

HANDOFF IN CELLULAR SYSTEM

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Abstract— Technology is moving very fast with time .Mobile is very important part of our life .we can enjoy mobile communication when continuous service is achieved and it is possible by smooth and successful handoff. With increasing traffic and energy demand, it is necessary to achieve efficient network .We need to maintain high quality of service and optimize energy at high traffic and at low cost so that common people can use it. Now a day's fuzzy logic algorithm is used at different stage of cellular system, provide stability to the system and handle imprecise data.

Keywords: Cellular System, energy demand ,etc.

I. INTRODUCTION

Handoff is process of transfer mobile station (MS) from one base station to another. The channel change in handoff may be through frequency band, codeword and timeslot or combination of these TDM, FDM, CDMA or hybrid scheme respectively. Coverage area in a cellular mobile network is divided in small cells in order to achieve high system capacity .Every cell has a base station that provides series to the mobile terminals i.e. phones of users of that regions .Before making connection with other user in the network, channels or frequency band are assigned the mobile terminal (MT) are free to move across the cell .When user move from one cell to another signal quality of current channel is degraded and handoff is initiated.

Handoff depend on many factors –

- 1- Network involved
- 2- Number of active connection
- 3- Types of network
- 4- Types of traffic network supports

II. TYPES OF HANDOFF: DIFFERENT TYPES OF HANDOFF ARE

HARD HANDOFF: It is called 'break before make'. When mobile is between base stations then mobile can switch with any of base station .Mobile make link with base stations back and forth this is called ping ponging. In this first the connection is broken than handoff process take place so chances of failure to link the base station is more.

SOFT HANDOFF: In this case the connection to the target is established before the connection to the source is broken hence this handoff is called 'make before break' .In this connection remain in the source cell and also new connection with target cell is established, both the connection run parallel to each other. In soft handoff more than two cells can be connected at a time with one phone. It is very advantageous and when such combination is made in downlink (forward

link) and uplink (reverse link) the handover is termed as softer. When cell has single cell site than only softer handover is possible.

A. CAMPARISION OF HARD AND SOFT HANDOFF

- 1-At one time one call uses only one channel.
- 2- Its uses TDMA and FDMA techniques.
- 3- Handoff duration is short so not easily perceptible to the user.
- 4-It is perceived of network engineer during the call.
- 5-It is simple and cheap.
- 6-Data overhead is minimized as data do not have to be duplicated.
- 7-Some time call may be terminated temporarily.
- 8-Used by WLAN, GSM, GPRS, LTE, and WiMAX.

SOFT HANDOFF

- 1-To support a single call several channels are used in network.
- 2-CDMA technique is used.
- 3- Perceived as a state of call by network engineer.
- 4-Reliability of the connection is high.
- 5-It is complex.
- 6-Chances of failure is less.
- 7- Used by UMTS, WiMAX.

Handoff can also be distinguished on the basis of whether handoff occurs between single type of network interface or variety of different network interface.

HORIZONTAL HANDOFF: It is of two types intracellular and intercellular.

INTRACELL HANDOFF: It is a type of soft handoff .It occurs when a user is moving within a cell for changing channels in order to minimize interchannel interference under the same BS

INTERCELL HANDOFF: It is a type of hard handoff. It occurs when a mobile terminal moves to adjacent cell and connection is transferred to one base station to another BS.

VERTICAL HANDOFF: It is process of changing active connection of mobile between different wireless technologies

DOWNWARD VERTICAL HANDOFF: Mobile user handoff to network which has higher bandwidth and limited coverage. It is a type of soft handoff.

UPWARD VERTICAL HANDOFF: Mobile user transfers its connection to the network with lower bandwidth and wider coverage. It is type of hard handoff.

III. STEPS OF HANDOVER PROCESS:

MEASUREMENT: Before the connection is made many parameters are considered or keep in mind Received signal strength (RSS), Signal to interference ratio (SIR), distance measure, Bit error rate (BER). These parameters are checked both side the BS and MT.

INITIATION: It is decided whether handoff is needed or not if so initiates it.

DECISION: Selection of new channel based on resource availability and network load. Different kinds of handoff decision protocols.

1-MOBILE CONTROLLED HANDOFF

(MCHO) : In MCHO the MT continuously

Monitors the signals of the surrounding BS and search lowest interference BS and request to that BS is done by the channel

- 1-Handoff should be fast.
- 2-Total number of handoff should be minimal.
- 3-QoS should be less affect with handoff.

MCHO has short reaction time. MCHO is used in DECT (digital enhanced cordless telecommunication) standard.

2-NETWORK CONTROLLED HANDOFF (NCHO): Signal of MT is measured by surrounding BS .RSS measurement and handoff decision is measured by network .Overall hand off decision is handled by mobile telephone switching office (MTSO). Network controlled handoff is used by first generation analog system such as AMPS (Advanced mobile phone services), TACS (Total access communication system) and NMT (Nordic mobile telephony).

IV. MOBILE ASSISTED HANDOFF (MAHO):

Network request the MT to measure the signal from surrounding BS. Based on the report of MT network made handoff decision .It is used in second generation like GSM and in CDMA one or IS -95 CDMA.

A. HANDOFF REQUIREMENT:

Handoff affects wireless network in many aspects such as quality of service (QoS) and capacity of networks.

So there are desirable feature and requirement to reduce the adverse effect of a handoff:

- 4-Successful handoff to total attempted handoff should be maximized
- 5-Maximam signalling should be their.
- 6-Handoff latency should be low.

B. REASON FOR HANDOFF FAILURE:

Call is forced to drop if adjacent cell do not have enough channel to support handoff. It is very important to limit the probability of forced call termination, as from user point of view chances of termination of ongoing call is less than blocking of a new call. So some extra channel should be reserved for handoff to reduce the chances of unsuccessful handoff. Some time signal of two base stations adds up destructively due to signal interference.

