Optimal Analysis of a Queuing Model based Communication Network

N. Thirupathi Rao, Debnath Bhattacharyya, V. Madhusudhan Rao, K. Srinivasa Rao, P. Srinivasa Rao, Tai-hoon Kim

Abstract*—Queuing model based communication network models development was increasing a lot in the recent days. The actual setup of the network and analyzing the performance of such networks are becoming the tough part day to day observations. Hence, the authors now a day's tries to model the communication network models in the form a queuing model and trying to analyze the performance of such networks. In the similar fashion, in current article also, the authors tried to develop a communication network model such that to analyze the performance. The arrivals considered for the model are the compound Poisson arrivals and the form of the arrivals is in bulk. The current network model considered is having the two stage arrivals and the performance was analyzed in the form of tables and graphical representations. Numerical representations are displayed to examine the impact of changes in input parameters on framework execution measures. With reasonable cost contemplations, the ideal working strategies of the communication networks are determined and broke down. It is watched that the compound Poisson binomial mass landings dissemination parameters have noteworthy impact on framework execution measures. Dissecting the two phase coordinate landings enhance the system execution and diminish clog in cradles and mean postponements.

Keywords*-- Optimal performance, network, communication, bulk arrivals, bandwidth, dynamic bandwidth, communication networks, utilization, loss of packets, queuing models.

I. INTRODUCTION

Communication networks displaying is an essential for plan and investigation of numerous communication frameworks [1, 2]. It is hard to lead research centre examinations under factor stack conditions, the communication organize models are created with different suspicions on landing forms, transmission forms, designation, steering and stream control systems.

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For better usage of assets and to enhance nature of administration parcel exchanging is utilized over circuit or message exchanging. Much work has been accounted for in writing in regards to communication systems with blockage control procedures. Bit dropping is one of the typical strategies received for blockage control.

In this technique, the thought is disposing of certain segment of benefit, for example, minimum huge bits with a specific end goal to diminish the heap. In any case, the bit dropping makes changes in voice quality because of a progressively fluctuating piece rate amid a cell transmission [3]. To keep up nature of administration and to lessen the clog in cradles another transmission system dynamic data transfer capacity designation technique is used as an option and effective control procedure [4].

In every one of the papers alluded above, they expected that the landings are single and take after Poisson process. In any case, in packetized exchanging the message that touches base to the source are changed over into an arbitrary number of parcels and land to the cushions in mass. In any case, in these papers likewise the creators considered that the entries to the system are to be first cradle as it were there [5]. For instance, in media communications there are some neighbourhood calls and some STD calls where the STD calls may straightforwardly touch base to the second cushion. To break down this kind of frameworks, a two hub pair communication networks coordinate with dynamic data transfer capacity allotment having two phase coordinate compound binomial Poisson entries is produced and broke down [6].

II. QUEUING MODEL

Consider two-transmitters pair correspondence organizes in which the messages touch base to the system are changed over into an irregular number of bundles [7]. The landing procedure of the messages is arbitrary and various parcels (X) that a message can be changed over takes after a binomial dissemination with parameters m and p i.e., the entry modules takes after a compound Poisson binomial process with composite entry rate $\alpha 1$. E(X), $\alpha 2$ [8].

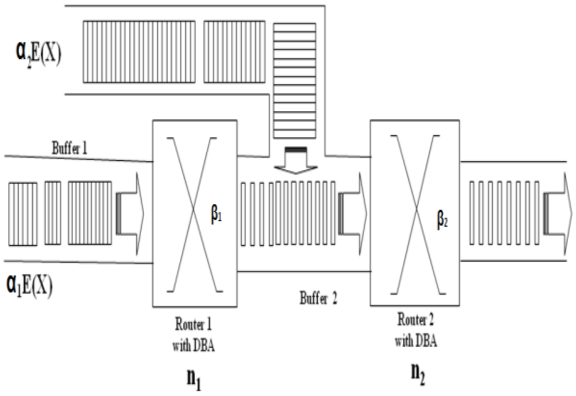


Fig 1. Network model with arrivals

III. OPTIMIZED MODEL PARAMETERS

In this segment, we infer the ideal working arrangements of the correspondence organizes under investigation [9]. Here, it is expected that the specialist co-op of the correspondence arrange is keen on augmentation of the benefit work at a given time t. Let the specialist co-op gets a measure of Ri units per each unit of time of the framework occupied at ith transmitter (i=1, 2). As it were, he gets income of Ri units per each unit of throughput of the ith transmitter. In this manner, the aggregate income of the correspondence arrange at time t is,

