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A Proposed Approach on Call Creating and Blocking Problem Reduction Techniques in Networking Environment

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Abstract

Wireless technology has changed our lives in many ways. Until very recently, we needed a computer wired to a suitable port, to get online. Even wired telephones are becoming a thing of past. Nowadays, we use our mobile phones for banking, to check ticket availability at a Cinema Hall, and many more. Wireless communication is the transport of information over a medium without the use of improved electrical conductors or "wires". And, Wireless networking refers to any kind of networking that does not engage cables. It helps in saving the charge of cables for networking in addition to providing the mobility. In recent years, fast enhance of the traffic of the non telephone services in a cellular phone is amazing and in the next generation of wireless system, it is expected to be the era of the multimedia communications. In order to provide such included services platform, the system must be able to multiple users with different broadcast rates for different service type's .in this paper we show how we can prevent call blocking in 4g technology. And to do this we use WCDMA.

Keywords: WCDMA, OVSF, NOVSF.

1. Introduction

WCDMA is a technique in which all users allocate the same carrier under the direct sequence code division multiple access [11].Third generation wireless networks such as WCDMA aim to supply multimedia services for mobile users anywhere at any time. They are required to support bursty traffic, which is considerably different from voice traffic carried in the second generation wireless systems to support a range of multimedia applications. The system must support variable transmission rates for different users. Today when mobile communications are growing at a faster pace, there is a rapid growth of cellular subscriber globally. So users with very different and time unstable rate and quality of service requirements will need to be accommodated. Now the management of network traffic is a very strong problem, in this context the ideal 3G mobile system should be able to flawlessly support major applications that run on the internet today, email to web access to collaborative computing and multicast since 2G wireless networks are not capable of supporting this vision, as 2G systems have been designed for mainly homogeneous user population and limit each user to a rate which is very small portion of the overall system capacity. The third generation network is targeted to supply high-rate transmission for multimedia applications [10]. Two important issues under research in WCDMA systems are spreading codes and modulation .Spreading is a primary operation of WCDMA radio interface. The spreading codes in WCDMA are of two types namely channelization codes and scrambling codes. Third generation mobile communication system will enable high data rate and variable data rate services ranging from 144kbps to 384 kbps for wide and upto 2Mbps for low coverage and mobility[26].WCDMA has been selected as the most promising technology to provide these high rate services with different QOS requirements. Multiple rate transmission is supported by using single channelization codes with multiple spreading factors(SF),the so called OVSF codes,at the forward link these code operation requires less complexity at the user equipment, compared to multimode operation and can provide only data rates which are a power of two with the lowest base rate.

OVSF & Code Blocking Problem

In WCDMA, all users allocate the same carrier under the direct sequence CDMA (DSCDMA) principle. In the 3GPP stipulation orthogonal variable spreading factor (OVSF) codes are used as channelization codes for data dispersal on both downlink and uplink. OVSF codes also decide the data rates allocated to calls. WCDMA supports data rates up to 2.048 Mbps in 5 MHz bandwidth using variable spreading factors [11]. When a exacting code is used in OVSF, its descendant and ancestor codes cannot be used concurrently because their encoded sequences become indistinguishable. Therefore, the OVSF code tree has a partial number of available codes. Because one OVSF code tree, along with one scrambling code, is used for transmissions from a single source that can be a base station or mobile station, the same OVSF code tree is used for the downlink transmissions and therefore the base station must carefully allocate the OVSF codes to the downlink transmissions [19]. Since the maximum number of OVSF codes is hard-limited, the competent assignment of OVSF codes has a important impact on resource consumption. Any two OVSF codes are orthogonal if and only if one of them is not a parent code of the other. Therefore, when an OVSF code is alloted, it blocks all of its ancestor and descendant codes from assignment because they are not orthogonal. This results in a major disadvantage of OVSF codes, called blocking property a new call cannot be supported because there is no accessible free code with the requested dispersal factor. OVSF codes can be generated recursively in a binary tree structure by using Walsh matrices or applying the following rule recursively: code Cn,i of length n generates the following two orthogonal codes of length 2n: C2n,i = [Cn,i; Cn,i] and C2n,i+1 = [Cn,i; -Cn,i], where –Cn,i denotes the inverted sequence (or binary complement) of Cn,i, n equals SF that is a power of 2, and i is an index[11]. OVSF codes have the advantage of supporting variable bit rate services, which is significant for emerging multimedia with different bandwidth requirements. OVSF codes are working as channelization codes in WCDMA. Any two OVSF codes are orthogonal if one of them is not a parent code of the other. Therefore, when an OVSF code is alloted, it blocks its entire ancestor and descendant codes from the assignment because they are not orthogonal to each other. This code blocking problem of OVSF codes can be a reason of a substantial spectral efficiency loss upto 25% [1]. Efficient channelization code management results in high code utilization and increased system capacity.

