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PERFORMANCE ANALYSIS OF CELLULAR/WLAN MIXED CELL USING PRIORITY BASED CALL MANAGEMENT SCHEME IN NEXT GENERATION NETWORKS

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ABSTRACT

Next Generation Networks (NGNs) are primarily propelled by huge potential market for systems of communication and services to suit individuals, which yield ubiquitous and tether-less access to users. Providing seamless handover and ubiquitous services in NGN presents many new research challenges. Priority based call management scheme is necessary to provide low call dropping probability for high priority services by means of channel reservation separately for new call and handoff call. Most of the existing call admission control (CAC) schemes do not consider the vertical handoff from WLAN to Cellular and surprisingly users do not access WLAN even when WLAN facility is available. Proposed call management scheme, which considers all possible vertical handoff scenarios and provides the maximum usage of WLAN. As result, any blocked request in WLAN is taken back by the overlaying Cellular system, if channels are available. So, a request is dropped/blocked only when all the channels of both Cellular and WLAN systems are busy. Main effort is essential to design a Call management scheme for the interworking of Cellular/WLAN, in which service type of the user has been considered. The analytical model has been derived for the call management scheme and validates the same with necessary OPNET simulation results. We provide an extensive numerical result to show that proposed scheme performs better than the existing complementary WLAN (C-WLAN) scheme.

Keywords: call management scheme, call admission control, WLAN, complementary WLAN (C-WLAN), dropping probability.

1. INTRODUCTION

Integration of cellular and WLAN increases the user's density and provides better bit rate on WLAN Hotspot. Heterogeneous Wireless Networks (HWN) is an integration of cellular/ WLAN network which is expected to be an effective network by means of providing high speed data access with wide radio coverage. Most popular wireless networks, Cellular networks (UMTS, LTE, LTE-A, etc.,) and Wireless Local Area Network (WLAN) are integrated in terms of user mobility, Quality of Service (QoS) provisioning, deployment strategy, etc.[1]. Cellular is known for its wide connectivity and can also be inter-networked with WLAN, which can deliver high speed data access, improving the existing QoS and support numerous users. An ongoing call can automatically be handed over from one RAT to another for better quality of service (QoS) [2]. Joint spectrum of multiple RAT will provide better throughput and lower call dropping probability for the users. Users will generate multiple classes of call related to multiple services such as data, voice, video and multimedia call. Joint spectrum techniques for a mixed cell, which provides low call dropping probability.

There are three types of user call request related to each service class; new call, horizontal handoff (HH) call and vertical handoff (VH) call. An efficient joint call management scheme under multiple RATs, multiple services with multi rate traffic is essential for better bandwidth usage, low dropping and blocking probability and better mobility support. Also, it is important to study the blocking probability as per the new call by implementing the Call management algorithm using the realistic Cellular/WLAN Internetworking scenario [4]. When a call request arrives, CAC performs a decision whether to accept the call or not. CAC [5] is mainly concerned with the resource management and traditionally CAC have concentrated on channel provision, conversely we propose a scheme in which we consider velocity and service type of user. In aC-WLAN model, a mobile station (MS) always accesses cellular system with priority in amixed cell. Mixed cell is a Cellular network with underlying WLANs where, the cellular users have additional privilege to access WLAN. If a request is blocked in cellular, an MS automatically switches to WLAN mode to access some free channels from the reserved pool of WLAN channels. The statistical results show that, at greater traffic load, a CWLAN model [6] must reserve at least 21% WLAN channels to produce the performance level analogous to that of our proposed model.

The realistic model has been analyzed [6] for a cluster of mixed cells with different traffic environment i.e., multi class of traffic, and different number of WLAN-hotspots. The model will be useful to estimate the call blocking and throughput performance in different cell with varying WLAN coverage in multi class traffic environment. It is also useful to plan appropriate number of WLAN-hotspots to optimize the cell performance in a cluster [6].Any mobile node automatically switches from one cellular network to another network, i.e. WLAN to Cellular and Cellular to WLAN [11], [12]. Vertical handoff dropping rate leads to poor services to the users. It is necessary to handle the user services based on the priority aspect. Proposed techniques determine the number of hotspots in a mixed cell and the number of WLAN(s) required to full coverage in each hotspot. Proposed model considers three classes of call; data, voice and video call.

