectively reduces the scanning delay, as the number of channels scanned will be lower. The entire hexagonal cell is divided into 3 sectors with each sector having an angle of 120^0 as shown in the Fig 4.1. The sectors are numbered serially from 1 to 3 and the angles of each sector being an arithmetic progression with first term and common difference being 120^0. Now by using GPS or sensor networks or any other localization techniques we can find out the position of the MS i.e. in which sector it is presently operating.

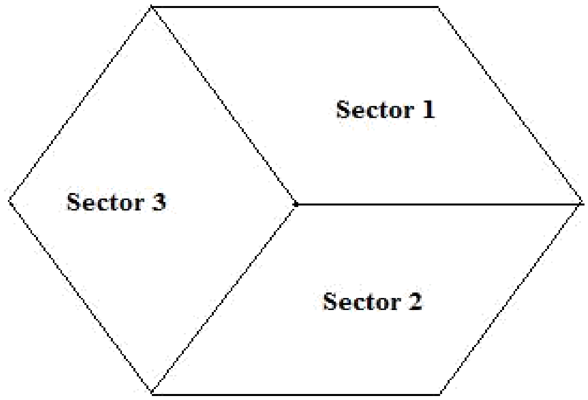

Fig 4.1: Cell sectors

Table 4.1- Sectors of cell

Number of Sectors	**Angular division**
Sector 1	$0^0 \leq \alpha < 120^0$
Sector 2	$120^0 \leq \alpha < 240^0$
Sector 3	$240^0 \leq \alpha < 360^0$

{Where α is the angle measured from +ve X axis}

Here we are going to measure the distance from MS to new AP where the handoff process will be performed. For sectoring process we will have to scan only two AP. As in one sector there are only two AP. In paper 'J' we have discussed the theory of calculating handoff latency using cell sectoring method.