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An Efficient Handoff Allocation During Travel By Time Based Algorithm

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Abstract

In the modern world no work will be done without cellular devices. People can’t spend their day without mobile devices. For best cellular communication Mobility is the most important feature. The continuous service in the cellular networks is achieved by supporting handoff (or handover) from one cell to another. Handover is the process of altering the channel connected with the current connection while a call is in progress. Handoff is a key element in wireless cellular networks in order to provide quality of service to the users and to support the user’s mobility..During travelling mobile hosts move from one cell to another cell, to deliver continuous service, the new cell would have sufficient channels to support the ongoing communication of the mobile hosts that moved into the cell. To improve the performance of channel allocation methods, it depends on the type of traffic and its allocation priorities. An optimal channel allocation algorithm has been proposed. An optimal channel allocation algorithm which uses cross layer architecture to efficiently utilize the bandwidth time and priority based reservation scheme is proposed. These procedures are used to reduce the call blocking probability, call dropping probability, end -to- end delay and thereby increasing the performance of the system by increasing the throughput of the complete system. The existing system used channel allocation system, based on traffic and priority, but it is not enough. The proposed system is designed based on the time of entering of the cellular node in a new cell and the time the particular cell stayed in the previous cell. So it is better for the travelling cellular networks

Keywords: Wireless Cellular Networks, Handoff Dropping Probability, Call Dropping Probability, Resource Allocation, Prioritization Schemes.

Introduction

In cellular networks, the term handover or handoff refers to the process of transferring an ongoing call or data session from one channel connected to the core network to another channel. In satellite communications it is the process of transferring satellite control responsibility from one earth station to another without loss or interruption of service.

Mobility is the most important feature of a wireless cellular communicationsystem. Usually, continuous service is achieved by supporting handoff (or handover)from one cell to another. Handoff is the process of changing the channel (frequency,time slot, spreading code, or combination of them) associated with the current connection while a call is in progress. It is often initiated either by crossing a cellboundary or by deterioration of the signal in the current channel. Handoff is dividedinto two broad categories— hard and soft handoffs. They are also characterized by“break before make” and “make before break.” In hard handoffs, current resources arereleased before new resources are used. In soft handoffs, both existing and newresources are used during the handoff process. Poorly designed handoff schemes tendto generate very heavy signalling traffic and thereby a dramatic decrease in quality ofservice (QoS).

The reason why handoffs are critical in cellular communication systems is thatneighbouring cells are always using a disjoint subset of frequency bands, sonegotiations must take place between the mobile station (MS), the current serving basestation (BS), and the next potential BS. Other related issues, such as decision makingand priority strategies during overloading, might influence the overall performance.

American English use the term handoff, and this is most commonly used within some American organizations such as 3GPP2 and in American originated technologies such asCDMA2000. In British English the term handover is more common, and is used within international and European organisations such as ITU-T, IETF, ETSI and 3GPP, and standardised within European originated standards such as GSM and UMTS. The term handover is more common than handoff in academic research publications and literature, while handoff is slightly more common within the IEEE and ANSI organisations

The purpose of handoff:

In telecommunications there may be different reasons why a handover might be conducted:

- when the phone is moving away from the area covered by one cell and entering the area covered by another cell the call is transferred to the second cell in order to avoid call termination when the phone gets outside the range of the first cell;
- when the capacity for connecting new calls of a given cell is used up and an existing or new call from a phone, which is located in an area overlapped by another cell, is transferred to that cell in order to free-up some capacity in the first cell for other users, who can only be connected to that cell;

- in non-CDMA networks when the channel used by the phone becomes interfered by another phone using the same channel in a different cell, the call is transferred to a different channel in the same cell or to a different channel in another cell in order to avoid the interference;
- in CDMA networks a handover (see further down) may be induced in order to reduce the interference to a smaller neighboring cell due to the "near-far" effect even when the phone still has an excellent connection to its current cell;

A special case is possible, in which the source and the target are one and the same cell and only the used channel is changed during the handover. Such a handover, in which the cell is not changed, is called intra-cell handover. The purpose of intra-cell handover is to change one channel, which may be interfered or fading with a new clearer or less fading channel.

