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Review on Call Transitions Model with Dis-connectivity Parameter in Dual SIM Mobile

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Abstract: *Nowadays, a person has to use the Internet to complete many tasks because many things depend on it. The purpose of this review study was to assess call drop, congestion, disconnectivity, non-connectivity challenges. Numerous approaches are offered based on the explanation of how issues with Internet connection develop, and the Markov chain model is utilized to choose the best course of action.*

Keywords: disconnectivity

I. INTRODUCTION

Two operators' relative shares of internet traffic can be compared using Markov Chain models. The idea is to model the internet traffic flow between the two operators as a Markov Chain, where the states represent the different amounts of traffic on each operator's network. Transitions between states would represent changes in the traffic share from one operator to the other, and the probabilities of these transitions would reflect the likelihood of these changes.

II. MARKOV CHAIN MODEL

Let S_1 and S_2 be two SIMs in a mobile. User is allowed to choose any of S_1 and S_2 based on faith, offers, reputation and quality of service. When he fails to connect any one SIM then shifts to other one. He toggles between two SIMs in n attempts if fails to connect or leaves the dialing process after any attempt. When connects, then faces disconnectivity problem.

Let $\{D^{(n)}, n \geq 0\}$ be a markov chain having transitions over the state space $\{S_1, S_2, Z, L\}$, where

State S_1: Corresponds to the user dialing a call through the first SIM S_1

State S_2: Corresponds to the user dialing a call through second SIM S_2

State Z: Corresponds to success obtained in call connection

State L: User leaving (abandon) the attempt of connecting process

The $D^{(n)}$ stands for state of random variable D at n^{th} attempt $(n \geq 0)$ by the user. Some underlying assumptions for the proposed model are:

The user initially chooses one of the two SIM, SIM S_1 with probability p and SIM S_2 with probability $(1-p)$. The p is termed as initial share of SIM in mobile.
User has two choices after each failed attempt:-
he can either leaves with probability p_L or
switches to the other SIM for a new trial.

The congestion probability that the call attempt through the SIM S_1 fails is c_1 and fails through the SIM S_2 is c_2.

The connectivity attempts of user between SIMs are on dial-by-dial basis, which means if the dial on S_1 is congested in k^{th} attempt $(k > 0)$ then in $(k+1)^{th}$ attempt user shifts to S_2. If this also fails, user switches to S_1

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Whenever call connects either through S_1 or S_2, we say system reaches to the state of success in n attempts.

The user can terminate the dialing process is marked as system to the leave state L at n^{th} attempts with probability p_L (either from S_1 or from S_2).

When connected call is suddenly disconnected either of S_1 or of S_2 we say it disconnectivity, it bears S_1 with probability d_1 and operator S_2 with probability d_2.

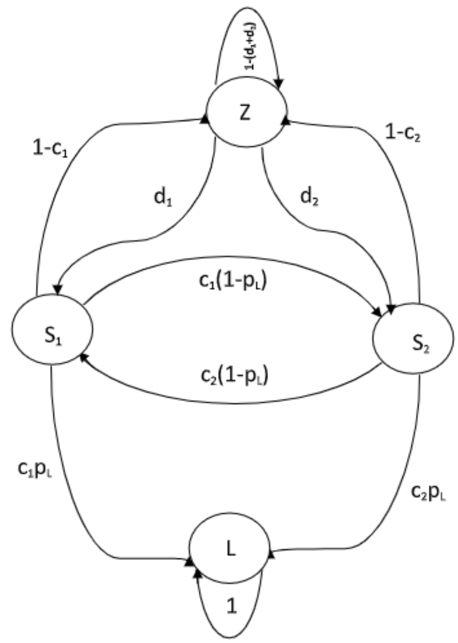

Fig 3 Transition Diagram

While occurring disconnectivity, the return back from success state to SIM $S_i(i = 1,2)$ is based on initial transition from S_i .By disconnectivity the system returns back to the same SIM from where it reaches again to the success state (Z).

From state Z user cannot move to the leave state L.

State Z and L are absorbing state.

The diagrammatic form of user's behavior can be modeled by a four state discrete time based Markov model whose transition diagram is in Fig 3.

The initial probabilities for user before the first call attempt selecting any one of SIMs are

$$\left.\begin{aligned} P\left[D^{(0)} = S_1\right] &= p \\ P\left[D^{(0)} = S_2\right] &= (1-p) \\ P\left[D^{(0)} = Z\right] &= 0 \\ P\left[D^{(0)} = L\right] &= 0 \end{aligned}\right\} \quad \ldots(1)$$

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States ($X^{(n)}$)

$X^{(n)}$	S_1	S_2	Z	L
S_1	0	$c_1(1-p_L)$	$1-c_1$	$c_1 p_L$
S_2	$c_2(1-p_L)$	0	$1-c_2$	$c_2 p_L$
Z	d_1	d_2	$1-(d_1+d_2)$	0
L	0	0	0	1

The transition probability matrix

III. TWO-CALL AND MARKET BASED ANALYSIS

Tiwari Kumar Virendra and Shukla D. (2023), examines, the impact of several kinds of criminals on the distribution of internet traffic using a Markov Chain model. Users can be divided into two groups: users who commit crimes and users who don't. Crime users were further classified into two groups: fully and partially criminal. To analyze the user's traffic better, a simulation research is being conducted.

