CHAPTER

2

HANDOFF FAILURE PROBABILITY

We have considered the shape of the cell is to be a regular hexagon. We have seen two cells overlapping in such a manner that the common cord between two adjacent circular cells also becomes the common side of the regular hexagons, when the cells are considered to be hexagons. However, two cells may overlap in such a way that there is some overlapping hexagonal portion between them. Two sides of the common chord of the two adjoining cells, one served by the Old Base Station (OBS) and the other by the New Base Station (NBS). When a Mobile Terminal (MT) crosses the common chord, then it will be under the New Base Station (NBS). This is because RSS of NBS is greater than RSS of OBS. Once the MT reaches the boundary of the circular cell (real) then the MT discovers that it may enter into the coverage area. Here, we have considered some hexagonal portion to be overlapping. MT is moving from its current serving BS (old BS), to the future serving BS (new BS). From which the probability of false handoff is calculated.

2.1. Handoff Management for Next Generation

Handoff management protocol will support seamless handoff in Next Generation Wireless Systems. We consider the mobile node's speed, Relative Signal Strength of the base station, handoff signaling delay information and threshold distance from cell boundary to reduce false handoff initiation probability which creates unnecessary traffic load and sometimes call blocking.

We consider the coverage area of the base stations (BS) as regular hexagonal cells. We take two base stations into our account to explain our proposed approach, one is Old Base Station (OBS) where the call generates and other is New Base Station (NBS), next destination of the MN. When the MN tends to move out the coverage area of OBS it needs hand off with NBS to continue the call. Handoff scenario between OBS and NBS describes the following parameters.

S_{th}= The threshold value of the RSS to initiate the handoff process. When the RSS of old BS (OBS) referred to as ORSS drops below S_{th} the MN starts the Hierarchical Mobile IP (HMIP) registration procedures for handoff to new BS (NBS).

S_{min}= The minimum value of RSS required for successful communication between the MN and OBS.

a = The cell size.

d = The threshold distance from cell (OBS) boundary, where the MN starts HMIP registration.

We divide our proposed work in paper 'A' into four sections:

1. Speed Estimation.
2. Measurement of threshold distance *d* from the cell (OBS) boundary.

3. RSS and S_{th} Measurement.
4. Handoff Management.

2.2. Received Signal Strength (RSS) Measurement of WLAN

We propose in paper _B' to reduce the handoff failure probability by placing a WLAN router in effective handoff region. A high traffic density increases the probability of handoff failure. Thus by integrating a WLAN with cellular networks, the traffic density of the cellular network (CN) is partially reduced, thereby minimizing the handoff failure probability to a great extent.

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 being out of range from each others' signal strength. Now let us consider two adjacent hexagonal cells. We define threshold signal strength of a cell as the signal strength after which the handoff is initiated. We place a WLAN router between the threshold signals of either cell i.e. with the router being at the midpoint of the line of the two AP's.

IEEE 802.11b WLAN provides a bit rate of 11 Mbit/s and operates on 11 out of 14 distinct frequency channels

When mobile station is under WLAN network coverage in the handoff region between the two cells the mobile station user can enjoy seamless connectivity.

When the mobile station is to move into a particular base station, it starts the scanning process for the channels in the new base station, being under the coverage area of WLAN. The channel scanning process mostly contributes to handoff latency. Here, we minimize the handoff latency by reducing the number of base stations to be scanned. Hence the number of channels to be scanned obviously becomes very low.

This scanning process occurs under the network coverage of WLAN. Hence, there is minimum handoff failure probability, which occurs mainly due to scanning delay during a handoff process. It is detailed discussed in paper 'B'.

2.3. Mother Cell Child Cell Concept

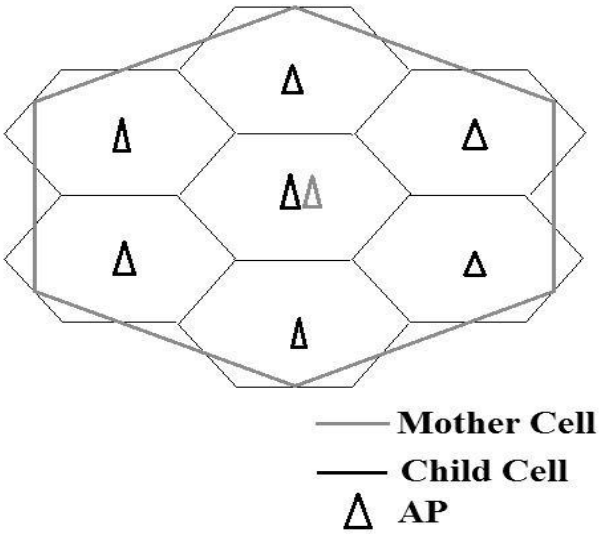

Fig 2.1: Mother Cell and Child Cell

Here we consider a larger hexagonal cell which covers up almost whole area of a seven cell cluster, having the AP at the center of the seven cell cluster, as shown in figure above. Each cell of the seven cell cluster is considered as the Child Cells and the larger cell is considered as the Mother Cell. The AP of the Mother Cell will have higher signal range than that of the Child Cells as it covers up larger area than the Child Cells. At the center of the seven cell cluster we consider two different AP side by side. One is for the Child Cell and another is for the Mother Cell with higher signal range. We know that the signal range of an

AP depends upon the battery power of the base station. Thus we can easily increase or decrease the signal range by changing the battery power. We can spread this Mother Cell Child Cell distribution throughout the whole communication region.

The AP of the Mother Cell will perform only the handoff job where as the APs of the Child Cells will perform both the handoff and the originating calls. This can be explained clearly by considering following three conditions.

1. When the MS is originating a call within a Child Cell the AP of that Child Cell will perform that job. Whereas the AP of the Mother Cell will not be involved in this.
2. When the MS is moving away from a Child Cell to another Child Cell, being in the same Mother Cell, the APs of those Child Cells will perform this handover job. Whereas the AP of the Mother Cell will not be involved in this as these calls are local calls for the Mother Cell. We will call this handoff as Local Handoff.
3. When the MS is moving away from a Mother Cell to another Mother Cell the handoff job will be performed by Mother Cell AP where as the AP of the Child Cell will not be involved in this.

The channel allocation of Mother Cell and Child Cell will be different due to their different working principle. All the channels of Mother Cell will perform only handoff job whereas the channels of Child Cell will be allocated in such a way that it will able to perform both the handoff and originating calls. In paper 'C' concept of Mother Cell Child Cell described.