How to Cite:
Ajit, P. S., Rohini, V., Kirubanand, V. B., Balamurugan, E., & Vinay, M. (2022). Dynamic ways of using DAS with reduced call drops and hands-off. *International Journal of Health Sciences*, *6*(S2), 7546–7551. https://doi.org/10.53730/ijhs.v6nS2.6828

Dynamic ways of using DAS with reduced call drops and hands-off

Princy S Ajit
CHRIST (Deemed to be University), Bangalore, India
Corresponding author email: princy.ajit@cs.christuniversity.in

Rohini V
CHRIST (Deemed to be University), Bangalore, India
Email: rohini.v@christuniversity.in

Kirubanand V B
CHRIST (Deemed to be University), Bangalore, India

Balamurugan E
University of Africa, Toru-Orua, Nigeria

Vinay M
CHRIST (Deemed to be University), Bangalore, India

***Abstract*---**In today's digital era people are controlled by digital gadgets, Cellular Systems are the backbone of these gadgets or cellular systems. Current technologies are offering more facilities to their users and also have a few challenges. In a cellular system, call dropping is one of the challenging problems, which is faced by a mobile user in a network due to many reasons like availability of free channels, low level of system configuration, high traffic rate, etc. In this research study, among various failures handover failure is one of the major reasons for call drops. A dropped call happens when your phone gets disconnected somehow from the cellular network. Usually, this happens because of poor cell signal wherever you are that causes the call to drop. When a handover failure exists, a call drop occurs. Many different techniques are proposed and introduced to remove the call drop problem. In this research proposed a proper load balancing for cellular signals using networking for efficient call drop-down solutions with the concept of the distributed antenna system.

***Keywords*---**handover, drop call rate, efficient resource management, sectoring, cell splitting, distributed antenna system, dynamic load balancing**.**

Introduction

Digital gadgets are part of human life today. With over one billion smartphones in use worldwide today, and that number expected to double in the next two years, it's no surprise that dropped calls are amongst the most frustrating aspects of daily life. Expectations from the users are increasing in terms of features like call bearing, call waiting, missed call alert, etc. Moreover, the regulatory bodies are stringent in adapting policies. Any compromise in this era of wireless telecommunications Telecom sector Standard of Services (QoS) is not admissible. The subscribers/customers pay the price handsome amount of money for the facilities. Regrettably, customers are always complaining that they unpredictably perceive this, undesirable and regular stoppage of successfully formed appeals. Dropped calls are, at best, an annoyance when it comes to business communications. At foulest, they could ruin a deal that is about to close. That sudden and unwanted termination of established calls from the Telecom Service Providers (TSPs) side is known as Call Drops. There are a number of reasons why a cell phone call might drop, which can be categorized as problems with the carrier, problems in own local environment, and finally problems specifically with mobile devices. Following are some of the reasons for call drops (i) Tower Handoffs (ii) Distance from cellular towers (iii) Construction Materials and (iv) Damaged Equipment. The research paper is organized as follows chapter I Introduction, Chapter II review of literature, Chapter III explained with types and reasons for call drops, Chapter IV proposed scheme for managing call drops, and Chapter V conclusion.

Literature Survey

In cellular networks, call dropping occurs when a base station is failed to provide free channels to allocate users for calls. It may be for a new call tried by a mobile user or a call which is ongoing and mobile station being in moving state and trying for handover for continuing of call [1]. GSM (Global System for Mobile Communication) has become the most used term in the present world. This is because communication is an important part of our life. Sometimes many problems play a role in call disconnection. The delay in identification of the exact reason for a call drop results in low quality of service of the network which may decrease the reputation of that network provider. The demand for GSM communication by people could make congestion and when congestion occurs call drop occurs. This is reported by the GSM Association. People expect from their network providers like maximization of service coverage area, network usage and minimization of congestion, and the optimum traffic balancing among the different frequencies.

Samanta et al. analyzed the various systems for their sensitivity and reliability measures improvement, Haring et al estimated the dropping probabilities of cellular networks by queuing handoff in place of reserving guard channels, Ohaneme et al. developed a model of a cell in a wireless communication network where the effect of handoff arrival and the utilization of guard channels was included, Boggia et al proposed cell splitting to improve the channel capacity of a cellular system, Re et al. analyzed the phenomenon of call drops extensively and Krishan Kumar, discussed various schemes like guard channel prioritization

scheme, auxiliary station scheme, handover queuing prioritizing scheme to reduce the effect of call dropdown.