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Proposed model removes the restriction of horizontal and vertical movements of call. It allows user to access WLAN on priority as long as maximum number of users do not exceed. The users' restriction provides guaranteed QoS in WLAN. It also provides low dropping probability of real time call compared to that of non-real time call. Finally results are useful to plan the deployment of WLAN hotspot(s) under multi service with multi rate arrival of call. Further there is an improvement in maximize the network throughput and achieves the 80% efficiency compare with the existing model.

2. REVIEW OF RELATED WORK

Call management scheme in a mixed cell is essential to fix a user preference of WLAN access. Call Management scheme is considered as one of the most important technique in this regard as it checks the amount of traffic which is already present in network in order to provide better services. When a call arrives CAC performs a decision whether to accept the call or not. CAC [4] is mainly concerned with the resource management and traditionally CAC have concentrated on channel provision, conversely we propose a scheme in which we consider velocity and service type of user. The CAC schemes projected in [5] supports only those downward VHs which were previously handed over from Cellular to WLAN. Both the schemes [4], [5] do not support the upward VH for the sessions originated in WLAN.

In tunnel based WLAN-first access scheme shows that [7], [8], [9], [10] users are always reside in the coverage of WLAN. Bandwidth utilization in the WLAN system is maximized as long as user stays in the WLAN coverage. Handoff call dropping rate in WLAN is decreases only if the rate of blocking requests is less than the Cellular. As a result, performance of the network becomes poor when there is increase in WLAN traffic. In existing models, free movement of the handoff request from Cellular to WLAN and WLAN to Cellular is not to be considered. The models show the effect of identical hotspot [11].

We propose a realistic model for a cluster of mixed cells with different traffic environment i.e., multi class of traffic, and different number of WLAN-hotspots. The model will be useful to estimate the call dropping and throughput performance in different cell with varying WLAN coverage in multi class traffic environment. It is also useful to plan appropriate number of WLAN-hotspots to optimize the cell performance in a cluster. Proposed model consider the vertical movements of call without any restriction. As long as maximum number of users does not exceed, users are allowed to access WLAN on priority based call management scheme. The significant decrease in call dropping probabilities of handoff call and new call. Further, the throughput of the network increases 80% of the system capacity compare with C-WLAN.

3. SYSTEM DESCRIPTION

3.1 Mixed cell

The mobility patter in a mixed cell has been developed in Figure-1 shows the effect of cellular with WLAN hotspots. In a mixed cell, the cellular traffic is shared by the WLAN based on the coverage area. In cellular, user capacity increases three times with 25 % WLAN coverage. The user's capacity also further increases at hotspots [11] such as Railway station, shopping malls, cafeteria and airports are densely populated area in a mixed cell. Non-hotspot coverage area represents coverage of the area outside the hotspots. WLAN service is inside in the hotspot area is called WLAN-hotspot. Otherwise it is called as WLAN-less-hotspot in Figure-1. Deployment of WLAN hotspot(s) in mixed cell has been developed and estimates the call intercepting probability of WLAN hotspots. Total number of WLAN-hotspots is considered to be a single hotspot with equal coverage [12]. The analytical study for an equivalent WLAN has not discussed in these models. The identical WLAN hotspots are fixed with user density, user traffic in Cellular coverage decreases with increasing the coverage area of WLAN. As a result, user density varies with WLAN hotspots. Each WLAN is directly connected to the core network using tightly coupling architecture [13]. Upward vertical handoff and downward vertical handoff is performed using proper signaling conditions [14], [15]. If any user access only WLAN service is called only WLAN user. In only Cellular, without integrating WLAN there are two types of call: Handoff (Horizontal) and new call. If Cellular is integrated with WLAN, there are three types of call occur: HH, VH, and new call. In a mixed cell, if user is move from WLAN to Cellular and Cellular to WLAN, vertical handoff traffic is generated is shown in Figure-1. Similarly if a user is move from Cellular to Cellular, horizontal handoff traffic is generated [16]. Figure-1 shows the tight and loose-coupling integration architecture. In tight coupling, the WLAN network acts as another cellular access network. WLAN traffic is directly injected in to the core network of cellular system. Loose coupling utilizes the common subscriber database without any user interfaces i.e. avoiding SGSN and GGSN nodes. Loose coupling integration allows for independent deployment of cellular networks and WLAN. Table-1 describes the notation for Cellular and WLAN systems.