An advantage of the hard handover is that at any moment in time one call uses only one channel. The hard handover event is indeed very short and usually is not perceptible by the user. In the old analog systems it could be heard as a click or a very short beep; in digital systems it is unnoticeable. Another advantage of the hard handoff is that the phone's hardware does not need to be capable of receiving two or more channels in parallel, which makes it cheaper and simpler. A disadvantage is that if a handover fails the call may be temporarily disrupted or even terminated abnormally. Technologies which use hard handovers, usually have procedures which can re-establish the connection to the source cell if the connection to the target cell cannot be made. However re-establishing this connection may not always be possible (in which case the call will be terminated) and even when possible the procedure may cause a temporary interruption to the call. Possibility of handover. While theoretically speaking soft handovers are possible in any technology, analog or digital, the cost of implementing them for analog technologies is prohibitively high and none of the technologies that were commercially successful in the past (e.g. AMPS, TACS, NMT, etc.) had this feature. Of the digital technologies, those based on FDMA also face a higher cost for the phones (due to the need to have multiple parallel radio-frequency modules) and those based on TDMA or a combination of TDMA/FDMA, in principle, allow not so expensive implementation of soft handovers. However, none of the 2G (second-generation) technologies have this feature (e.g. GSM, D-AMPS/IS-136, etc.). On the other hand, all CDMA based technologies, 2G and 3G (third-generation), have soft handovers. On one hand, this is facilitated by the possibility to design not so expensive phone hardware supporting soft handovers for CDMA and on the other hand, this is necessitated by the fact that without soft handovers CDMA networks may suffer from substantial interference arising due to the so-called near-far effect.

In all current commercial technologies based on FDMA or on a combination of TDMA/FDMA (e.g. GSM, AMPS, IS-136/DAMPS, etc.) changing the channel during a hard handover is realised by changing the pair of used transmit/receive frequencies.

For the practical realisation of handoffs in a cellular network each cell is assigned a list of potential target cells, which can be used for handing-off calls from this source cell to them. These potential target cells are called neighbours and the list is called neighbour list. Creating such a list for a given cell is not trivial and specialised computer tools are used. They implement different algorithms and may use for input data from field measurements or computer predictions of radio wave propagation in the areas covered by the cells.

During a call one or more parameters of the signal in the channel in the source cell are monitored and assessed in order to decide when a handover may be necessary. The downlink (forward link) and/or uplink (reverse link) directions may be monitored. The handover may be requested by the phone or by the base station (BTS) of its source cell and, in some systems, by a BTS of a neighbouring cell. The phone and the BTSs of the neighbouring cells monitor each other others' signals and the best target candidates are selected among the neighbouring cells. In some systems, mainly based on CDMA, a target candidate may be selected among the cells which are not in the neighbour list. This is done in an effort to reduce the probability of interference due to the aforementioned near-far effect.

Vertical Handover

Main article: Vertical handover There are also inter-technology handovers where a call's connection is transferred from one access technology to another, e.g. a call being transferred from GSM to UMTS or from CDMA IS-95 to cdma2000.The GPP UMA/GAN standard enables GSM/UMTS handoff to Wi-Fi and vice-versa.

Handoff Prioritization Different systems have different methods for handling and managing handoff request. Some systems handle handoff in same way as they handle new originating call. In such system the probability that the handoff will not be served is equal to blocking probability of new originating call. But if the call is terminated abruptly in the middle of conversation then it is more annoying than the new originating call being blocked. So in order to avoid this abrupt termination of ongoing call handoff request should be given priority to new call this is called as handoff prioritization. There are two techniques for this.1) Guard Channel Concept: In this technique, a fraction of the total available channel in a cell is reserved exclusively for handoff request from ongoing calls which may be handed off into the cell.2) Queuing: Queuing of handoffs is possible because there is a finite time interval between the time the received signal level drops below handoff threshold and the time the call is terminated due to insufficient signal level. The delay size is determined from the traffic pattern of a particular service area.

Inter System Handoff:• If during ongoing call mobile unit moves from one cellular system to a different cellular system which is controlled by different MTSO, a handoff procedure which is used to avoid dropping of call is referred as Inter System Handoff.

Intra System Handoff:

- If during ongoing call mobile unit moves from one cellular system to adjacent cellular system which is controlled by same MTSO, a handoff procedure which is used to avoid dropping of call is referred as Intra System Handoff.

Frequency reuse refers to the use of the same frequency channel in different areas that are distant enough so that the interference caused by the use of the samechannel is not a problem. The users in different geographic locations maysimultaneously use the same frequency channel. It improves the spectrum efficiency,but if the system is not properly designed serious problems may occur likeinterferences due to the common use of the same channel known as co-channelinterference. So, the cells which are using the same set of frequency channels called asco-channel cells should e at enough distance which is known as co-channel reusedistance or frequency reuse distance

Co-Channel Interference Reusing the same frequency channel in different cells is limited by co-channel interference between cells, and the co-channel interference can be a major problem. AsMSC - Base Station Controller - Base Station Mobile Switching Centrelong as the cell size is fixed, co-channel interference is independent of the transmitted power of each cell to interference ratio (C/I) is used to measure theamount of interference over a specific carrier. **Cell Splitting**When the traffic density increases and the frequency channels Fi in each cell Ci cannot provide enough mobile calls, the original cell can be split into smaller cells.Normally the new radius is one-half the original radius and the new area is one fourthof the old cell area. This implies an additional base stations needed to be established atthe center of each new cell that has been added so that the higher density of calls canbe handled effectively. As the coverage is smaller, the transmitting power levels arelow and help in reducing co-channel interference.