Further, Ramanath et al. considered small cell networks and studied the impact of user mobility. Assuming Poisson call arrives at random positions with random velocities, they discussed the characteristics of handovers at the boundaries and derived explicit expressions for coal block and call drop probabilities using tools from Spatial Queuing Theory. Dharmaraja et al. denied the fact that the handoff process, call blocking and call dropping are Poissonian phenomena and provided numerical solutions for new and handoff call blocking probabilities with an arbitrary handoff interarrival time distribution and they used the mathematical theory to derive numerical techniques for important QoS measures and Gaur discussed the importance of DCA, FCA, and HCA along with the concept of cell splitting and cell sectoring. After reviewing the state of art literature, the most serious is considered here is traffic congestion. A research problem is defined to establish a dynamic load balancer using distributed antenna system which can able to control the handoff failure.

Types and Reasons for Call Drop

Cell phone signals are radio waves generally transmitted at a set series of frequency bands between 700 and 2100 MHz. Like any other radio signal, cell signals can be subject to interference or obstruction. A dropped call happens when the phone gets disconnected somehow from the cellular network. Usually, this happens because of poor cell signal wherever you are that causes the call to drop. Many reasons are identified for occurring of call drops as Radiofrequency call drop (RF call drop), Handover failure, low level of system configuration settings, etc. [2, 3]

Radiofrequency Call Drop

RF call drop is due to downlink and uplink failure. As we know in presence of several interferences in downlink and uplink, MS cannot decode SACCH (Slow Associated Control Channel). SACCH carries the system information message necessary for call connection. When MS fails to decode the SACCH, it releases the radio channel connection abruptly which results in a call drop. [2, 3] Following are some of the reasons for RF call drop:

1. Weak coverage area and radio signal.
2. Intra-network interference.
3. Absence of proper radio parameter settings.
4. Hardware failure.
5. Power failure.

Signal strength is measured in decibel milliwatts (dBm). A strong cell phone signal is one that exceeds -85 dBm, and having a strong signal is the first step toward having clear, high-quality mobile service. While the bars on mobile phone are intended to measure signal strength, they also measure the quality of the signal or its signal-to-noise ratio. Because different carriers and phone manufacturers interpret the overall data in their own ways, the readout isn't

particularly accurate or reliable. Further, The distance between user and the nearest cell tower when calls keep dropping, this is almost always the first thing. After all, cellular signals are radio frequency waves that behave in the same way as any other RF signal. Consider the FM radio in your car. If the receiver (in this case, your cell phone or tablet) is too far from the signal source – in this case, a cell tower – the signal will be weak or even undetectable.

Handover Failure

Handover failure could be caused by unavailable time slots due to high traffic, congestion, low signal strength, or poor quality on the target cell. Handover can fail due to hardware issues in target cells, most likely TRX or time slot issues. If the handover attempt fails, MS attempts to reconnect to the old channel. If it can't, the call is dropped. After a penalty time, the handover attempt is repeated. As we know that cell size is limited, and an MS is always in a moving state from one place to another. Sometimes it moves from one cell to another neighboring cell. To continue its call base station, need to perform a handover. In handover, the base station transfers the active call from one cell to another cell without disturbing the call. Handover is based on the signal strength received by MS from the current base station.[1,7] When a mobile station is moving from one cell towards its neighboring cell the received signal strength of the mobile station decreases as it is moving far from its base station.

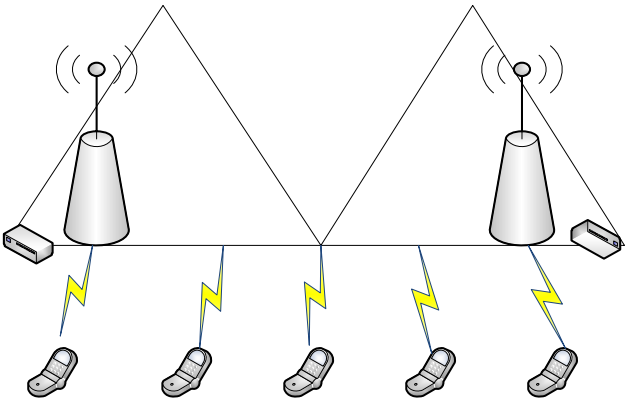

Figure 1: Handoff issue Explanation

Proposed Scheme to Control Call Drop

The proposed solution is to use a dynamic load balancer on DAS (Distributed Antenna System), which provides mobile coverage, where the coverage, capacity, or quality is not up to the mark. A distributed antenna system, or DAS, is a network of spatially separated antenna nodes that are linked to a common source via a transport medium to provide wireless service within a geographic area or structure. DAS antenna elevations are typically close to or below the clutter level, and node installations are small. An indoor distributed antenna system (iDAS) or an outdoor distributed antenna system (oDAS) can be deployed (an oDAS).(Fig 1a)