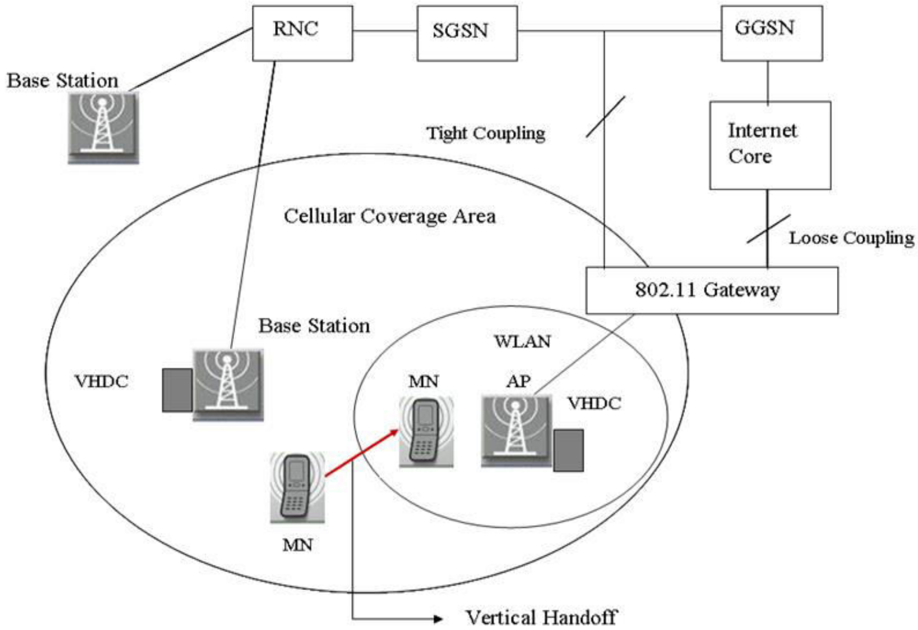

Figure-1. Architecture of the integrated heterogeneous network consisting of a WLAN and cellular network.

Table-1. Description of notation.

Notation	Description
b1 and b2	**VHR blocking probabilities of NR, HHR in Cellular**
P_{ns}^{u}, P_{hhs}^{u} and P_{vhs}^{u}	NR- successful, HHR- successful and VHR - successful move to HHR - arrival state in neighboring cell with probabilities
$1/r^{u}$ $(1/r^{w})$	Mean CRT in a cellular system (WLAN) in seconds
b	WLAN coverage probability of a call request being reject
'g'	ratio of the coverage areas of all WLAN hotpots combined to the coverage area of the whole Cellularsystem
$f_{CRT}^{*}(s)$	Laplace Transform of Hyper-Erlang function distribution
λ_t	Total call arrival rate
P_{n}^{w}	Probability of new call in WLAN
P_{r}^{w}	Probability of real time call in WLAN.
$P^{u}(0,0,0)$	Probability of no call being handled in the Cellular system
$T_{vhs}^{u}, T_{hhs}^{u}, T_{ns}^{u}$	Mean channel holding time (CHT) of vertical handoff call, horizontally handoff call and new call in a Cellular.
$P^{w}(0,0)$	Probability of no request is being handled in a Cellular.
T_{hhs}^{w}, T_{ns}^{w}	Channel Holding Time (CHT) of horizontally handoff call and new call in WLAN.

4. PROPOSED CALL MANAGEMENT SCHEME

Figure-2 shows the flowchart of Call Management Scheme for the proposed scheme of the logical coverage in a heterogeneous cell. The cellular coverage without any embedded WLAN is called Cellular-only coverage. When a user moves to neighbor cell with ongoing call session, a horizontal handoff request (HHR) is initiated. When a call request is blocked in Cellular, it is transferred to WLAN, this is called downward vertical handoff request (VHR) and when a user with continuing call session moves from WLAN to Cellular-only coverage, a VHR is initiated, known as upward VHR.

4.1 Conditions of requests

The initiation of new call request (NR), HHR and VHR are represented by NR-arrival, HHR- arrival and VHR-arrival states, respectively. A NR-arrival proceeds either to blocked or to successful states, if it is deprived or allocated a channel, respectively. A NR- successful state may move to finishing point, if that session is fully. Else, it will proceed to HHR-arrival state, when MS commences

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HHR in neighboring cell. Similarly, HHR- arrival and VHR- arrival states in Cellular will proceed to supplementary states. In WLAN, the VHR- arrival proceeds to either VHR-successful or blocked state. VHR-successful proceeds to either VHR- arrival or completion state (to Cellular).