NOVSF Codes & Blocking Reduction

NOVSF codes are less flat to blocking; they are of three types mainly these codes aims to get better the utilization of OVSF codes without the overhead of code reassignments. To achieve this in TYPE1 NOVSF codes only a single layer of OVSF codes with SF is taken into thought and time multiplexing is applied to share them among channels. This implies that both time and code multiplexing are worn in NOVSF codes. All OVSF codes of the same layer are orthogonal to each other and, therefore, that do not block each other. Each code may be shared in time amongst more than one channel. The numbers of time slot in an OVSF code with SF 8 can be variable or fixed. If it is variable not fixed, then we need to set up a variable, say cycle length, to specify the number of time slots, which requires that receiver be learned about the cycle length during transmission. If we suppose that the number of time slots is fixed and equal to 64[6], in this case, allotting one time slot of an OVSF code with SF 8 would be corresponding to assigning an OVSF code with SF 512 to a channel lacking any time multiplexing. Similarly, when all 64 time slots of an OVSF code are allotted to the same channel, the data rate becomes the same as the one that would be obtained in case of allotting an OVSF code with SF 8 lacking any time multiplexing [11]. Thus, if all 64 time slots of a code are not allotted to the same channel, the data over the channel are transmitted intermittently.

Type 2 NOVSF codes can be defined in three different cases. In all cases, OVSF codes are simplified in code trees such that all the codes of code tree are orthogonal to each other. The reason why the codes in the first two cases are orthogonal is as follows. There are initially X1;X2; : : : ;Xi orthogonal codes with the same spreading factor (SF) that is equal to i, where either i = 4 or i = 8. Let code Xj, j _ i, generate nj orthogonal codes with the same SF, where n j is a power of 2[6]. All of these n j orthogonal codes with the same SF are placed on the same distinct layer of a code tree. Therefore, all codes of the resultant code tree are yet orthogonal to each other, the descendants of a code can be assigned to more than one tree layer. However type 3 of NOVSF codes are generated scientifically when there is no limit on the upper bound of SF.

Proposed Work

The whole project will comprise of three modules:

- The first module is designed to showing the code blocking probability and number of calls rejected of OVSF codes.
- The second module show the blocking probability and number of calls rejected of Type 1 NOVSF codes,
- The third module shows the blocking probability and number of calls rejected of Type 2 (Case 2) NOVSF codes.

Based on the finding of simulation results derived from the above modules a new factor termed as CUF (Code Utilization Factor) is proposed as follows

CUF = <u>(Over all requests arrived – requests rejected by the scheme)</u> **(3.1)**

(Overall requests arrived at the scheme)

CUF × 100 gives the spectrum efficiency of the proposed schemes, so that these schemes can be compared based on analytics derived from simulation results

1. MODULE - 1

It deals with the assignment of the OVSF codes. The output of the this module is a graph between blocking probability and new call arrival rate (request/minute) based on deriving analysis from the number of rejections over the new call arrival rate, this will provide a method for detailed analysis regarding the OVSF codes . It is assumed that the entire OVSF code tree is free initially and the handled data rate is R, 2R, 4R and 8R can be either 8 kbps or 16 kbps.

1.1 Algorithm for OVSF

1. Start
2. Generate the OVSF code tree using a structure with fields sf blocked, assigned, parent, right and left.
3. Initialize an array of new calls arriving with values 20,40,60,….., 500.

4. Repeat the following for each element of the array of new calls:
    A. Divide the element of the array into 4 equal groups.
    B. Repeat the following

i. For group no.1 (from left to right) arch the leaf layer "(i.e. 9th layer) for free codes by checking the block and assigned field; if blocked and assigned are 0 assign the code and make the values of fields 1, else increment the value of blocked code by 1.

ii. For group no. 2 (from left to right)Search the eight layer for free codes by checking the blocked and assigned field; if blocked and assigned fields are 0 then assign the code and make the values of fields 1, else increment the value of blocked code by 1.

iii. For group no.3 (from left to right) Search the seventh layer for free codes by checking the blocked and assigned field; if blocked and assigned fields are 0 then assign the code and make the values of fields 1, else increment the value of blocked code by 1.

iv. For group no.4 (from right to left) Search the sixth layer for free codes by checking the blocked and assigned field, if blocked and assigned fields are 0 the assign the code and make the values of fields 1, else increment the value of blocked code by 1.

