A Spectrum Selection Framework for Mobility Handoff in Cognitive Radio Cellular Network

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ABSTRACT
Cognitive radio (CR) offer solution by utilizing the spectrum holes in space without introducing an unacceptable fear of harmful interference for the primary user. And also solve the spectrum inefficiency and spectrum scarcity problem. That are represented the potential opportunities for non-interfering use of spectrum which requires three main tasks Spectrum Sensing, Spectrum Analysis and Spectrum Allocation. In this paper, A spectrum selection framework for mobility handoff in cognitive radio cellular network, First introduced the Spectrum decision making is to determine a set of spectrum bands by considering the application requirement as well as the dynamic nature of spectrum band and user handoff process each spectrum is characterized by jointly considering primary user activity and spectrum sensing operations. Based on this, dynamic resource management scheme is developed to coordinate the spectrum decision adaptively dependent on the time-varying cognitive radio network capacity. Load balancing base open access spectral selection method was proposed for CR spectral selection, And it provide the opportunities to improve the user experience & also increase the network capacity.

Keywords
Cognitive implementation, Resource management, Spectrum decision making, Handoff Technique, Load balancing base open access spectral selection method.

1. INTRODUCTION
Cognitive radio (CR) technology used to realize dynamic spectrum access (DSA) that enables an unlicensed user (or, secondary user) to adaptively adjust its operating parameters and exploit the spectrum which is unused by licensed users (or) primary users in an opportunistic manner. The CR technology allows secondary users (SUs) to seek and utilize “spectrum holes” in a time and location-varying radio environment without causing harmful interference to primary users (PUs). This opportunistic use of the spectrum leads to new challenges to make the network protocols adaptive to the varying available spectrum [8]. In CR (cognitive radio) network to proposed spectrum decision framework, using DSA algorithm is to provide the efficient bandwidth utlization, while guaranteeing the service quality and also reduce the spectrum inefficiency problem [1], [2]. In DSA scenario where cognitive terminal having multi-homing capability, dynamically access frequency bands assigned to different radio access networks has been considered, this gain achieved to 10 to 40% [3], [10]. CR arises to be tempting a solution to the spectral congestion problem. Co-operative sensing & External sensing algorithm are proposed, as a solution to hidden primary user problem & it can decrease the sensing time & also reduce the probability of misdetection. The developing algorithm for prediction into the future using past information can be considered as some of the open research areas [4], [6]. Propose a “spectrum assignment policy” having a tradeoff between the minimization of the call blocking rate of ongoing call for smooth handoff, this process required a two phases are, [i]. A collision between two calls for spectrum band allocation is resolved, [ii]. Spectral and allocation among a no of call is considered [5]. The load balancing scheme may increase the number of satisfied users, but may not always increase the overall system throughput **,** and To improve global resource utilization and reduce regional congestion given asymmetric arrivals and a goal requiring load balancing among multiple cells. Reduce the blocking rate of MS arrivals across the whole system by 50% to 100% or even more, It also increases system utilization and mitigates regional congestion [10]. We propose the proactive spectrum access approach & two channel Selection & switching technique, That are overcome the frequent disruptions to operation of both primary as well as secondary users, because of existing proposal take a reactive sense. To minimize disruptions to primary user and maintains reliable communication at secondary users. The proactive approach effectively reduces the interference to primary user by up to 30% & significantly decreases throughput jitters at secondary users [7]. In cooperative sensing algorithm the opportunistic use of under-utilized spectrum since they are able to sense the spectrum and use frequency bands if no Primary user is detect However, since the required sensitivity is very demanding any individual Radio might face a deep fade[9], [15].in decentralized MAC(Media Access control) opportunity to minimizes the interference caused to neighboring cells, decreases their transmission opportunities, leading to the so-called sensing efficiency problem [19].

2. SYSTEM MODEL

2.1 Handoff technique
Related work on CR (cognitive radio) based spectrum handoff falls into two categories based on the moment when SUs (secondary user) carry out spectrum handoffs. One approach is that SUs (Secondary user) perform spectrum switching and radio frequency (RF) front-end reconfiguration after detecting a PU (Primary user) namely the reactive approach. Although the concept of this approach is intuitive, there is a non-negligible sensing and reconfiguration delay which causes unavoidable disruptions to both the PU (Primary user) and the SU (Secondary user) transmissions. Handoff type is related to different mobility event, and its performance is mainly dependent on both network and user conditions, such as resource availability, network capacity, user location, etc. Thus, Cognitive radio networks require a unified mobility management scheme to exploit different handoff types adaptively to the dynamic nature of underlying spectrum bands.

2.2 Spectrum decision making

First, novel spectrum management functionalities such as spectrum sensing, spectrum sharing, and spectrum decision, and spectrum mobility are introduced. A particular emphasis is given to cross-layer design approaches from the viewpoint of both infrastructure-based network requiring central network entities and adhoc networks based on distributed coordination. The main challenge in CR networks is to integrate these functions in the layers of the protocol stack, so that the CR users can communicate reliably over a dynamic spectrum environment. Thus, the influence of these functions on the performance of the upper layer protocols, such as the network layer, and transport layer protocols are investigated, and open research issues in these areas are also outlined.