4.2 State transition probability

Let us consider 'M' channels in a single Cellular system. Out of these, only 'm' channels can be implied for NRs and remaining (M-m) channels are held in reserve for handoff requests. We also consider k WLAN channels in altogether WLAN cells of a heterogeneous cell. Let blocking probabilities of NR, HHR (VHR) in Cellular be 'b1' and 'b2', in that order. Consider call blocking probability in WLAN be 'b'. For ease, we denote any variable x' as complement of x specified by x'= (1–x). In Cellular only coverage, NR- arrival, HHR- arrival and VHR- arrival states proceed to NR- blocked, HHR-blocked and VHR- blocked with transition probabilities given by 'b1', 'b2' and 'b2', respectively. Therefore, these proceed to NR- successful, HHR- successful and VHR-successful states, with probabilities denoted by (b1)', (b2)' and (b2)', in that order. NR- successful, HHR- successful and VHR - successful move to HHR - arrival state in neighboring cell with probabilities.

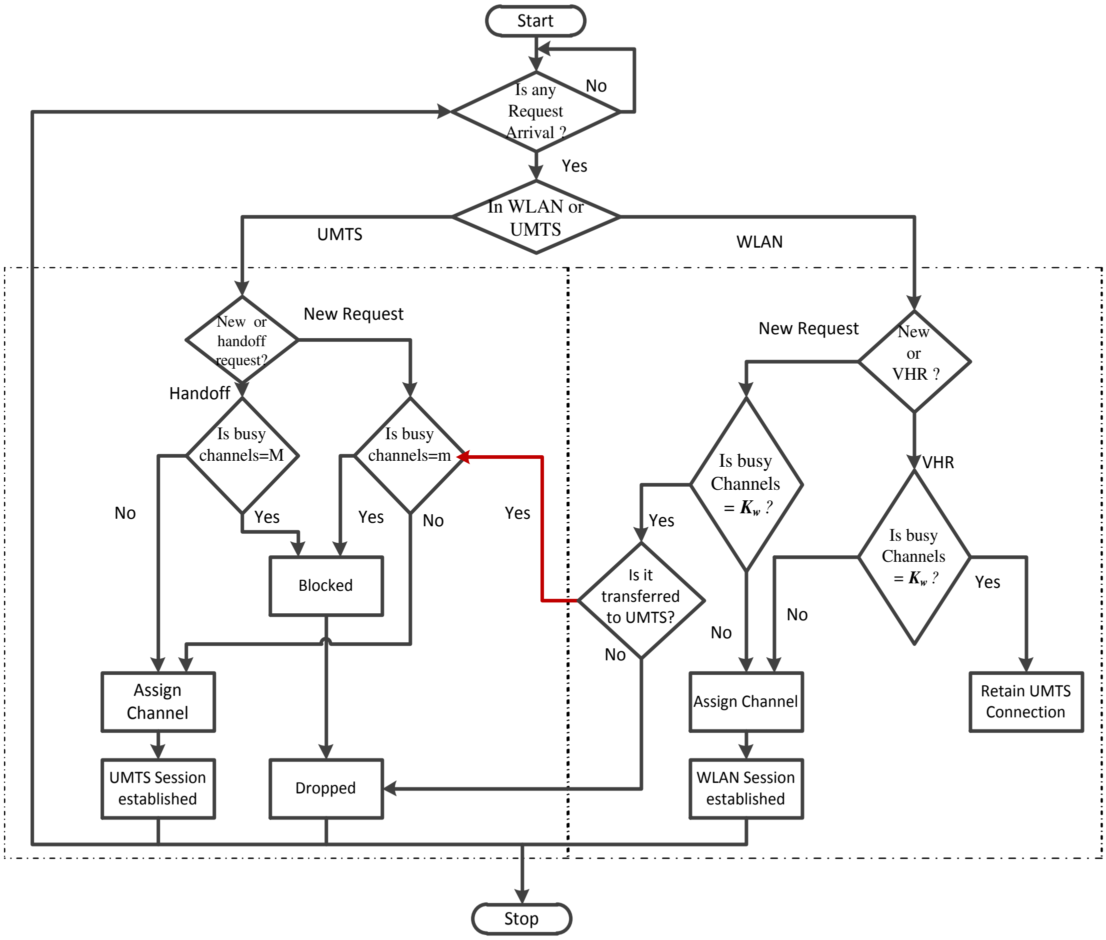

Figure-2. Flowchart of call management scheme.

given byP_{ns}^{u}, P_{hhs}^{u} and P_{vhs}^{u}, correspondingly, and they proceed to endstate with probabilities given by $(P_{ns}^{u})'$,$(P_{hhs}^{u})'$ and $(P_{vhs}^{u})'$, correspondingly. A blocked NR and HHR taking place in Cellular only coverage, will commence secondary VHR in WLAN, that is, the ongoing session Cellularin WLAN coverageis compellingly passed over to WLAN, and the unallocated Cellular channel is allocated to a blocked call of Cellular.