R (t) =R_1. (Number of packets transmitting through transmitter 1) + R_2. (Number of packets transmitting through transmitter 2)

(1)

$$R(t)=R_1\beta_1\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1 t}\right)}{r\beta_1}\right]\right]$$
$$+R_2\beta_2\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\left({}^{k_1}C_r\right)\left({}^{r}C_J\right)\left(\frac{\beta_1}{\beta_2-\beta_1}\right)^r\left(\frac{1-e^{-[J\beta_2+(r-J)\beta_1]t}}{J\beta_2+(r-J)\beta_1}\right)\right]\right.\right.$$
$$\left.\left.+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}\left({}^{k_2}C_s\right)(-1)^s\left(\frac{1-e^{-\mu_2 k_2 t}}{\mu_2 k_2}\right)\right]\right\}\right\}$$

(2)

C (t) = A- C_1*(standard waiting time of a client in transmitter 1) -C_2*(standard waiting time of a client in transmitter 2)

(3)

$$C(t)=A-C_1.\frac{\frac{\alpha_1}{\beta_1}\left[\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}.k_1\left(1-e^{-\beta_1 t}\right)\right]}{\beta_1\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1 t}\right)}{r\beta_1}\right]\right]}$$

$$-C_2.\frac{\frac{\alpha_1}{\beta_2}\left(\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}k_1\right)\left[\left(1-e^{-\beta_1 t}\right)+\frac{\beta_2}{\beta_2-\beta_1}\left(e^{-\beta_2 t}-e^{-\beta_1 t}\right)\right]+\frac{\alpha_2}{\beta_2}\left(\sum_{k_2=1}^{\infty}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}k_2\right)\left(1-e^{-\beta_2 t}\right)}{\beta_2\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\left({}^{k_1}C_r\right)\left({}^{r}C_J\right)\left(\frac{\beta_1}{\beta_2-\beta_1}\right)^r\left(\frac{1-e^{-[J\beta_2+(r-J)\beta_1]t}}{J\beta_2+(r-J)\beta_1}\right)\right]+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}\left({}^{k_2}C_s\right)(-1)^s\left(\frac{1-e^{-\beta_2 k_2 t}}{\beta_2 k_2}\right)\right]\right\}\right\}}$$

(4)

Substituting the values of R (t) and C (t) from equation (3) and (4) respectively we get total cost function as,

$$P(t)=R_1\beta_1\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1 t}\right)}{r\beta_1}\right]\right]$$

$$+R_2\beta_2\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\left({}^{k_1}C_r\right)\left({}^{r}C_J\right)\left(\frac{\beta_1}{\beta_2-\beta_1}\right)^r\left(\frac{1-e^{-[J\beta_2+(r-J)\beta_1]t}}{J\beta_2+(r-J)\beta_1}\right)\right]\right.\right.$$

$$\left.\left.+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}\left({}^{k_2}C_s\right)(-1)^s\left(\frac{1-e^{-\mu_2 k_2 t}}{\mu_2 k_2}\right)\right]\right\}\right\}$$

$$-C_1.\frac{\frac{\alpha_1}{\beta_1}\left[\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}.k_1\left(1-e^{-\beta_1 t}\right)\right]}{=\beta_1\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1 t}\right)}{r\beta_1}\right]\right]}$$

