

Minimize the Cost in Mobile Communication by the Help of Circular Check Manager Method.

Debabrata Sarddar, Pinaki Das, Rajat Pandit

Abstract: The mobile nodes are always moveable inside a cell or from one cell to another cell or from one sub cell to another sub cell. This mobility management are based on cell channel, radio frequency, handover, channel allocation and binding updates. The multiple mobile node are connected in a cell or sub cell, the costing for the mobile node are being change due to the number of mobile node and distance from cell tower or sub cell tower. The cells are divided in to multiple sub cells for enhancing the service. In busy hours the main cell and sub cell both are working but in idle time only the main cell are activated for give the service. In check manager method the time are dynamic for active phrase or idle phrase. In active phrase the main cell and sub cell both gives the service and idle phrase only the main cell gives the services because that time the no of node are minimum. The circular check manager method the in active phrase, if the main cell are free then the sub cell are send the authentication to the main cell for allocate the new channel and established the connection.

Index Terms: Channel Allocation, Check Manager, Handover, Radio Frequency.

I. INTRODUCTION

The mobile node are moved from one cell to another cell in active phrase and not moved in idle phrase. In active phrase the cell are mostly busy mobile node are frequently change the cell or sub cell [1]. The maximum cost of the cell used in active phrase. The costs are increase due to the channel allocation, binding cost, handover, authentication checking, and frequency resources.

The MN changes a cell or sub cell then make the handover or handoff. Nearest two BTS/ BS send the radio frequency to the MN then MN check the power level of two frequencies. If power level of new BTS/ BS is cross the Ping Pong point then MN send a request to new BTS/ BS for allocate the new channel for make the handover. Then new BTS check all the necessary condition to make the handover.

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If all the condition is satisfy then make the handover and MN are connected to new BTS/ BS [2][3].

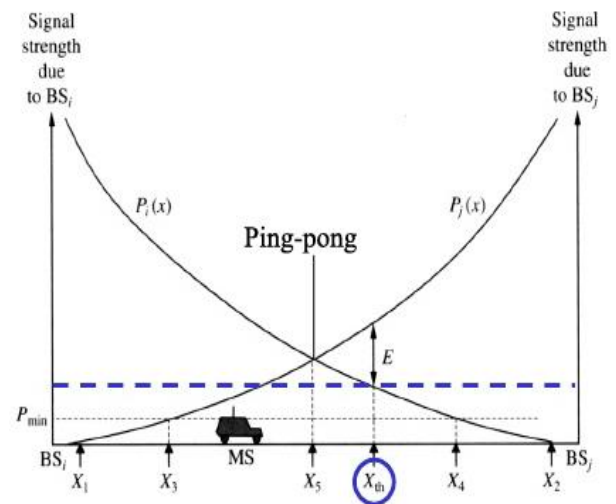


Fig: Ping-Pong point.

The hand off or handover are 4types.

A. Intra-cell handover: This hand over used to optimize the load of BTS or balancing the load of cell. In this hand over the MN are moved inside a cell, only change the carrying frequency [4].

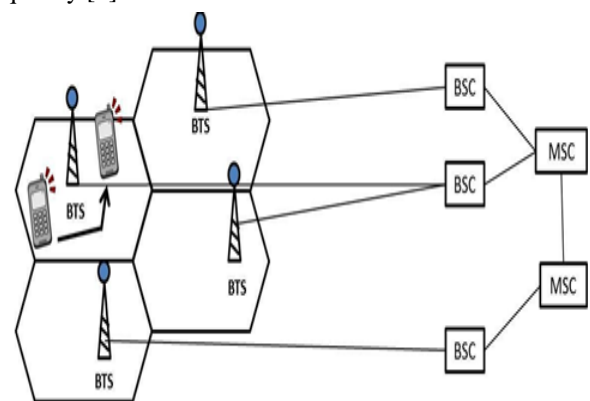


Fig: Intra – BTS Handover.

B. Intra – BSC Handover: This handover perform one BTS to another BTS on a single BSC. If a MN are moved from one BTS to another BTS, the MN request new BTS to allocate the channel for new connection and those BTSs are belonging to a single BSC then make this handover[5].