Call management scheme considers service type, velocity of the user before making a decision of accepting or rejecting any request. On receiving a call request, Call management scheme checks the speed of the user. If it is a high speed user, its call will be handled through Cellular network over WLAN network, as WLAN with its limited coverage leads to frequent vertical handoffs. In case of low speed user call will be divided in terms of real time or non-real time service. For real time service Cellular network is given the priority due to its sensitivity to delay and for non-real time service WLAN is given priority due to its higher bandwidth and it's insensitivity to delay. We propose an analytical model in which if the call arrives of a high speed user, it sends request to Cellular. If bandwidth is available, it grants access to Cellular network. In case of a real time service, if bandwidth for

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Cellular is not available, it transfers the call to the WLAN network. The new call will be taken on the WLAN network. If bandwidth is available it grants access to WLAN else it request access to Cellular network. To provide better QoS CAC algorithm will hand over an existing call from Cellular to WLAN. The call will be barred if bandwidth in both Cellular and WLAN is not available.

In WLAN coverage probability of a call being reject is b. New call successful, HHR-successful transit to VHR state from WLAN to Cellular is P^w_{ns} and P^w_{hhs}, correspondingly, and they proceed to conclusion state with the probabilities, $P^w_{ns}{}'$ and $P^w_{hhs}{}'$, correspondingly. The value of this probability is calculated in [19] as

$$P^u_{ns} = \int_0^\infty \int_\tau^\infty f_{residual_{CRT}}(t) f_{sht}(\tau)\, d\tau\, dt = \frac{r^u\left(1 - f^*_{CRT}(h)\right)}{h} \quad (1)$$

$$P^u_{hhs} = P^u_{vhs} = f^*_{CRT}(h) = 1 - \left({}^1\!/_{r^u}\right)(hP^u_{ns}) \quad (2)$$

$$P^w_{ns} = \int_0^\infty \int_\tau^\infty f_{residual_{CRT}}(t) f_{sht}(\tau)\, d\tau\, dt = \frac{r^w\left(1 - f^*_{CRT}(h)\right)}{h} \quad (3)$$

$$P^w_{hhs} = P^w_{vhs} = f^*_{CRT}(h) = 1 - \left({}^1\!/_{r^w}\right)(hP^w_{ns}) \quad (4)$$

5. AVERAGE CHANNEL HOLDING TIME

Consider Session Holding Time (SHT) follows exponential distribution, with mean 1/h sec and Cell Residence Time (CRT) follows Hyper-Erlang distribution, with mean ${}^1\!/_{r^w}$ sec in WLAN and ${}^1\!/_{r^u}$ sec in Cellular only coverage. Estimation of channel holding time (CHT) is done by finding least of CRT and SHT. Equations have been referred from [3].

$$F_{CHT}(t) = P(CHT \geq t) = 1 - P(SHT > t, residual_{CRT} \geq t) \quad (5)$$

$$f_{CHT}(t) = \frac{d}{dt}\left(1 - \int_0^\infty f_{sht}(t)\,dt \int_t^\infty f_{residual_{CRT}}(t)\,dt\right) \quad (6)$$

where $f^{*(1)}_{CRT}(0)$ is the first derivative of $f^*_{CRT}(s)$ when $s = 0$. Implying Laplace transform method, the mean value of X is found by: $E(X) = (-1)f^{*(1)}_{CRT}(0)$

From [20], we get mean CHT for various sessions as:

$$E[T^u_{ns}] = \frac{1}{h} - \frac{r^u((1-f^*_{CRT}(h))}{h^2} \quad (7)$$

$$E[T^u_{vhs}] = E[T^u_{hhs}] = \frac{r^u(1-f^*_{CRT}(h))}{h} \quad (8)$$

$$E[T^w_{vhs}] = \frac{r^w(1-f^*_{CRT}(h))}{h} \quad (9)$$

Laplace Transform of Hyper-Erlang function distribution is,

$$f^*_{CRT}(s) = \sum_{i=1}^{N} \alpha_i \left(n_i\beta_i/(s+n_i\beta_i)\right)^{n_i} \quad (10)$$

where, $\alpha_i \geq 0, \sum_{i=1}^{n} \alpha_i = 1$, N, n_i and β are positive numbers.