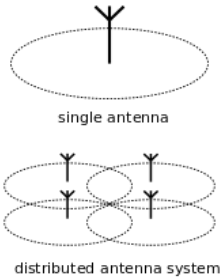

Fig.1a Distributed Antenna System

A load balancer is a device that serves as a reverse proxy, distributing network or application traffic across multiple servers. Load balancers are used to increase application capacity (concurrent users) and reliability. It is deployed to a mobile network. In this system, having 'N' no of antenna set up so users can have more efficient communication with reduced call drops. We can achieve this with my approach to managing DAS in the most efficient way.

Our proposed model is as follows, we will be having a system installed in a different distributed antenna which will be using the network dynamically when the user requests it and at the other time antenna will be in the idle state.

- Install the Load balancing system in Distributed Antenna
- If the load of DAS exceeds
  - Enable Additional DA
- Else
  - Keep it in Idle state

In this pattern, if the DAS works, it will be very efficient in many ways like reduction in cost, electricity, and resources which in turn will help different mobile network providers to have fewer call drops and handoffs.

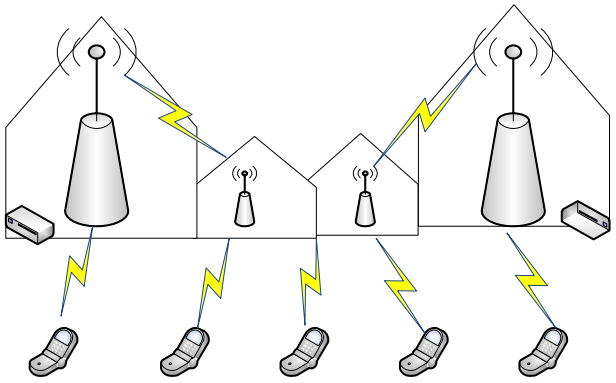

Figure 2: Dynamic Load Balancer on DAS

Conclusion

For nearly a year, call drops have plagued mobile subscribers, particularly the urban population. Call drops have become a global topic as a result of campaigns such as #NoCallDrops. Since then, various outlets have joined the debate, resulting in increased public awareness of the issue. It mandates researchers to provide the optimal solution for the global issue. The proposed research is a conceptual model to attain the solution with minimal cost.

References

1. Vinay Prakash Sriwastva, Jalnesh Singh, Vinay Kumar Verma,"Decreasing Call blocking rate by using optimization technique" International Journal of Science and Research Publications, Volume 4, Issue 6, June 2014
2. Ram, M., & Kumar, A. (2014). Performability analysis of a system under 1-out-of-2: G scheme with perfect reworking. *Journal of the Brazilian Society of Mechanical Sciences and Engineering*
3. Samanta, R. K., Bhattacharjee P., Sanyal G., Performance Analysis of Cellular Wireless Network by Queuing Priority Handoff calls. *International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering*
4. Haring G., Marie R., Puigjaner R., Trivedi K., Loss Formulas and their application to Optimisation for Cellular Networks, *IEEE Transaction Vehicular Technology*
5. Ohaneme, C., Onoh, G., &Ifeagwu, E. Improving Channel Capacity of a Cellular System Using Cell Splitting. *International Journal of Scientific and Engineering Research*
6. Boggia, G., Camarda, P., D'alconzo, A., Biasi, A. D., &Siviero, M..Drop Call Probability in Established Cellular Networks: From data Analysis to Modelling. *IEEE 61st Vehicular Technology Conference*.
7. Handoff and Drop Call Probability: A Case Study of Nigeria's Global System for Mobile Communications (GSM) Sector *Rex Ndubuisi Ali Department of Electrical and Systems Engineering, University of Pennsylvania*
8. Ramanath S., Kavitha, V., Altman, E., Impact of mobility on call block, call drops and optimal cell size in small cell networks
9. Dharmaraja, S., Trivedi, K.S., Logothetis, D., Performance modeling of wireless networks with generally distributed handoff interarrival times. *ELSEVIER-COMPUTER COMMUNICATIONS*
10. Gaur, P., (2016), A Review of Menace of Call Drops in India and Possible Ways to Minimize It *International Journal of Mathematical, Engineering and Management Sciences*