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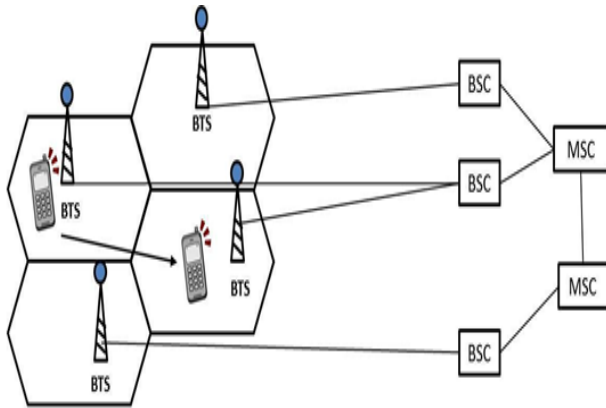


Fig: Intra – BSC Handover.

C. Inter – BSC Handover: This type of handover is occurred when a MN is moved from one BTS to another BTS but those BTS are not in same BSC [6].

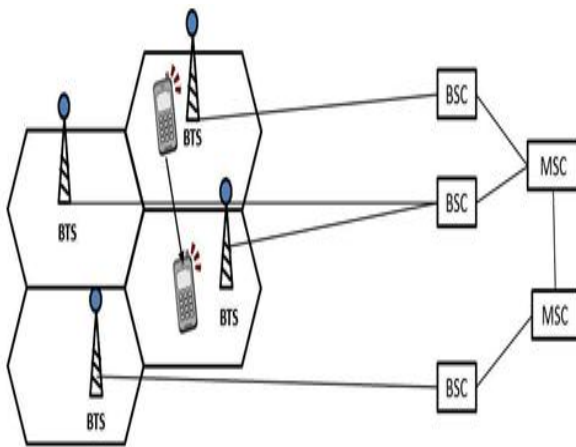


Fig: Inter – BSC Handover

D. Inter – MSC Handover: A mobile node is moved from one BTS to another BTS but that BTS are belongs to separate BSC and that BSC are belonging in separate MSC. This is the Inter MSC handover.

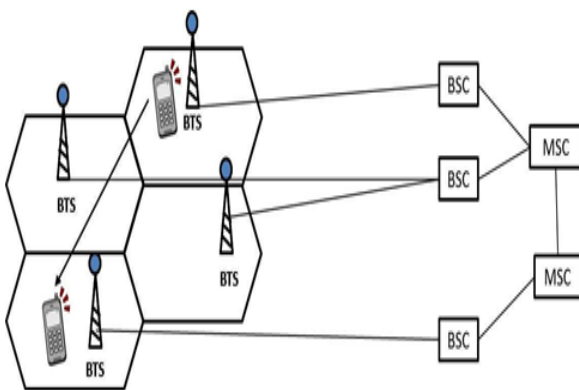


Fig: Inter – MSC Hand over

The basis of UMTS handover is two types.

A. Hard handoff: This handover is make basis of signal strength of new BTS. The new link is established after break down the old link [7].

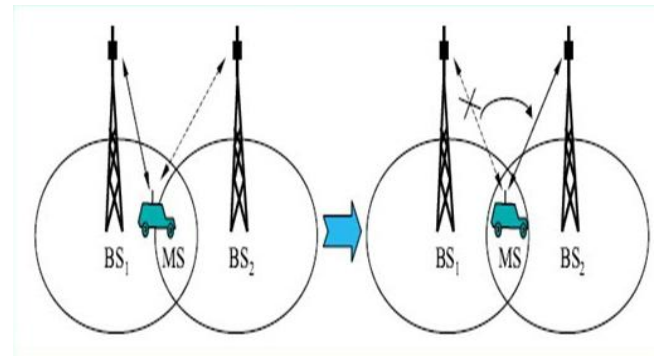


Fig: Hard handoff

B. Soft Handoff: This type of handoff basically make on the basis of make before break. The MN are move to the overlapped region and received the signal of new BTS then the MN send the request packet to allocate a free channel for the connection and update the binding information[8][9].

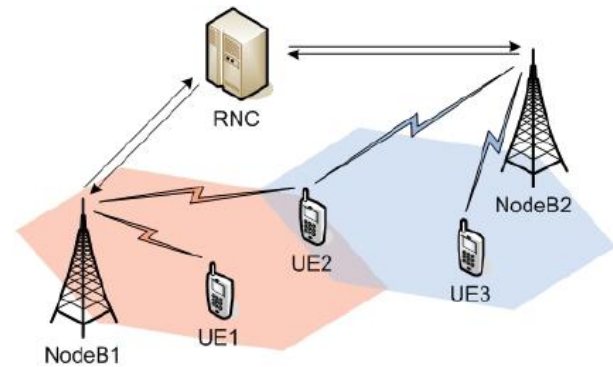


Fig: Soft Handoff

Cause of Hand off: the cause of hand off is shown below.