$$-C_2.\frac{\frac{\alpha_1}{\beta_2}\left(\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}k_1\right)\left[\left(1-e^{-\beta_1 t}\right)+\frac{\beta_2}{\beta_2-\beta_1}\left(e^{-\beta_2 t}-e^{-\beta_1 t}\right)\right]+\frac{\alpha_2}{\beta_2}\left(\sum_{k_2=1}^{\infty}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}k_2\right)\left(1-e^{-\beta_2 t}\right)}{\beta_2\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\left({}^{k_1}C_r\right)\left({}^{r}C_J\right)\left(\frac{\beta_1}{\beta_2-\beta_1}\right)^r\left(\frac{1-e^{-[J\beta_2+(r-J)\beta_1]t}}{J\beta_2+(r-J)\beta_1}\right)\right]+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}\left({}^{k_2}C_s\right)(-1)^s\left(\frac{1-e^{-\beta_2 k_2 t}}{\beta_2 k_2}\right)\right]\right\}\right\}}$$

(5)

To obtain the optimal values of β_1 and β_2, maximizing P (t), with respect to β_1 and β_2 and verify the hessian matrix $\frac{\partial P(t)}{\partial \beta_1}=0$ implies

$$\frac{\partial P(t)}{\partial\beta_1}=R_1.\beta_1\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\,{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1 t}\right)}{r\beta_1}\right]\right]$$

$$+R_2.\beta_2.\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}({}^{k_1}C_r)({}^{r}C_J)\left(\frac{\beta_1}{\beta_2-\beta_1}\right)^r\left(\frac{1-e^{-[J\beta_2+(r-J)\beta_1]t}}{J\beta_2+(r-J)\beta_1}\right)\right]\right.\right.$$

$$\left.\left.+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}({}^{k_2}C_s)(-1)^s\left(\frac{1-e^{-\mu_2 k_2 t}}{\mu_2 k_2}\right)\right]\right\}\right\}$$

$$-C_1.\frac{\dfrac{\alpha_1}{\beta_1}\left[\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}.k_1\left(1-e^{-\beta_1 t}\right)\right]}{=\beta_1\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\,{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1 t}\right)}{r\beta_1}\right]\right]}$$

$$-C_2.\frac{\dfrac{\alpha_1}{\beta_1}\left(\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}k_1\right)\left[\left(1-e^{-\beta_1 t}\right)+\frac{\beta_2}{\beta_2-\beta_1}\left(e^{-\beta_2 t}-e^{-\beta_1 t}\right)\right]+\dfrac{\alpha_2}{\beta_2}\left(\sum_{k_2=1}^{\infty}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}k_2\right)\left(1-e^{-\beta_2 t}\right)}{\beta_2.\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}({}^{k_1}C_r)({}^{r}C_J)\left(\frac{\beta_1}{\beta_2-\beta_1}\right)^r\left(\frac{1-e^{-[J\beta_2+(r-J)\beta_1]t}}{J\beta_2+(r-J)\beta_1}\right)\right]+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}({}^{k_2}C_s)(-1)^s\left(\frac{1-e^{-\beta_2 k_2 t}}{\beta_2 k_2}\right)\right]\right\}\right\}}=0$$

(6)

$\dfrac{\partial P(t)}{\partial\beta_2}=0$ Implies

$$\frac{\partial P(t)}{\partial\beta_2}=R_1.\beta_1\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\,{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1 t}\right)}{r\beta_1}\right]\right]$$

$$+R_2\beta_2.\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}({}^{k_1}C_r)({}^{r}C_J)\left(\frac{\beta_1}{\beta_2-\beta_1}\right)^r\left(\frac{1-e^{-[J\beta_2+(r-J)\beta_1]t}}{J\beta_2+(r-J)\beta_1}\right)\right]\right.\right.$$

$$\left.\left.+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}({}^{k_2}C_s)(-1)^s\left(\frac{1-e^{-\mu_2 k_2 t}}{\mu_2 k_2}\right)\right]\right\}\right\}$$

$$-C_1.\frac{\dfrac{\alpha_1}{\beta_1}\left[\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}.k_1\left(1-e^{-\beta_1 t}\right)\right]}{=\beta_1\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\,{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1 t}\right)}{r\beta_1}\right]\right]}$$