6. TRAFFIC CALCULATION

Let 'g' is the ratio of the coverage areas of all WLAN hotpots combined to the coverage area of the whole Cellular system. Let the total call arrival rate be λ_t. Call arrival rate for real time user in Cellular is λ^u_r denoted by $(1-g)\lambda_t P^u_r$, where P^u_n is the probability of new call in Cellular and P^u_r is the probability of real time call in Cellular.

6.1 Real time call request service

New call arrival rate in Cellular is given by:

$$\lambda^u_{rnc} = (1-g)\lambda_t P^u_r P^u_n \quad (11)$$

Handoff call arrival rate in Cellular is given by:

$$\lambda^u_{rhh} = \lambda^u_{rnc} b'_1 P^u_{ns} + \lambda^u_{rhh} b'_1 P^u_{hhs} + \lambda^w_{rhh} b'_1 P^u_{hhs} + \lambda^w_{rnc} b'_1 P^u_{hhs} \quad (12)$$

$$\lambda^u_{rhh} = \frac{\lambda^u_{rnc} b'_1 P^u_{ns} + \lambda^w_{rhh} b'_1 P^u_{hhs} + \lambda^w_{rnc} b'_1 P^u_{hhs}}{1 - P^u_{hhs} b'_1} \quad (13)$$

$$\lambda^u_r = \lambda^u_{rnc} + \lambda^u_{rhh} \quad (14)$$

In WLAN network, call arrival rate for a new real time call is:

$$\lambda^w_{rnc} = g\lambda_t P^w_r P^w_n \quad (15)$$

where, P^w_n is the probability of new call in WLAN and P^w_r is the probability of real time call in WLAN.

In WLAN network, call arrival rate for a horizontal handoff real time call is given by:

$$\lambda^w_{rhh} = g\lambda_t P^w_r (1 - P^w_n) \quad (16)$$

6.2 Non real time call request service

New call arrival rate in Cellular is given by:

$$\lambda^u_{nrnc} = (1-g)\lambda_t P^u_n (1 - P^u_r) \quad (17)$$

HHR call arrival rate in Cellular is given by:

$$\lambda^u_{nrhh} = \lambda^u_{nrnc} b'_1 P^u_{ns} + \lambda^u_{nrhh} b'_1 P^u_{hhs} + \lambda^u_{nrvh} b'_1 P^u_{vhs} \quad (18)$$

VHR call arrival rate in Cellular is given by:

$$\lambda^u_{nrvh} = \lambda^w_{nrhh} b'_1 + \lambda^w_{nrhh} b P^w_{ns} + \lambda^w_{nrnc} b P^w_{hhs} \quad (19)$$

New call arrival rate in Cellular is given by:

$$\lambda^w_{nrnc} = g\lambda_t P^w_n (1 - P^w_r) \quad (20)$$

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Handoff call arrival rate in WLAN is given by:

$$\lambda_{rhh}^{w} = g\lambda_t(1 - P_r^{w})(1 - P_n^{w}) \tag{21}$$

7. ESTIMATION OF HANDOFF CALL DROPPING/BLOCKING PROBABILITY

A demand cannot be approved to any channel if no channel is free, that is, a call is blocked if all channels are busy. Therefore, blocking probability is same as the steady state probability, when no channel is free. Cells can be exhibited as M/G/m queuing structure, where data channels are allotted a Node B in Cellular (that is, a base station). The M/G/m queue scheme defines a model, such that, if a request senses no channels (servers) as free, it will not arrive in the queue, hence it will get vanished in the system.