A. Level Triggered Handover: For the handover the receiving signal strength is used for the trigger. If the nearest or adjacent cell signal value is higher than the own cell signal (near about 3 to 6 dB) then the hand over occur.

B. Intra-cell Handover: when the assigned time or frequencies are interfered then handover is making on a new channel. This handover is not done due to the poor quality of received signal.

C. Distance triggered Handover: when a MN is goes far from the BTS and goes to the end of the coverage area of the cell.

D. Maintenance Handover: this is the special type of hand off. When a BTS is maintained then the connection of that BTS is shifted or handover to the nearest cell or BTS.

II. RELATED WORK

A. Mobility Management in Mobile Network: The mobility of the MN is depending on the following points [10].

1) Binding Update: This is depending on the Reachability Identity and Routing Identity.

2) Reachability Identity: The identical name or identity of the mobile node which has not been changes on the network.

3) Routing Identity: when a MN is moved inside a single cell or from one cell to another cell then the routing identity always update his binding. The location identity is assigning a new



route to update the binding [11].

B. Time Base Mobility Management: The Time base mobility management is completely depending on the time. All the MN has a particular mobility pattern [12]. Sometimes this MN is change the cell very quickly and some time is not change the cell for long time. According to this activity the total 24 hours in a day is divided in two parts that's active phrase and idle phrase.

In TBMM method the mobility management are depending on the time. If a MN are sending a request to the BTS for create a new connection then BTS check the time that the time is in active phrase or idle phrase [1].

In active phrase the MN are move or change the cell very quickly. In idle phrase the MN are not change the cell or very slow changes.

If the time is active phrase then BTS send this request to the corresponding sub cell for allocation the new channel. If the time is idle phrase then the BTS own gives the channel for creating or established the connection. In active phrase use the precise location manages system to discover the MN. In idle phrase, loose location management is used for discover the MN [13].

C. Check Manager Method: The check manager method is based on the TBMM but the timing area is not fixed. The timing are constructed through maintain the small database which is contained the IMEI no and time of connection [14]. The check manager method the active phrase time and idle phrase time is changes according to the busyness of the cell. In active phrase the MN are connected in the corresponding sub cell but in idle phrase the main cell gives the total services no need to sub cell.

III. PROPOSED WORK

In previous paper [14] create a Check Manager using of DTBMM. In previous work the check manager only check the channel in one time to introduce the MN. The populations of MN are not same in every day or every time. So the checking is not introduced in one time. This paper is based on the following points. According to other paper the particular MN are move in a particular pattern [12] [1] in a time from one sub cell to another sub cell or one cell to another cell. In a day some time the BTS/ BS are most active and sometime are idle. In previous work the time are divided in two parts that are **Active phrase:** in this time maximum mobile are making the call or change the cell or sub cell. So this time it cell or sub cell are most busy and the cost of this time is maximum. **Ideal Phrase:** this phase actually belonging in lazy time or idle time when the many or maximum MN are in idle, they does not change the cell or sub cell or does not create any call. The cost of the cell is very low for that time. **Circular Check Manager Design:** The circular check manager is based on Data Base formation, Dynamic time area construction, movement detection, and registration and connection setup.

1) Data Base formation: the small data base is maintained in the BTS/ BS for string the data of MN and time of call and handoff. The data base is consisting of the following entities.

- a) The database update for every MN when make the call or disconnected the call or make the hand over.
- b) Every day in a certain time the BTS/ BS calculate the total connected MN number, calling time and handover

in respected time and cell or sub cell for seven cell cluster.

c) The entries database is stored in Billboard manager (BM) [15] or location directory.

2) Dynamic time area construction: In check manger (CM) method the timing area are divided in two parts in respect of the busyness of BTS/ BS. In active time the services are making through the sub cell for enhancing the service area. The idle time the BTS/ BS are not so busy so we can transfer the active call in main cell.

In active time a process always check the main cell channel idleness if the main cell channel is idle the call are transfer to the main cell from sub cell.