IV. CALL-BY-CALL AND USER BEHAVIOUR BASED ANALYSIS

Thakur Sanjay and Jain Parag(2013) described the competition between mobile service providers and operators starts as soon as dual-Sim phones become commonplace in the country. Call congestion frequently forces users to attempt contacting their Sim number numerous times before they are able to connect. A call-by-call feature will allow the user to switch Sims while the process of repeated calling is in progress. In this research, a Markov chain is proposed as a prediction model to analyze user behavior in a dual Sim mobile environment. This model predicts the impact of congestion on the initial traffic share among the Sims.The first traffic sharing pattern in dual-Sim mobile is explained by the proposed User Behavior Prediction Model. The likelihood of competition congestion has a big impact on the rise in the proportion of loyal S1 customers. Numerous SIM card holders select the smaller service providers.

V. CALL-BY-CALL AND STRATEGIES BASED ANALYSIS

Johannes K. Chiang and Yao-Hung Lin (2014 examined the business relationships between ISPs. The report also suggests routing layouts and service binding techniques. diverse competitive settings call for diverse routing solutions. Therefore, the model is meant to direct strategies for competitive capacity allocation. In this research, the business relationship between ISPs and the current Internet environment in the majority of nations outside the USA was taken into consideration. There are currently other corporate types available for linked members, such as ICP, hosting providers, and access providers. However, our method is limited to ISPs. The author sees this as a research limitation since complex relationships cannot be explained by the new Internet business model or applied to our 1-step Markov Chiang model since all hosting providers and ICPs connect to an ISP before connecting to an IX. Further 2-step Markov Chain research into more complex ISP relationships pertaining to the worldwide Internet ought to be carried very soon. Important considerations include cost, bandwidth, and service capacity, especially in Internet-based business ventures. As the investigation continues, analyzing price strategy and capacity allocation in a competitive IX environment will be a pertinent area of study.

VI. CALL-BY-CALL AND FAVOURED DISCONNECTIVITY BASED ANALYSIS

Thakur Sanjay and Shukla Diwakar (2010) presented the Iso-share analysis of Internet traffic between the two operators. A simulation research is conducted to support the conclusions, and a Markov chain model is used for analysis. A model explains how users behaved when an operator gave them two new services. Iso-share curves demonstrate that they consider disconnectivity when putting together their quality-of-service bundle and create corresponding marketing strategies. In order to attain a predetermined end share, the proposed Markov chain parameters s_1, s_2 related to quality-favoured disconnectivity have a significant impact on managing and lowering the initial share p of customers in the market. Further research shows that when self-blocking is high in an operator's network, preferred disconnectivity regulates traffic share loss. In order to increase the value of this parameter and increase their traffic share in the cutthroat market, Internet service providers (or operators) are advised to implement preferred. Each call drop results in preferred disconnectivity and undoubtedly improves share if an operator provides a brief period of free Internet access.

VII. CALL-BY-CALL AND MARKET BASED ANALYSIS

Chiang J.K. and Huang K.(2007), simulated the behavior of IXP/SP market rivalry and draw the conclusion that exchange providers' market share would decrease as a result of market competition, this study explores a new research topic and offers a cybernetic traffic model in the IXP/SP environment with regard to e-Services. Both routing and service binding techniques are presented in this paper. Routing techniques vary depending on the different competitive settings. This leads to a model that is meant to direct pricing strategies that are competitive and capacity allocation for intelligent service decision support.

This work uses a Markov Chain to create a traffic model for the Internet service exchange (IX) environment. First, the operation and topologies of the network platforms are examined in terms of workload and traffic functions. It is useful for modeling traffic sharing and market rivalry, and it helps predict risks. This work is original and has not yet been replicated, as far as we know. We can simulate the erosion of market share caused by competition between two exchange providers by using this model. This study uses the model that has been presented to show that smaller competitors in the Internet exchange market can still make money from it even if their Quality of Service (QoS) isn't as good as that of the larger provider. The study also included a number of routing strategies that include the competitive Internet exchange environment. The logical propensity to create more IXPs and the strategy for the SPs to survive are terminated by the result.

VIII. CONCLUSION

In this paper we study how problems with Internet connections evolve, offer several approaches based on interpretation, and use Markov chain models to choose the best course of action. Markov chain model is used to study how traffic share is distributed among operators and how quality of service is measured using call-to-call effort, two-call effort, two markets and disconnectivity.

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