In fig 1, see the infrastructure-based CR networks consisting of multiple cells. Each cell has a single BS and its CR users. In this architecture, CR users observe their radio environments and report the results to the BS (base station). Accordingly, the BS determines proper action in support of a upper-level control node, Such as the mobility management entity (MME) in 3GPP. CR users have a single wideband RF transceiver that can sense multiple contiguous spectrum bands at the same time without RF reconfiguration. In this technique occurring two main problem that are,

1. Resource allocation: In resource allocation there is a less memory, so we not able to save large number of users.
2. Handoff technique: In our spectrum selection method only satisfy the radio network and sensor network not worth able for mobile based network

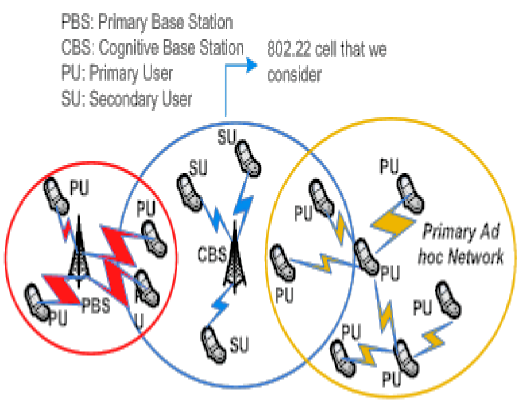

Fig:1 Cognitive Radio architecture

3. ALGORITHM DESCRIPTION

3.1 Dynamic spectrum algorithm

In DSA (Dynamic spectral access) algorithm, The Spectrum availability in CR networks varies over time and space, making it more difficult to provide seamless and reliable communications to mobile users traversing across multiple cells. For efficient mobility management, CR networks need to mitigate this dynamic spectrum availability by performing mobility management adaptively dependent on the heterogeneous network conditions. In DSA (Dynamic spectral access) scenario where cognitive terminal having multi-homing capability, dynamically access frequency bands assigned to different radio access networks has been considered. To provide the opportunities to both user and operator and then improve the user experience & increased network capacity. Compared to SINR (Signal interference to noise ratio) based hand over algorithm, the DSA algorithm has very large gain in network capacity. This gain equal to 10-40% for different value of traffic rate per cognitive terminal, also increase this gain the traffic rate also increased per cognitive terminal.

4. PROPOSED WORK

4.1 Algorithm- Load balancing base open access spectral selection method

Based on this, a minimum variance based spectrum decision is proposed for real-time applications, which minimizes the capacity variance of the decided spectrum bands subject to the capacity constraints. For best-effort applications, a maximum capacity-based spectrum decision is proposed where spectrum bands are decided to maximize the total network capacity. Moreover, a dynamic resource management scheme is developed to coordinate the spectrum decision adaptively dependent on the time-varying cognitive radio network capacity. Load balancing base open access spectral selection method was proposed for CR spectral selection, And it provide the opportunities to improve user experience & increase network capacity. Network topology includes seven wireless access nodes. Each wireless access node has Omni-directional antenna. Each wireless access node is assigned different frequency band. So, there is no interference between different wireless access nodes. Describe the spectrum capacity is denoted by $c^{CR}(s)$

$$c^{CR}(s)=E[c(s)]+\frac{T^{OFF}}{T^{OFF}+\tau}.c(s).\eta$$

τ -Represents the spectrum switching delay, T^{OFF}- Transmission time without switching in the spectrum.

To calculate the gain in the network capacity is calculated by,

$G=(T_{LBS}/T_{DSA}).100\%$

Where, T_{LBS} –QOS guaranteed network capacity in the load balancing spectral selection algorithm, guaranteed network capacity in the dynamic spectral access algorithm.

4.2 Structural design model

In fig2, explain the concept of the cognitive network, the mobility management technique to track the where the subscriber allow the call and then delivered to other service. In spectrum pool is a set of licensed spectrum band, each of its spectrum consist of multiple channel. Resource allocation it depends on the spectrum availability, first to find the available spectrum band after to allocate user in the white space spectrum. We use the spectrum handoff technique, first to sense the spectrum, after to detect the primary user, Then to find who are currently active. Based on this information spectrum holes or white space will be recognized. In spectrum selection method to use the algorithm of load balancing spectral selection method it is used to find the available spectrum band after allocate the user it depends upon the capacity allocation scheme to resolve the collision between the two calls, After to avoid the spectral inefficiency problem.