3) Movement detection: the nature of the movement of MN is completely arbitrary. In a day in fixed time the MN are moving the cell very fast and some time they are not moved. Depending of this movement this is two types.

a) **Active Part [1]:** in this part the MN are frequently change the cell or sub cell. For that case every time they make the registration and setup the connection, using binding updates.

b) **Idle Part [1]:** this part the MN is in under the main cell. The activity of MN in this part is very low.

4) Finding the connection probability: According to the MN movement the main cell always supports the maximum MN. When a MN wants to connect, the circular check manager is checking the main cell channel allocation probability (P1), if channel is free then connect to main cell. If the MN is already connected in any sub cell then sub cell check the main cell allocation probability (P2). If the channel is free then connection is switched to main cell.

5) Registration: a MN, when change the cell or sub cell the registration are very essential. In idle time registration are minimum and active time the registration are maximum.

6) Connection set up: in the proposed circular method the connection are set up in the basis of dynamic timing area. When a MN are in moving or change the cell or sub cell the connection set up very vital for continuous connection.

B. Circular Check Manager Algorithm: A mobile MN need to create the new connection or make the hand over the circular check manager check the availability of channel in main cell or sub cell. If some channel of main cell is free then main cell nearest MN which is connected to sub cell, are transfer to the main cell and make the continuous connection.