$$-C_2.\frac{\dfrac{\alpha_1}{\beta_1}\left(\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}k_1\right)\left[\left(1-e^{-\beta_1 t}\right)+\frac{\beta_2}{\beta_2-\beta_1}\left(e^{-\beta_2 t}-e^{-\beta_1 t}\right)\right]+\dfrac{\alpha_2}{\beta_2}\left(\sum_{k_2=1}^{\infty}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}k_2\right)\left(1-e^{-\beta_2 t}\right)}{\beta_2.\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}({}^{k_1}C_r)({}^{r}C_J)\left(\frac{\beta_1}{\beta_2-\beta_1}\right)^r\left(\frac{1-e^{-[J\beta_2+(r-J)\beta_1]t}}{J\beta_2+(r-J)\beta_1}\right)\right]+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}({}^{k_2}C_s)(-1)^s\left(\frac{1-e^{-\beta_2 k_2 t}}{\beta_2 k_2}\right)\right]\right\}\right\}}=0$$

(7)

The determinant of the Hessian matrix is,

$$|D|=\begin{vmatrix}\dfrac{\partial^2P(t)}{\partial\beta_1^{\,2}} & \dfrac{\partial^2P(t)}{\partial\beta_1\partial\beta_2}\\[2ex] \dfrac{\partial^2P(t)}{\partial\beta_1\partial\beta_2} & \dfrac{\partial^2P(t)}{\partial\beta_2^{\,2}}\end{vmatrix}<0$$

(8)

Substituting the values of β_1^* and β_2^* in equation (6), we get the optimal value of the profit at given time t as

$$P^*(t)=R_1.\beta_1^*\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\,{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1^* t}\right)}{r\beta_1^*}\right]\right]$$

$$+R_2.\beta_2^*.\left\{1-\exp\left\{\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{3r-J}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}({}^{k_1}C_r)({}^{r}C_J)\left(\frac{\beta_1^*}{\beta_2^*-\beta_1^*}\right)^r\left(\frac{1-e^{-[J\beta_2^*+(r-J)\beta_1^*]t}}{J\beta_2^*+(r-J)\beta_1^*}\right)\right]\right.\right.$$

$$\left.\left.+\alpha_2\left[\sum_{k_2=1}^{m_2}\sum_{s=1}^{k_2}\frac{{}^{m_2}C_{k_2}p_2^{k_2}(1-p_2)^{m_2-k_2}}{1-(1-p_2)^{m_2}}({}^{k_2}C_s)(-1)^s\left(\frac{1-e^{-\beta_2^* k_2 t}}{\beta_2^* k_2}\right)\right]\right\}\right\}$$

$$-C_1.\frac{\dfrac{\alpha_1}{\beta_1^*}\left[\sum_{k_1=1}^{m_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}.k_1\left(1-e^{-\beta_1^* t}\right)\right]}{\beta_1^*\left[1-\exp\left[\alpha_1\sum_{k_1=1}^{m_1}\sum_{r=1}^{k_1}\frac{{}^{m_1}C_{k_1}p_1^{k_1}(1-p_1)^{m_1-k_1}}{1-(1-p_1)^{m_1}}\,{}^{k_1}C_r(-1)^{3r}\frac{\left(1-e^{-r\beta_1^* t}\right)}{r\beta_1^*}\right]\right]}$$