Three events can take place in Cellular viz. new request arrival, HHR-arrival, VHR-arrival. By Erlang 3-D loss formula for steady state Markov chains, probability for j HHR-successful, i new call successful, k VHR-successful states inside Cellular is denoted by:

$$P^u(i,j,k) = \frac{P^u(0,0,0)(\lambda_{nc}^{u}T_{ns}^{u})^i(\lambda_{hhr}^{u}T_{hhs}^{u})^j(\lambda_{vhr}^{u}T_{vhs}^{u})^k}{i!j!k!} \tag{22}$$

$P^u(0,0,0)$ denotes the probability of no call being handled in the Cellular. $T_{vhs}^{u}, T_{hhs}^{u}, T_{ns}^{u}$ denote mean channel holding time (CHTs) of vertical handoff call, horizontally handoff call and new call in a Cellular .

$$P^u(0,0,0) = \left(\sum_{i=0}^{m}\frac{(\lambda_{nc}^{u}T_{ns}^{u})^i}{i!}\left\{\sum_{j=0}^{M-i}\frac{(\lambda_{hhr}^{u}T_{hhs}^{u})^j}{j!}\left\{\sum_{k=0}^{M-i-j}\frac{(\lambda_{vhr}^{u}T_{vhs}^{u})^k}{k!}\right\}\right\}\right)^{-1} \tag{23}$$

Blocking probability of a request

Two events can occur in cellular, HHR arrival and new callarrival. Blocking of a HHR or a new request in cellular arises when no Cellular channel is free. By Erlang's 2-D loss formula for steady state Markov chain, probability for k VHR successful and i NR successful states in Cellular is denoted by:

$$P^u(i,j) = \frac{P^u(0,0)(\lambda_{rnc}^{u}T_{ns}^{u})^i(\lambda_{rhh}^{u}T_{hhs}^{u})^j}{i!j!} \tag{24}$$

$P^u(0,0)$ denotes the probability of no call being handled in a Cellular . T_{hhs}^{u} , T_{ns}^{u} denotechannel holding time (CHT) of horizontally handoff and new call.

$$P^u(0,0) = \left(\sum_{i=0}^{m}\frac{(\lambda_{rnc}^{u}T_{ns}^{u})^i}{i!}\left\{\sum_{j=0}^{M-i}\frac{(\lambda_{rhh}^{u}T_{hhs}^{u})^j}{j!}\right\}\right)^{-1} \tag{25}$$

Blocking probability in Cellular is equal to the probability of all channels being engaged by new request and HHRs.

$$b_1 = \sum_{i=0}^{M} P(i, M-i)$$

$$b_1 = P^u(0,0)\left[\sum_{i=0}^{M}\left[\frac{(\lambda_{rnc}^{u}T_{ns}^{u})^i(\lambda_{rhh}^{u}T_{hhs}^{u})^{M-i}}{i!(M-i)!}\right]\right] \tag{26}$$

Blocking Probability in WLAN: Since all real time call in WLAN are first transferred to Cellular network and only horizontal handoff call are handled by WLAN, so there is no blocking in WLAN.

8. RESULTS AND DISCUSSIONS

We consider value of various parameters as $n = 2$, $n_1 = 3$, $n_2 = 4$, $\alpha_1 = 0.3$, $\alpha_2 = 0.7$, $\beta_1 = 0.3$, and $\beta_2 = 0.4$ with $h = 4$sec, $r^u = 5$sec, $r^w = 40$sec, $g = 0.4$, $P_r^u = 0.3$, $P_n^u = 0.5$ in Cellular system and $K = 50$, $r^w = 3$sec, $n_1 = 4$, $n_2 = 2$, $\alpha_1 = 0.2$, $\alpha_2 = 0.8$, $\beta_1 = 0.2$ and $\beta_2 = 0.5$ with $h = 4$sec and $P_r^w = 0.4$, $P_n^w = 0.35$ in WLAN system.

Figure-3, show the change in Dropping Probability of New call and Handoff call respectively, as the call arrival rate increases. Call Dropping Probability is maximum when only Cellular network is employed, while it is lesser in the case of Complementary WLAN scenario, and it is least in the case of proposed Call management scheme for Heterogeneous networks. The simulation results show that proposed scheme is best suited for implementation than the previously implied conventional schemes. Analytical result, which compares the General analysis (without dividing the call on the basis of service type) for Cellular only Network scheme and proposed scheme (on dividing the call on the basis of service type) for Heterogeneous Network scheme. The improvement percentage is always above 100%. This shows significant improvement in the call dropping probability. Hence this result clearly proclaims the superiority of the Proposed Call management scheme over the General analysis scheme.