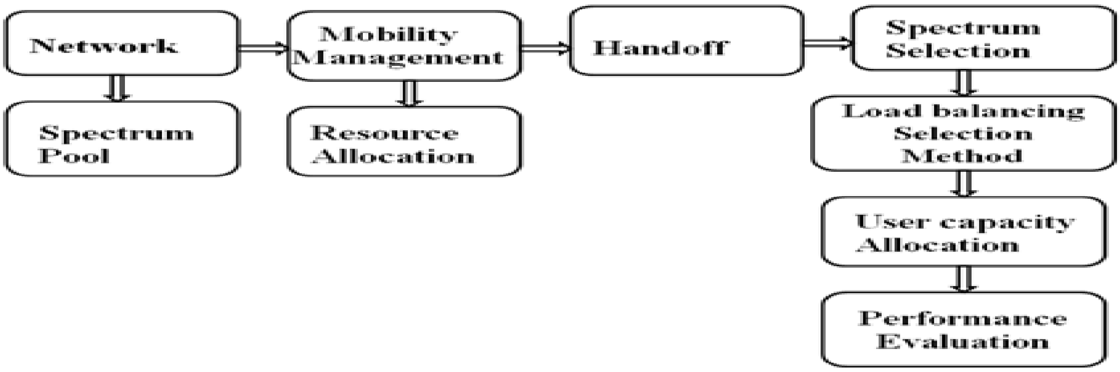

Fig2. Block diagram of CR network

5. SIMULATION RESULT

In fig 3, the infrastructure-based CR (cognitive radio) network is developed. In the network topology includes 15 wireless access nodes. Each wireless access node has Omni-directional antenna. And it assigned different frequency band. In CR network is consisting of one base-station and multiple CR users. Each user is uniformly distributed over the network coverage with the radius of 2 km. The CR network is assumed to operate in 20 licensed spectrum bands consisting of four VHF/UHF TV, four AMPS, four GSM, four CDMA, and four WCDMA bands. The bandwidth of these bands are6 MHz (TV), 30 kHz (AMPS), 200 kHz (GSM), 1.25 MHz (CDMA), and 5 MHz (WCDMA), respectively.

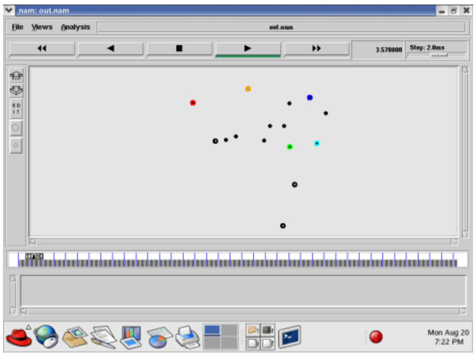

Fig 3. Node formation

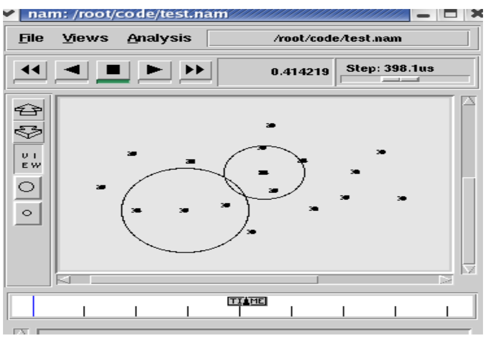

Fig 4. Handoff process

In fig 4, Users take the handoff process in within the network packet dropping will be occurred in the network this shown in the fig 5, Because of improper spectral selection. In graphical representation of fig6, Represented by, if the user capacity is increased means drop rate is also increased in the network, and also cell capacity will be reduced.

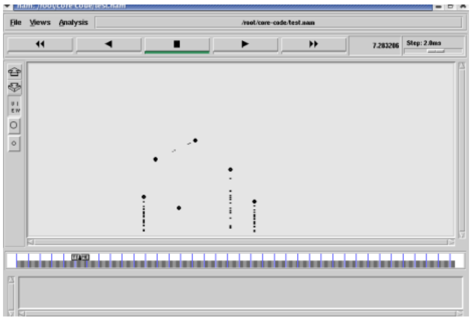

Fig 5: Packet dropping

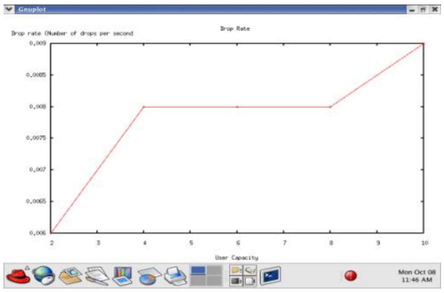

Fig 6: Graphical Representation for Droprate Vs User capacity

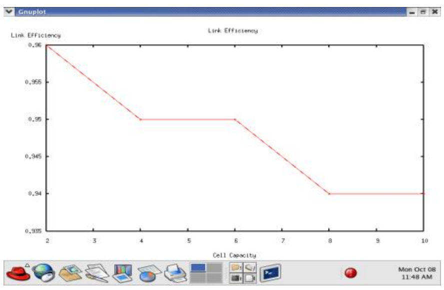

Fig 7: Link efficiency Vs Cell capacity

6. CONCLUSION

In Cognitive Radio (CR) cellular networks, the available spectrum band are vary over time and space and they are discontinuously distributed over the wide range of frequency, in the simulation result, user take the handoff process packet dropping will be occurred in the network, because of improper spectrum selection issues so, we can introduce the spectrum decision making, Its used to select the available spectrum, next we propose the load balancing-base open spectral access method, first to introduced a handoff decision mechanism to minimize quality degradation caused by user mobility. & also overcome the packet dropping. Minimization of the call blocking rate of ongoing call for smooth handoff.

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