$$-C_2\frac{\frac{\alpha_1}{\beta_2^*}\left(\sum_{k_1=1}^{m}\frac{{}^{m}C_{k_1}p_1^{k_1}(1-p_1)^{m-k_1}}{1-(1-p_1)^{m}}k_1\right)\left[\left(1-e^{-\beta_2^* t}\right)+\frac{\beta_2^*}{\beta_2^*-\beta_1^*}\left(e^{-\beta_2^* t}-e^{-\beta_1^* t}\right)\right]+\frac{\alpha_2}{\beta_2^*}\left(\sum_{k_2=1}^{\infty}\frac{{}^{m}C_{k_2}p_2^{k_2}(1-p_2)^{m-k_2}}{1-(1-p_2)^{m}}k_2\right)\left(1-e^{-\beta_2^* t}\right)}{\beta_2^*\left\{1-\exp\left[\alpha_1\sum_{k_1=1}^{m}\sum_{r=1}^{k_1}\sum_{J=0}^{r}(-1)^{r-J}\frac{{}^{m}C_{k_1}p_1^{k_1}(1-p_1)^{m-k_1}}{1-(1-p_1)^{m}}\left({}^{k_1}C_r\right)\left({}^{r}C_J\right)\left(\frac{\beta_1^*}{\beta_2^*-\beta_1^*}\right)^{r}\left(\frac{1-e^{-\left[J\beta_2^*+(r-J)\beta_1^*\right]t}}{J\beta_2^*+(r-J)\beta_1^*}\right)\right.\right.} \quad (9)$$

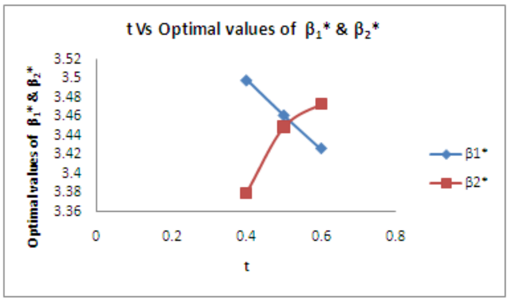
$$\left.\left.+\alpha_2\left[\sum_{k_2=1}^{m}\sum_{s=1}^{k_2}\frac{{}^{m}C_{k_2}p_2^{k_2}(1-p_2)^{m-k_2}}{1-(1-p_2)^{m}}\left({}^{k_2}C_s\right)(-1)^{s}\left(\frac{1-e^{-\beta_2^* k_2 t}}{\beta_2^* k_2}\right)\right]\right]\right\}$$

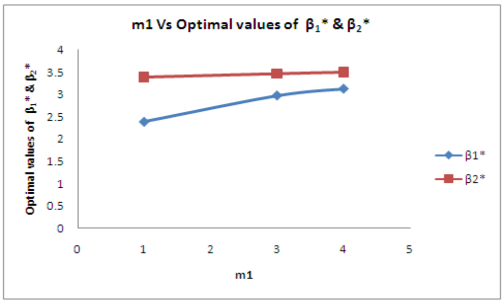
IV. ARITHMETICAL ANALYSIS

In the current section, the performance of the currently considered model was analyzed and the values that were obtained are tabulated and given in the following tables and the performance was also given in the form of graphical representation for the better understanding of the readers.