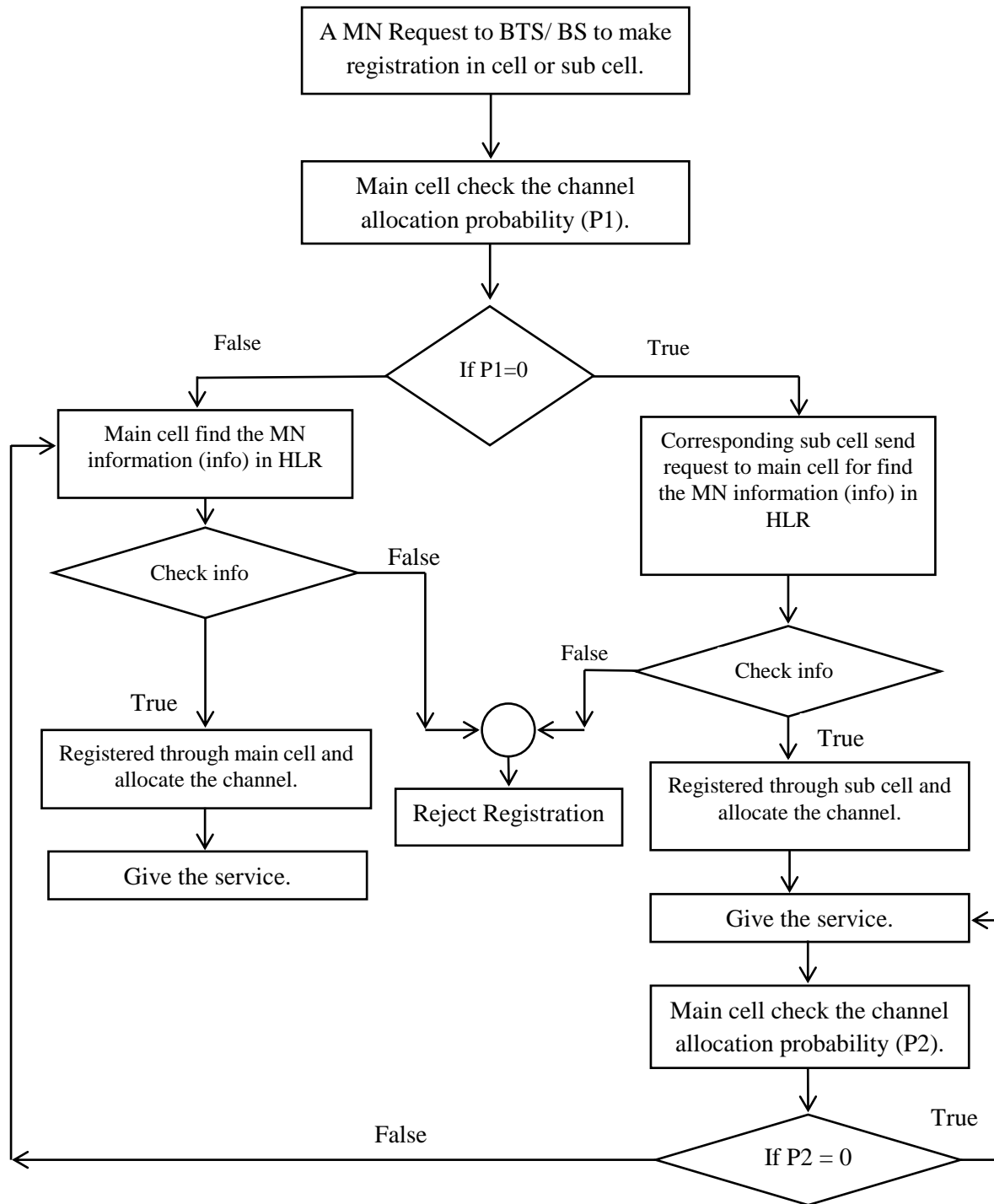


Fig: Circular Check Manager Flow Chart

1) **Step 1:** a MN generates a new call in any cell or sub cell or make the hand over from cell to cell or sub cell to sub cell then MN send a signal to nearest BTS/ BS, then BTS/ BS check the probability value of channel of main cell.
 2) **Step 2:** if main cell channel are completely allocated then main cell send the request to the nearest sub cell. That means if the probability value is 0 then request goes to nearest sub cell. If the probability value is greater than 0 means main cell channel are free for allocation.

3) **Step 3:** when request are goes to main cell or sub cell then find the total information about the MN from HLR through BTS, BSC, MSC.
 4) **Step 4:** if the total information are correct then MN identity are store in VLR and allocate the channel from cell or sub cell.
 5) **Step 5:** if channel if the MN are take the service from main cell then the service are continue, if MN takes service from sub cell then a process always check the probability value of main cell.

6) **Step 6:** then check this probability value if the value is greater than 0 then connections are switched from sub cell to cell. If this value is 1 then continue the service from sub cell.

C. Advantages:

The circular check manager method has some advantages. That does describe below.

- 1) In another work [14] the time are divided in two phrases that are active phrase and idle phrase but in this method there has no boundary of time.
- 2) In that method the main cell always completely busy for serving the service of MN. Each and every time the entire channels are busy of main cell.
- 3) If the MN is connected in sub cell and main cell is free then the MN is transfer to main cell, so we reduce the use of sub cell.
- 4) If the least number of MN is connected then main cell are serve the maximum serves, if the servicing capacity is over for main cell then sub cell are active to give the service otherwise they can go the sleep mode.
- 5) In that method the total cost are reduce in active phrase or idle phrase.

D. Cost analysis:

Check manager are calculate the cost for MN.

1) **Mobile IP:** the cost for hand over and binding for MIP. The cost is denoted by $C_{MIP}(t)$.

$$C_{MIP} = M \cdot H_{MNLD} \cdot R_{HO}(t) \text{ -----(1)}$$

2) **Time Base Mobility Management:** In TBMM method the cost are divided in two parts depending on the time, that are cost for active time (C_{active}) and idle time (C_{idle}) and the total cost is C_{total}

The times are denoted by h for active phrase and $(24-h)$ is idle phrase.

$$C_{total} = \{C_{active} \cdot h + C_{idle} \cdot (24-h)\} / 24 \text{ -----(2)}$$

Cost for active phrase

$$C_{active} = M \cdot H_{MNLD} \cdot R_{HO}(t) \text{ -----(3)}$$

Cost for idle phrase

$$C_{idle} = M \cdot H_{MNLD} \cdot R_{TM}(t) + M \cdot H_{ARAR} \cdot R_{HO}(t) \cdot \alpha \text{ -----(4)}$$

The binding update rate is R_{TM}

$$R_{TM}(t) = C \cdot V_{node} \cdot L_{cell} \cdot \int_{V_{node}(t-\Delta t)}^{V_{satt}} D_n(V_{sat,t}) dt \text{ ----(5)}$$

V_{node} = Velocity of node.

L_{cell} = Cell boundary length

3) **Circular Check Manager Method:** That method the cost is basis of the channel freeness and depending on two probabilities.