    C. Sum the value of the codes blocked and assigns it to an array which is equal in dimension with new call array.

5. Calculate the blocking probability by dividing each element of code blocked array by corresponding element of the new call array.
6. Plot the graph blocking probability Vs new call arrival rate (request/minute)
7. End

2. MODULES - 2

It deals with the assignment of the Type 1 NOVSF codes. The output of this module is a graph between blocking probability and new call arrival rate (request/minute). It is assumed that the entire NOVSF code tree is free initially and the handled data rate is R, 2R, 4R and 8R where R can be either 8 kbps or 16 kbps.

2.1. Algorithm for Type 1 NOVSF Codes

1. Start.
2. Generate the NOVSF code tree layer 4; having 8 elements (codes), here each element is an array of 1*64, showing 64 slots of each code. All the element of the arrays is zero initially.
3. Initialize an array of new calls arriving with values 20, 40, 60,….., 500.

Repeat the following for each element of the array of new calls:

(a) Divided the element of the array into 4 equal groups

(b) Repeat the following

(i) For group no. 1

Search tree layer for free slots by checking the value of array element/slots. If 0 then assign the code slots and make the value of slot 1, else keep on following this till either no user is left without code or all the code slots of each code are assigned.

Check the number of users assigned, if this number is less then the number of user to be assigned take this difference as number of blocked code and add them with last computed numbers of blocked codes.

(ii) For group no. 2

Search tree layer for two free slots in the same code by checking the value of array element/slots. If 0 assign both the code slots and make value of slots 1, else keep on following this step till either no user is left without code or all the code slots of each code are assigned.

Check the number of users assigned, if this number is less than the number of users to be assigned take this difference as number of blocked codes and add them with last computed numbers of blocked codes.

(iii) For group no. 3

Search tree layer for four free slots in the same code by checking the value of array elements/slots. If 0 assign both the cod slots and make the value of slots 1, else keep following this step till either no user is left without code or all the code slots of each code are assigned.

Check the number of users assigned, if this number is less than the number of user to be assigned take this difference as number of blocked codes and add them with last computed numbers of blocked codes.

(iv) For group no. 4

Search the layer for eight free slots in the same code by checking the value of array element/slots. If 0 assign both the code slots and make the value of slots 1, else keep on following this step till either no user is left without code or all the code slots of each code are assigned.

Check the number of users assigned, if this number is less then the number of user to be assigned take this difference as number of blocked codes and add them with last computed numbers of blocked codes.

(c) Sum the values of the codes blocked and assign it to an array which is equal in dimension with new call array.

4. Calculate the blocking probability by dividing each element of code blocked array.
5. Plot the graph blocking probability Vs new call arrival rate (request/minute)
6. End

3. MODULES - 3

It deals with the assignment of the Type 2 NOVSF CODES (Case2). The output of this module is a graph between blocking probability and new call arrival rate (request/minute). It is assumed that the entire NOVSF code tree is free initially and the handled data rate is R, 2R, 4R and 8R where R can be either 8 kbps or 16 kbps.

3.1 Algorithm for Type 2 NOVSF

1. Start.
2. Generate the NOVSF code tree using a structure with field’s sf, assigned, parent, right and left.
3. Initialize an array of new calls arriving with values 20, 40, 60,….., 500.

4. Repeat the following for each element of the array of new calls:

(a) Divide the element of the array into 4 equal groups

(b) Repeat the following

(i) For group no. 1 (from left to right)

search the leaf layer (i.e.8th layer) for free codes by checking the Assigned field; if assigned field is 0 then assign the code and Make the value of field 1, else increment the value of blocked Code by 1.

(ii) For group no. 2

Search the seventh layer for free codes by checking the assigned Fields, if assigned field is 0 then assign the code and make the value of field 1, else increment the value of blocked code by 1.

(iii) For group no. 3(from left to right)

Search the sixth layer for free codes by checking the assigned field; if Assigned field is 0 then assign the code and make the value of field 1, Else increment the value of blocked code by 1.

(iv) For group no. 4 (from right to left)

Search the fifth layer for free codes by checking the assigned field; if Assigned field is 0 then assign the code and make the value of field Else increment the value of blocked code by 1.

(c) Sum the value of the codes blocked and assign it to and array which is equal in dimension with new call array.

5. Calculate the blocking probability by dividing each element of code blocked array by corresponding element of the new call array.

6. Plot the graph blocking probability Vs new call arrival rate(request/minute)

7. End

Conclusion

This technique is a powerful tool for reducing the problem of blocking calls and also to minimize the problem of call rejection. This comparison is simple and crudest algorithm as compared to other algorithms it is more effective. In this paper we show that we will use 3 modules to enhance its performance and then calculate CUF.Then it will show that which algorithm is suitable for this process. Our future work will be to implement this by using Matlab tool.

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