Table I. Arithmetical symbol of best value of β_1*and β_2*

t*	m_1	m_2	p_1	p_2	α_1#	α_2#	R_1	R_2	C_1	C_2	β_1*$	β_2*$	R	D_1
0.6	6	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.498	3.380	3.015	-0.564
0.7	6	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.461	3.449	3.038	-0.564
0.8	6	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.426	3.473	3.045	-0.564
0.4	**3**	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	2.387	3.392	2.466	-0.927
0.4	**4**	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	2.973	3.475	2.829	-0.927
0.4	**5**	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.125	3.511	2.920	-0.927
0.4	6	**2**	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.293	3.180	2.863	-0.656
0.4	6	**3**	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.451	3.335	2.999	-0.656
0.4	6	**4**	0.3	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.876	3.568	3.271	-0.656
0.4	6	5	**0.4**	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.874	3.220	3.159	-0.189
0.4	6	5	**0.5**	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.942	3.224	3.190	-0.189
0.4	6	5	**0.6**	0.4	0.4	0.3	0.6	0.7	0.2	0.3	3.998	3.229	3.216	-0.189
0.4	6	5	0.3	**0.5**	0.4	0.3	0.6	0.7	0.2	0.3	3.013	3.442	2.827	-0.496
0.4	6	5	0.3	**0.6**	0.4	0.3	0.6	0.7	0.2	0.3	3.214	3.442	2.936	-0.496
0.4	6	5	0.3	**0.7**	0.4	0.3	0.6	0.7	0.2	0.3	3.458	3.442	3.060	-0.496
0.4	6	5	0.3	0.4	**0.5**	0.3	0.6	0.7	0.2	0.3	3.487	3.922	3.270	-0.823
0.4	6	5	0.3	0.4	**0.6**	0.3	0.6	0.7	0.2	0.3	3.564	3.965	3.326	-0.823
0.4	6	5	0.3	0.4	**0.7**	0.3	0.6	0.7	0.2	0.3	3.612	4.008	3.367	-0.823
0.4	6	5	0.3	0.4	0.4	**0.3**	0.6	0.7	0.2	0.3	3.721	3.938	3.391	-0.270
0.4	6	5	0.3	0.4	0.4	**0.5**	0.6	0.7	0.2	0.3	3.961	4.083	3.561	-0.270
0.4	6	5	0.3	0.4	0.4	**0.6**	0.6	0.7	0.2	0.3	4.010	4.153	3.611	-0.270
0.4	6	5	0.3	0.4	0.4	0.3	**0.3**	0.7	0.2	0.3	3.852	3.922	3.445	-0.319
0.4	6	5	0.3	0.4	0.4	0.3	**0.4**	0.7	0.2	0.3	3.875	3.944	3.465	-0.319
0.4	6	5	0.3	0.4	0.4	0.3	**0.6**	0.7	0.2	0.3	3.956	3.987	3.519	-0.319
0.4	6	5	0.3	0.4	0.4	0.3	0.6	**0.3**	0.2	0.3	3.851	3.907	3.438	-0.645
0.4	6	5	0.3	0.4	0.4	0.3	0.6	**0.4**	0.2	0.3	3.894	3.944	3.473	-0.645
0.4	6	5	0.3	0.4	0.4	0.3	0.6	**0.6**	0.2	0.3	3.976	4.050	3.554	-0.645
0.4	6	5	0.3	0.4	0.4	0.3	0.6	0.7	**0.06**	0.3	3.575	3.870	3.293	-0.702
0.4	6	5	0.3	0.4	0.4	0.3	0.6	0.7	**0.07**	0.3	3.591	3.893	3.310	-0.702
0.4	6	5	0.3	0.4	0.4	0.3	0.6	0.7	**0.08**	0.3	3.635	3.915	3.340	-0.702
0.4	6	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	**0.07**	3.845	3.907	3.436	-0.139
0.4	6	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	**0.08**	3.891	3.944	3.472	-0.139
0.4	6	5	0.3	0.4	0.4	0.3	0.6	0.7	0.2	**0.09**	3.934	3.980	3.506	-0.139