Channel Allocation

Channel allocation implies that a given radio spectrum is to be divided into a set of disjoint channels, which can be used simultaneously while minimizing interference in adjacent channels via good channel separation. In order to divide agiven radio spectrum into such channels many techniques such as frequency division, time division or code division can be used. In frequency domain, the spectrum isdivided into disjoint frequency bands, whereas in the time division the channelseparation is achieved by dividing the usage of the channel into disjoint time periodscalled time slots. In code division, the channel separation is achieved by using different modulation codes **Fixed Channel Allocation Scheme** In fixed channel assignment the number of channels is fixed for a particularcell. If the total number of available channels in the system is divided into sets, theminimum number of channel sets required to serve the entire coverage area is relatedto the frequency reuse distance D and radius R of each cell as follows. Thedrawback here is, when the number of calls is increased beyond the limited number ofchannels for a cell, excess are rejected. Extensions to this allocation technique areborrowing schemes. **Simple Borrowing Scheme** A simple borrowing scheme implies that if all channels allocated to a cell are being used, then additional channels can be borrowed from any cell that has some freeunused channels. Such a cell is called a donor cell. It can select a donor from amongadjacent cells that has the largest number of free channels. This is known as borrowingfrom the richest. After that it has to return the borrowed channel to the donor if achannel becomes available in the cell that initially borrowed a channel. Anothertechnique is to select the first free channel found for borrowing when the searchfollows a predefined sequence known as borrow first available scheme.

Centralized Dynamic Channel Allocation Scheme In this scheme, a channel is selected for a new call from a central pool of freechannels, and a specific characterizing function is used to select one among candidatefree channels. The simplest scheme is to select the first available free channel that cansatisfy the reuse distance. Another scheme is to pick a free channel that can minimizethe future blocking probability in the neighbourhood of the cell that needs anadditional channel known as locally optimized dynamic assignment . Thedisadvantage of this scheme is, if the mobile switching center which is acting ascentral pool of free channels fails the whole system will be affected and also burden orload on it increases. So to avoid these problems distributed dynamic channel allocationschemes are developed.

Types of Handoff Handoff is divided into 2 categories, hard and soft handoffs. They are alsocharacterized by “break before make” and “make before break” respectively.in hard handoff, existing resources are released before new resources are utilized.Usually, the hard handoff can be further divided into two different types – intra and inter cell handoff. Hard handoff procedure. In softhandoff, both existing and new resources are used. The smaller the size of the cellsand variable propagation of signals causes much frequent handoffs. The soft handoff can also be divided into two different types – multi way soft handoffs and softer handoffs. Soft handoff procedure is Poorlydesigned handoff schemes tend to generate very heavy signaling traffic and thereby adramatic decrease in quality of service (QoS). The reason why handoffs are critical incellular communication systems is that neighbouring cells are always using a disjointsubset of frequency bands, so negotiations must take place between the mobile stationa. before handoff c. after handoff b. during handoff Types of ServicesThere are two different types of services, real time (such as audio and video transmission) and non-real time service (such as data transmission). There are severalparameters in measuring cellular systems. Some of those are blocking probability fornew calls originated in a cell, forced termination probability of on-going calls, queuelength, average length of requests and average transmission delay for data users .

The design of a good handoff scheme requires that the blocking probability for newcalls must be minimized and also reduce transmission delay of non-real time servicecalls and maximize channel utilization.

Handoff Initiation

The performance evaluation of a handoff is based on various initiation criteria.

It is assumed that the signal is averaged over time, so that rapid fluctuations due to themulti-path nature of the radio environment can be eliminated [39]. If MS is movingfrom BS1 to BS2, the mean signal strength of BS1 decreases as the MS moves awayfrom it. Similarly, the mean signal strength of BS2 increases as the MS approaches it.

Prediction Techniques

Prediction techniques base the handoff decision on the expected future value of the received signal strength. A technique has been proposed and simulated to indicatebetter results, in terms of reduction in the number of unnecessary handoffs, than therelative signal strength, both without and with hysteresis, and threshold methods.

Handoff Decision

The decision-making process of handoff may be centralized or decentralized (i.e., the handoff decision may be made at the MS or network). There are three different kinds of handoff decisions.

Network-Controlled Handoff

In a network-controlled handoff protocol, the network makes a handoffdecision based on the measurements of the MS's at a number of BS's. In general, the handoff process (including data transmission, channel switching and network switching) takes 100-200ms. Network-controlled handoff is used in first generation analog systems such as AMPS (Advanced Mobile Phone System), TACS (TotalAccess Communication System), and NMT (Nordic Mobile Telephone).