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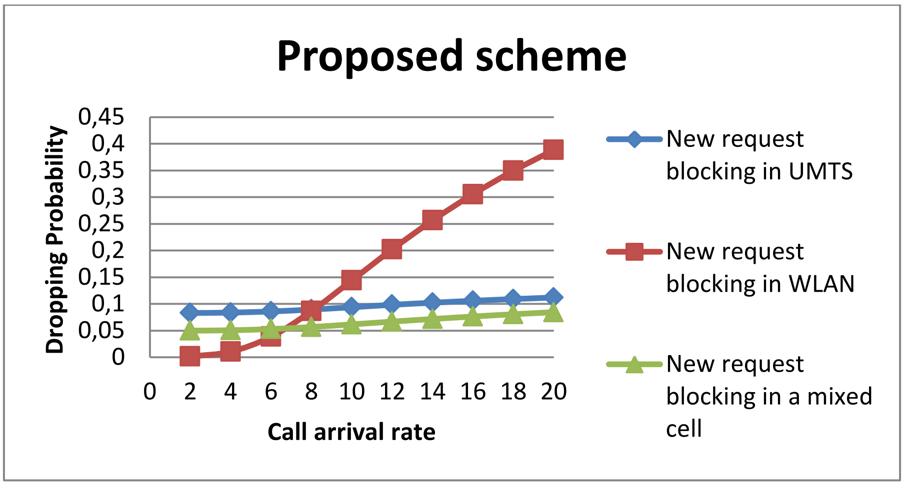

Figure-3. Effect of increasing call arrival rate: dropping probability of new and handoff request call.

Figure-4 shows the OPNET statistical result simulated in MATLAB to compare Cellular only Network and Proposed Heterogeneous Network scheme. Figure 4 shows that proposed scheme achieves maximum throughput when compared with Tunnel-WLAN scheme and cellular first access scheme. Figure-4 shows the final simulation result, which compares Cellular only Network and Proposed scheme for Heterogeneous Network. There is an improvement in the throughput for the proposed scheme. This shows substantial enhancement in throughput. Hence this result clearly states the pre-eminence of the proposed Heterogeneous Network scenario over the Cellular Network scenario.

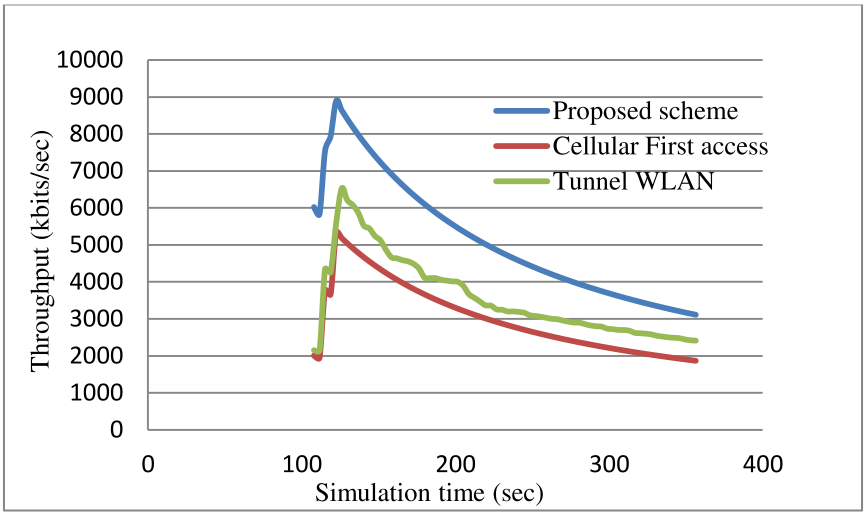

Figure-4. OPNET statistics- throughput of cellular and proposed heterogeneous scheme.

9. CONCLUSIONS

In this article, we have analyzed the performance of priority basedcall management scheme for heterogeneous network which is based on velocity and service type of user rather than channel reservation. Proposed call management scheme in a mixed cell with integrated WLAN affords better call dropping performance than the existing model at higher traffic condition. Voice traffic in WLAN area is limited so that the available bandwidth can be utilized for services which are insensitive to delay and Cellular network is given priority for real time services. From the simulation results it can easily be validated that an enhanced heterogeneous network is being created in order to give the user access to both WLAN as well as Cellular network. The significant decrease in call dropping probability of handoff call and newcall which optimize the proposed result. Future work includes adoption of bandwidth adaptive scheme based on threshold values for multi class services in wireless networks. Attempts can be made to find out ways in which heterogeneous networks is applied to 5G technologies by taking up scenarios which consider handoff, data rate, traffic intensity and such other factors into account

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