To reduce handoff call drop two methods are there:

- 1-Resources management
- 2-Handoff scheme

1-ADMISSION CONTROL: To keep the system from being overloaded new calls and ongoing call is treated differently. Handoff request must be prioritized and new call should be kept in queue.

Admission control can be centralized and distributed.

2-Bandwidth is very important resource in wireless network. Handoff request can be

A. NON PRIORITIZATION SCHEME:

Handoff and new call are served equally .It follow first come first serve mechanism, when BS has an idle channel whatever request first whether new call or handoff is given

Carried out when channels are available and bandwidth is reserved. Each cell should reserve some of its bandwidth from total capacity for handoff and new request of new calls should be accepted.

To manage the bandwidth numerous scheme should be proposed such as:

- 1-Complete sharing (CS) - entire bandwidth is shared for all traffic.
- 2-Complete partitioning (CP) - Bandwidth is divided into distinct portion each portion corresponds to a particular traffic class.

3- Power control is necessary mechanism in all mobile systems because of an important role in spectrum and resource allocation as well as the battery life and safety reasons. To achieve required CIR level power control scheme is used .By measuring the received power and increasing or decreasing the transmitted power in order to maximize the minimum CIR in given channel allocation system we try to reduce overall CIR. By this the number of mobile terminals is supported can be increased as capacity is increased as capacity is increased. Power control can be done in either centralized or a distributed way.

B. HANDOFF SCHEMES:

- 1-Non Prioritization Scheme
- 2-Prioritization scheme

Priority. In this scheme no priority is given to the handoff over call so call dropping probability increased. Channel utilization is high in this scheme as all available channels in BS are shared by handoff and new calls. CS and PS are used in non prioritization scheme. If the load offered by traffic stream drops below its allocated capacity this can lead to waste the capacity. CP is of two type dynamic partition boundaries and static partition boundaries.

Both call dropping probability and call blocking probability can be minimized by prioritized scheme by giving priority to handoff calls over new calls. Several handoff prioritization schemes have been proposed until now like Guard channels. Some fixed or changing number of channel is reserved for handoff only remaining channel are used for new calls. Forced termination probability is decreased and handoff call is served better. It decrease total carried traffic and increase call blocking probability. By the use of neighbouring BS the number of guard channel is decided. When number of MT in pre handover zone is determined by the BS, it receives the number of guard channels for handoff calls. If number of handoff call is in queue new call is assigned to that channel

and number of free channel is greater than number of guard channel.

C. QUEUING HANDOFF CALLS:

This scheme queues the handoff call when all the channel of BS. It is assigned to one of handoff in queue when channel is released. If queue is empty and if any channel in BS is free. Some system queue new call also to decrease the call blocking probability. The time between handoff initiation and receiver threshold make it possible to using queuing handoff. Queuing is done with/without the guard channel scheme.

D. CELLULAR SYSTEM DEPLOYMENT SCENARIO:

In different cellular structure different handoff techniques and radio propagation environment is required. In different system a handoff algorithm with fixed parameter cannot be performed. While designing a handoff algorithm with fixed parameters cannot be performed. Several basic cellular structures are their example like macrocell, microcell, and overlay.

MACROCELL: Its radii are several kilometres. The MSC has to manage large number of MS, despite than centralized handoff is possible due to low crossing rate. In uplink and downlink signal quality is same. The transition region between BS is large, to avoid flip flopping handoff allow some delay. To preserve the signal quality delay should be short enough because interference increases as MS penetrate new cell. The penetration of cell is called cell dragging. To get rid of fluctuation the averaging interval (i.e. time period used to average signal strength variation) should be large enough. Cellular system of first and second generation provides wide area of coverage even in cities using macrocell. BS transceiver in a macrocell transmit high output power with antenna mounted several meters high on a tower to illuminate a large area.

MICROCELL: To satisfy the required service demand some capacity improvement techniques will not be sufficient. The single most effective means of increasing the capacity of cellular system in microcells. Microcell are classified as one, two, or three dimensional depending on whether they are long road or highway covering an area such as number of adjacent roads or located to multilevel buildings respectively. Due to short term variation medium/long term alternation and incremental growth of radio network microcell are more sensitive to the traffic and interference. The number of handoff per cell is increase in order of magnitude and time available to make handoff is decreased. To reduce the handoff rate umbrella cell can be used microcell encounter a propagation phenomenon called corner effect. Corner effect demands a faster handoff and can change the signal quality very fast. It is hard to predict corner effect.

VI. MACROCELL/MICROCELL OVERLAYS:

Lacks of service of microcell in some areas, congestion of certain microcells, high speed of some user are reason for higher handoff rate and signalling load for microcell. To remove these problem mixed cell architecture consisting and large macrocell and small size microcells can be used. Overlay

provide balance between maximizing number of user per unit area and minimizing network.

VII. HANDOFF ALGORITHMS:

CONVENTIONAL ALGORITHMS:

Relative signal strength: BS is measured over time and BS with the strongest signal strength is selected to carry out a handoff. To select the strongest signal strength several measurement are used:

Relative signal strength plus threshold.

Relative signal strength with hysteresis.

Relative signal strength with hysteresis and threshold.

SIR BASED ALGORITHMS: Signal to interference ratio is a measure of the communication quality. This method allows handoff if SIR of BS is lower than the threshold and the SIR of target BS is better.

VELOCITY BASED ALGORITHM: The probability of call drop may be high if user moves fast. So for fast moving user handoff algorithm with velocity adaptation is proposed for urban communication.

DIRECTION BASED ALGORITHM: Important for high mobility users especially NLOS handoff.

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