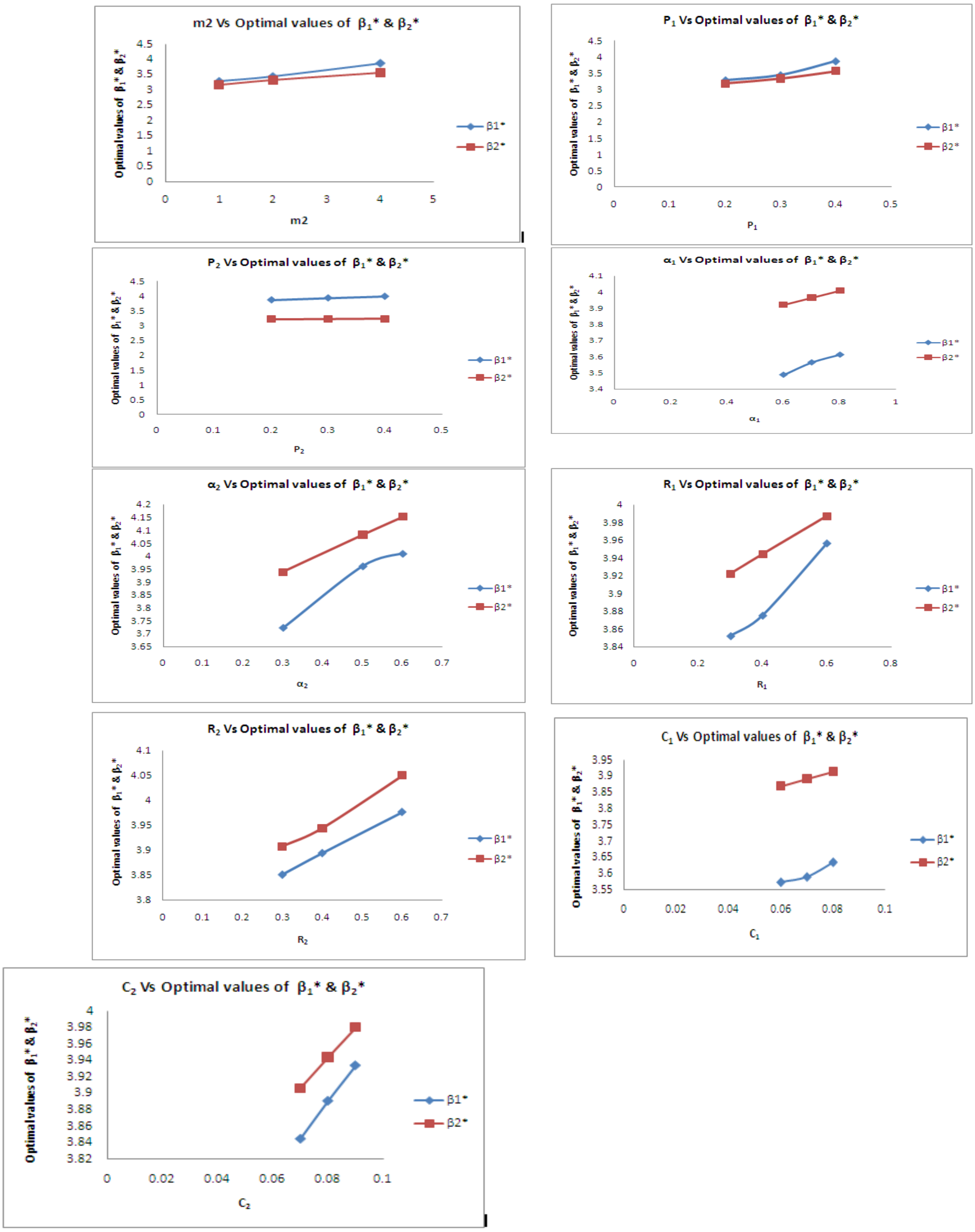


Fig 3.The optimal performance of a variety of considerations

V. SENSITIVITY INVESTIGATION

The sensitivity examination of the Transmission Rate parameters β1* and β2*, and the aggregate cost work p*(t) are contemplated regarding the parameters t, m1, m2, p1, p2, α1, α2, R1, R2, C1 and C2. In order to verify the status of the model, the following values were considered and the results are shown in the following table as follows,

t = 0.7 sec,
m_1=1,
m_2=3,
p_1=0.3,
p_2=0.2,
$\alpha_1 = 0.5 \times 10^4$ packets/sec,
$\alpha_2 = 0.4 \times 10^4$ packets/sec,
R_1 = 0.7,
R_2 = 0.6,
C_1 =0.4 and
C_2 =0.2.

