

Quality of Service in Cognitive Radio Network

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ABOUT THE STUDY

Cognitive Radio (CR) is a new technique to solve the problem of the wireless spectrum that is not fully used. There are many issues and problems in the design and implementation of cognitive radio. Extending Quality of Service (QoS) enabled applications to CR networks which are even more challenging because unused spectrum cannot be dedicated. Unlike other wireless networks, CR poses special and unique challenges to guarantee quality of service for various flows. This study reveals the problems and issues of QoS deployment in the wireless cognitive network.

A spectrum is the range of electromagnetic radiation that enables wireless communication and is controlled by governments. Every day, the number of new wireless users and applications is growing at a very fast pace, and both have experienced moderate growth, especially over the past decade. Wireless users worldwide have reached 3.2 billion and are projected to grow 100 fold by 2013. New applications require additional allocations of unavailable spectrum, creating an artificial shortage of spectrum reallocation. Initial usage studies revealed that allocated spectrum remained unused most of the time and was also a function of geographic location and time. Other measurements of frequency occupancy that were performed showed average utilization of 5.2% in New York City and 17.4% in Chicago. Several studies measuring spectrum residence in other countries such as Spain, Singapore, Germany, New Zealand and the UK also confirm that spectrum is currently underutilized. A solution to lower utilization of allocated spectrum is Cognitive Radio (CR). A CR is defined as an intelligent device that is fully aware of its surroundings and makes decisions with the goal of achieving maximum and efficient use of the radio spectrum.

Cognitive Radio (CR)

The main purpose of Cognitive Radio (CR) is to dynamically access the free spectrum to enable communication. A common

situation consists of a CR coexisting with a Primary User (PU). PUs has the highest priority in using spectrum, but CRs can opportunistically use spectrum if PUs are not using it at the moment. The main features of CR are categorized as follows:

Spectrum sensing: Spectral sensing is an important feature of the cognitive radio. CR has the ability to survey the radio environment to find free channels, called spectrum channels, and use these free channels for transmission. Detection operations also require the ability to accurately detect the presence of the PU when he later resumes communication.

Spectrum management: Spectrum management helps find the best idle holes for CR transmission among the many available holes found by the discovery process. Appropriate holes are allocated to CRs depending on spectrum availability.

Spectrum mobility: Spectrum mobility is called changing frequency bands during data transmission because of the presence of PUs in this band. CR should switch to another idle hole not being used by a PU at that time, in order to continue transmission data. As soon as the PU needs the current frequency band, the CR should stop transmitting it, free up the hole currently occupied for the PU functioning.

Quality of Service (QoS)

Over the past decade, the development of wireless communication technology has increased exponentially, and wireless services have evolved from traditional voice services to a wide range of multimedia services varied by application. Therefore, providing QoS to these applications according to their bandwidth requirements is an important and difficult task. QoS is the performance level of service provided by a network to its users in order to achieve deterministic behavior through proper use of network resources. The meaning of QoS changes depending on the requirements of the application domain. This is the process that controls network performance and reliability. This is a complex process and modeling QoS is a difficult and arduous task. ISO 9000 defines QoS as "the extent to which a set of specific characteristics satisfies requirements".

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Received: 27-Jun-2022, Manuscript No. IJOAT-22-18971; **Editor assigned:** 30-Jun-2022, Pre Qc No. IJOAT-22-18971 (PQ); **Reviewed:** 07-Jul-2022, QC No. IJOAT-22-18971; **Revised:** 21-Jul-2022, Manuscript No. IJOAT-22-18971 (R); **Published:** 29-Jul-2022, DOI: 10.35248/0976-4860.22.13.199.

Citation: Goyal C (2022) Quality of Service in Cognitive Radio Network. Int J Adv Technol. 13:199.

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