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The Impact of Real Traffic from Twitter for 5g Network Deployment

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Abstract

The utilization of technology, particularly cellular networks, is continuously expanding. This is evident through the increasing number of mobile network operators (MNOs) users, especially in the current era where most things are accomplished online. Consequently, mobile network operators must furnish a comprehensive array of cellular network access services, not just for smartphones but also for other smart devices, to guarantee maximum coverage. With the growing interest in 5G deployment based on low band and millimeter wave communication (mm Wave) for outdoor use scenarios, such as tourist destinations, site design experts are looking for sophisticated real-time traffic data from social media like Twitter to simulate and calculate outdoor radio coverage using 3GPP 38.901 prediction models. This study used the frequencies of 700 MHz and 26 GHz, utilizing Inter-band Carrier Aggregation (CA) to increase data rates while maintaining a wide range and optimizing the number of *gNodeBs*. This research is intended to monitor the Borobudur Temple area, Indonesia, which serves as a tourist destination and one of the world's wonders, thus making it a densely populated area and inevitably requiring good network connectivity. The parameters used are Synchronization Signal Reference Signal Received Power (SS-RSRP), Synchronization Signal to Interference plus Noise Ratio (SS-SINR) and data rate. The simulation revealed that CA SS-RSRP with traffic map increased by 38.88%, SS-SINR increased by 45.05%, and the peak data rate increased from 5884.12 Mbps to 6199.88 Mbps.

Keywords: 5G *NR planning; Inter-band carrier aggregation; 700 MHz; 26 GHz; Twitter social media*

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Background to the Study

The frequency will impact resource efficiency as a limited resource with reusable qualities when not in use since unused frequencies should be recycled. To make the most of the frequency spectrum, it is suggested to talk about frequency renting patterns, spectrum pooling, and spectrum sharing. Within the next five years, the concept of shared exclusive used licensing, in which operators can cooperate in the use of frequency licenses, is anticipated to be applied. This needs to be considered since 5G technology can employ carrier aggregation and cognitive radio to improve data speed and capacity. [1].

The fact that there has been an annual rise of cellular network data traffic by more than 50% insinuates that telecommunications services have evolved into a contemporary trend of human requirements that offers swift access to information in helping human activities and improving their quality of life. The path for this technological improvement is an essential topic of discussion at every national and international conference, given the requirement to fulfill the 5G NR technology standard.

Key Aspect of 5G Technology

A key aspect of 5G technology is using higher frequency bands with bigger bandwidths to boost the attainable data throughput [2]. Due to innate radio propagation characteristics, including increased propagation loss, stronger channel correlation, low diffraction, and poor multipath settings, adding higher frequency bands for mobile cellular services is challenging [3]. Carrier Aggregation (CA) is a key component in modern wireless communication systems because it allows for more transmission capacity (BW) by combining numerous concurrent channels over a fragmented spectrum [4]. This research aimed to obtain a 5G NR network design in the Borobudur tourist area at a frequency of 700 MHz and 26 GHz using CA. This tourist site attracts millions of tourists worldwide and is one of the world's wonders.

Conclusion

The CA 700 MHz and 26 GHz obtained excellent results using a real traffic map from Twitter. Four sites are required in an area of 35.02 km2 with a real traffic map, and five sites are required without a real traffic map from Twitter; this is equal to the number of sites required at 700 MHz with a slight increase in SS-RSRP and SS-SINR and a significant increase in Data Rate. On this basis, it is clear that CA is an innovative approach to obtaining higher data rates and can use a real traffic map from Twitter to precisely position the site according to user presence on the 26 GHz frequency while maintaining an outstanding range of 700 MHz. Although 700 MHz is According to (Ahamed 2021) sufficient for the Borobudur Temple area, Carrier Aggregation and the traffic map, especially with 26 GHz in this scenario, highly increased the Data Rate. As a result, with many existing users, there would be no traffic load. In essence, 5G network planning comprises coverage planning and capacity planning. However, since this research only addressed coverage planning, it is suggested that further research examining capacity planning can be continued.

References

Ahamed M. M. & Faruque, S. (2021). *5G network coverage planning and analysis of the deployment challenges, Sensors, 21*(19), DOI: 10.3390/s21196608.