Table II. Sensitivity Analysis

Parameter	Performance Measure	% change in parameters						
		-15%	-10%	-5%	0	+5%	+10%	+15%
t=0.7	β_1*	4.013	4.052	4.087	4.105	4.126	4.152	4.178
	β_2*	3.950	3.970	3.991	4.011	4.031	4.051	4.071
	R	3.581	3.605	3.628	3.643	3.660	3.683	3.697
P_1=0.3	β_1*	3.724	3.789	3.818	3.851	3.885	3.910	3.942
	β_2*	3.897	3.920	3.942	3.964	3.986	4.007	4.029
	R	3.442	3.479	3.501	3.524	3.547	3.566	3.589
P_2=0.2	β_1*	3.896	3.924	3.952	3.976	3.998	4.018	4.036
	β_2*	3.888	3.923	3.957	3.991	4.024	4.057	4.090
	R	3.508	3.535	3.561	3.585	3.608	3.630	3.651
α_1=0.5	β_1*	3.862	3.889	3.922	3.942	3.958	3.982	4.003
	β_2*	3.856	3.880	3.905	3.929	3.953	3.977	4.001
	R	3.481	3.502	3.526	3.545	3.561	3.581	3.600
α_2=0.4	β_1*	3.796	3.823	3.849	3.878	3.892	3.918	3.947
	β_2*	3.763	3.794	3.825	3.855	3.885	3.915	3.945
	R	3.413	3.438	3.462	3.487	3.505	3.529	3.554
R_1=0.7	β_1*	3.781	3.804	3.831	3.862	3.886	3.911	3.937
	β_2*	3.803	3.827	3.851	3.875	3.899	3.922	3.946
	R	3.425	3.445	3.466	3.489	3.509	3.529	3.550
R_2=0.6	β_1*	3.751	3.787	3.812	3.841	3.874	3.898	3.921
	β_2*	3.876	3.910	3.943	3.976	4.009	4.042	4.074
	R	3.445	3.474	3.499	3.525	3.552	3.576	3.600
C_1=0.4	β_1*	3.851	3.898	3.925	3.968	3.987	4.019	4.041
	β_2*	3.854	3.879	3.903	3.927	3.951	3.974	3.998
	R	3.476	3.505	3.526	3.554	3.572	3.592	3.613
C_2=0.2	β_1*	3.471	3.492	3.524	3.552	3.581	3.603	3.634
	β_2*	3.967	3.396	3.426	3.455	3.483	3.512	3.540
	R	3.127	3.160	3.193	3.214	3.240	3.263	3.285
		-75%	-50%	-25%	0	+25%	+50%	+75%
m_1=1	β_1*	3.487	3.503	3.521	3.548	3.561	3.578	3.591
	β_2*	3.415	3.427	3.440	3.452	3.464	3.477	3.489
	R	3.146	3.159	3.174	3.193	3.204	3.219	3.230
m_2=3	β_1*	3.202	3.239	3.261	3.286	3.307	3.331	3.364
	β_2*	3.253	3.299	3.344	3.389	3.433	3.476	3.518
	R	2.927	2.966	2.997	3.030	3.060	3.091	3.127
	R	3.425	3.445	3.466	3.489	3.509	3.529	3.550

The execution measures are very influenced with the variety in time (t) and the bunch estimate dissemination parameters of entries. As time (t) increments by 15% the normal number of bundles broadcast through the two cushions increments alongside the two transmitters and the landing rate of the parcels increments. As the group measure appropriation parameter p increments to 15%, the normal number of parcels broadcast through the two cradles increments alongside the two transmitters and the entry rate of the bundles increments. Over all investigation of the parameters mirrors that dynamic data transfer capacity distribution methodology for clog control immensely diminishes the mean postponement in correspondence and enhance influence excellence by lessening burstness in cushions.

VI. CONCLUSION

The current article deal with a good and fresh correspondence arranges demonstrate with mass landings having two phase coordinate entries. Here it is expected that the messages arrive straightforwardly to the main cushion and second cradle which are associated pair. Advance it is expected that the communication is changed over into an irregular number of parcels and put away in cushions for forward transmission. The landing forms in both the cradles are portrayed with compound Poisson binomial procedures. With appropriate cost contemplations, the ideal working approaches of the correspondence organize are additionally determined. Through mathematical representations the affectability of the adjustments in input parameters and expenses on the ideal working arrangements is likewise examined. This correspondence organize is much helpful for execution assessment, control and observing of correspondence systems at information/voice transmissions, satellite interchanges, LLAN, WAN planning and web suppliers. This correspondence organize model can likewise be stretched out to non-Markovian change forms which require assist examinations.

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