Mobile-Assisted Handoff

In a mobile assisted handoff process, the MS makes measurements and thenetwork makes the decision. In the circuit-switched GSM (Global System Mobile), theBS controller (BSC) is in charge of the radio interface management. This mainlymeans allocation and release of radio channels and handoff management. The handofftime between handoff decision and execution in such a circuit-switched GSM isapproximately 1 second.

Mobile-Controlled Handoff

In mobile-controlled handoff, each MS is completely in control of the handoff process. This type of handoff has a short reaction time (in the order of 0.1 second). MSmeasures the signal strengths from surrounding BS's and interference levels on allchannels. A handoff can be initiated if the signal strength of the serving BS is lowerthan that of another BS by a certain threshold.

Conclusion

With the enormous growth of mobile users, effective utilization of bandwidth is very much essential. In this point of view, this paper proposes optimized channel allocation algorithm which uses cross layer architecture to efficiently utilize thebandwidth and time and priority based reservation scheme is also discussed. Theseprocedures are used to reduce the call blocking probability, call dropping probability,end-to-end delay and thereby increasing the performance of the system by increasingthe throughput of the complete system. Main objective of this paper is to maximize the quality of service by theefficient utilization of bandwidth reservation. To have a channel allocation schemewhich reduces the blocking of new calls and also efficiently handles handoff calls without dropping them. The paper aims to provide better performance in bandwidth reservation andchannel allocation procedures. in packet delivery and to increase the throughput of the system.

References

[1] D.J. Harasty, L.F. Chang, A.R. Noerpel, Architecture alternatives for wireless data services, IEEE ICUPC94 San Diego, California, September 1994.

[2] Y.-B. Lin, A. Noerpel, D. Harasty, A nonbloking channel assignment strategy for handoffs, IEEE ICUPC94, San Diego, California, September 1994.

[3] Cox, D. and Reudink, D., Increasing channel occupancy in large-scale mobile radio systems: dynamic channel reassignment. IEEE Trans. Commun. v21 i11.

[4] D. Everitt , D. Manfield, Performance analysis of cellular mobile communication systems with dynamic channel assignment, IEEE Journal on Selected Areas in Communications, v.7 n.8, p.1172-1180, September 2006 [doi>10.1109/49.35562]

[5] G. Falciasecca, M. Frullone, G. Riva, M. Sentinelli, A. Serra, Investigation on a dynamic channel allocation for high capacity mobile radio systems, IEEE Vehicular Technology Conference, 1988.

[6] Hong, D. and Rappaport, S.S., Traffic model and performance analysis of cellular radio telephone systems with prioritized and non-prioritized handoff procedures. IEEE Trans. Veh. Technol. v35 i3.

[7] Oh, S.-H. and Tcha, D.-W., Prioritized channel assignment in a cellular radio network. IEEE Trans. Commun. v40 i7.

[8] S. Tekinay , B. Jabbari, A measurement-based prioritization scheme for handovers in mobile cellular networks, IEEE Journal on Selected Areas in Communications, v.10 n.8, p. 1343-1350, September 2006 [doi>10. 1109/49.166761]

[9] P. V. Krishna, N. C. S. N. Iyengar and S. Misra, "An Efficient Hash Table-Based Node Identification Method for Bandwidth Reservation in HybridCellular and Cellular Networks", Computer Communications (Elsevier), Vol.31, No. 4, 2008, pp. 722-733.

[10] P. V. Krishna and N. Ch. S. N. Iyengar, 'Optimal Channel Allocation Algorithm with Efficient Channel Reservation for Cellular Networks', Int. J. Communication Networks and Distributed Systems, Vol. 1, No. 1, 2008,pp.33-51.

[11] J. Misic, T.Y. Bun, On call level QoS guarantees under heterogeneous user mobilities in wireless multimedia networks, in: Proceedings of the IEEE Global Telecommunications Conference – GLOBECOM'99, Rio De Janerio, Brazil, 1999, pp. 2730–2736.

[12] I. Katzela and M. Naghshineh, "Channel Assignment Schemes for Cellular Mobile Telecommunication Systems: a Comprehensive Survey," IEEE Personal Communications, Vol. 3, No. 3, pp. 10-31, June 1996.

[13] P. Venkata Krishna, N.Ch.S.N. Iyengar, A cross layer based QoS model for wireless and mobile networks, Journal of Mobile Communications 1 (4) (2007)114–120.

[14] M. Naghshineh, A. S. Acampora, QOS provisioning in micro-cellular networks supporting multimedia traffic, Proceedings of the Fourteenth Annual Joint Conference of the IEEE Computer and Communication Societies (Vol. 3)-Volume, p.1075, April 02-06, 1995