Cost for active phrase C_{active}

$$C_{active} = \sum_{0.8}^{1.0} [M \cdot H_{MNLD} \cdot R_{HO}(t) \cdot h - \{ \sum_{0.0}^{0.8} [M \cdot H_{MNLD} \cdot R_{TM}(t) + M \cdot H_{ARAR} \cdot R_{HO}(t) \cdot \alpha] \} \cdot (24-h)] \text{ -----(6)}$$

Cost for idle phrase C_{idle}

$$C_{idle} = \sum_{0.0}^{0.8} M \cdot H_{MNLD} \cdot R_{HO}(t) \cdot h \text{ -----(7)}$$

Total cost is C_{total}

$$C_{total} = C_{active} + C_{idle}$$

$$C_{total} = \sum_{0.8}^{1.0} [M \cdot H_{MNLD} \cdot R_{HO}(t) \cdot h + \{ \sum_{0.0}^{1.0} [M \cdot H_{MNLD} \cdot R_{TM}(t) + M \cdot H_{ARAR} \cdot R_{HO}(t) \cdot \alpha] - \sum_{0.0}^{0.8} [M \cdot H_{MNLD} \cdot R_{TM}(t) + M \cdot H_{ARAR} \cdot R_{HO}(t) \cdot \alpha] \} \cdot (24-h)] + \sum_{0.0}^{0.8} M \cdot H_{MNLD} \cdot R_{HO}(t) \cdot h$$

IV. SIMULATION RESULT

The circular check manger method is reducing the cost of handover and new connection. The simulation is done by the MATLAB 2018 software.

Table1: Various Parameter and Values

Sl No	Parameters	Values
1	Velocity of Node(V_{node})	60Km/Hour
2	Cell boundary length(L_{cell})	7Km
3	M	10
4	H_{MNLD}	2
5	H_{ARAR}	1
6	α	15%
7	Δt	1sec
8	Probability($p1$)	$0 >= 0.8$ ($C_{main cell}$),
9	Probability($p2$)	$0.8 > 1.0$ ($C_{Sub cell}$)
10	Number of Node	10^6
11	Total Time	24 Hours

The density of mobile node is calculated by the ratio of total mobile node and active mobile node. According to the time phrase the cost are divided into two phrase active time cost for active phrase and idle time cost for idle phrase.

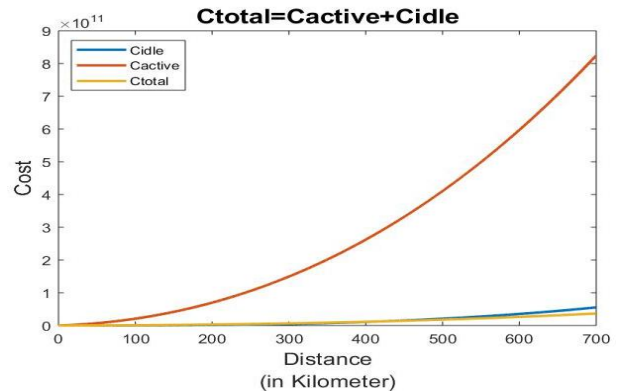


Fig: Cost Management vs. Distance

This graph shows that the total cost of cell in idle phrase and active phrase, which is depending on the distance. If we increase the distance, simultaneously increase the cost.

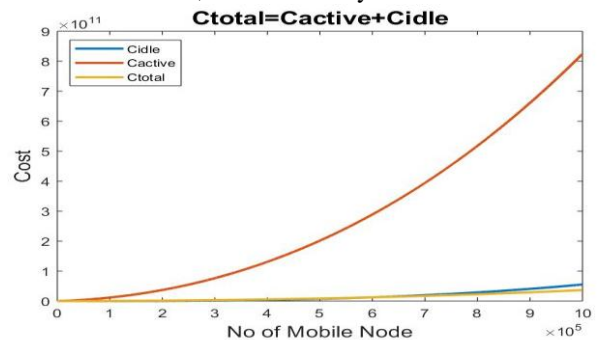


Fig: Cost Management vs. No of Mobile Node

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This graph shows that the total cost of cell in idle phrase and active phrase, which is depending on the distance. If we increase the no of mobile node, simultaneously increase the cost.

V. CONCLUSION

The proposed of Circular Check Manager method are reduce the cost of handover or hand off or create a new connection. In this method use the various types of hand off and the cost is the various. In active phrase the cost is higher and the idle phrase the cost is lower. In circular check manager method the simulation result shows the total cost. This is the based on the Check manager method. In check manager method, the active and idle time is not fixed, both are variable and that depends on the probable value of busy of main cell. So we can use it in our cell to reduce the cost in future.

VI. FUTURE WORK

In future work try to reduce the cost of hand off or making the new connection to remove the active phrase and idle phrase.

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