



RESEARCH ARTICLE

NETWORK ASSISTED MULTIPATH TRANSMISSION OVER CELLULAR NETWORK WITH HIGH THROUGHPUT AND BASELINE ESTIMATION

1,*Vismitha, A.S. and 2Mr. Sandeep, K.V.

¹M.Tech Student (DCN), Dept. of Tele Communication, DSCE, Bengaluru-560078

²Assistant Professor, Dept. of Tele Communication, DSCE, Bengaluru-560078

ARTICLE INFO

Article History:

Received 14th March, 2018
Received in revised form
27th April, 2018
Accepted 20th May, 2018
Published online 28th June, 2018

Key words:

NAMH, Bifurcation router,
MPTCP, Throughput,
Baseline estimation.

*Corresponding author

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Citation: Vismitha, A.S. and Mr. Sandeep, K.V. 2018. "Network Assisted Multipath Transmission over Cellular Network with High Throughput and Baseline Estimation", *International Journal of Current Research*, 10, (06), 70062-70065.

ABSTRACT

The design and implementation of a mobile data service which gives parallel multi-path transmission over multiple cellular networks to achieve significant performances like maximum throughput and baseline estimation. In previous systems, in the application layer or transport layer is used a network assisted architecture for multi-homed (NAMH) cellular access is proposed. In another system, routers and base stations provides necessary multihoming functionality which includes identification of a bifurcation router and dynamic splitting of the data stream. In the proposed work, using the multipath TCP(MPTCP) and dynamic routing with the increased topology will simulated and compared the results with the existing systems using NS3 simulator.

INTRODUCTION

In this paper, we propose a multi-path delivery of data, which supports simultaneous multi-network connectivity and compared with the existing system. The architecture is based on multi-radio clients which gives the high speed transmission. Architecture of the system consists of two or more cellular (LTE) interfaces and a WiFi interface. The method of splitting the data towards multiple interfaces is done by using network elements such as base stations and routers here we are using bifurcation router to split the data. In this architecture, network elements cooperate to find a suitable branching point for the data flow to be split towards the two cellular network interfaces like LTE and WIFI. Existing systems such as Project Fi provide performance gains over cellular network services, but the main advantage is limited by the use of a single cellular network at a time and the lack of multi-homing support in legacy TCP/IP protocols. But poor interaction of TCP transport layer protocol with highly varying cellular channels is a main problem (Wisichik, 2011), due to the inability of TCP's congestion control to adapt to rapid changes in available bandwidth. Multipath TCP (MPTCP) is an addition to TCP

which supports striping of data from a one TCP connection across multiple sub flows. The various proposal system which have been made for congestion control in MPTCP (Li, 2016) share the same weakness as TCP's congestion control. Here we are using multipath TCP protocol to avoid the problems of TCP.

System Design: In the Fig.1 Architecture of the multipath transmission design consists of five router, one bifurcation router, two carriers and two interface system like LTE system or WIFI. The main aim is to delivery packets from server to host with multiple interfaces. First server should detect the multiple interfaces of the same host. When the server (Router1, 2...5) sends data the basic IP address have to assign to it for the identification it sends from one cellular network to another cellular network at the cloud, router is considered as bifurcation router it splits the data into data block and meta data it is called flow splitting., the meta data consists of basic information of the data. Data is splitted and the packets are sent to the multiple interfaces like LTE1 and LTE2 even the data is splitted there is null packet loss and it achieves maximum throughput, baseline is estimated and compared with the existing system.

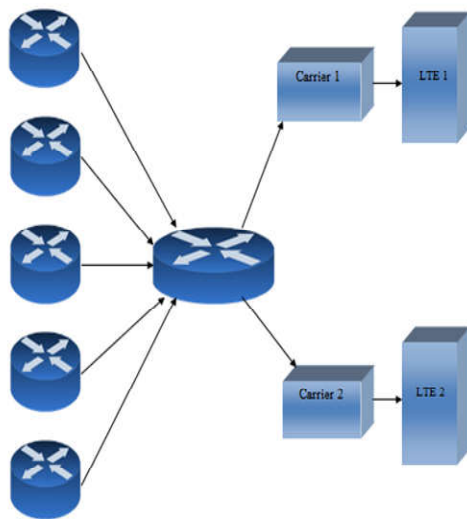


Fig.1 Architecture of the multipath transmission

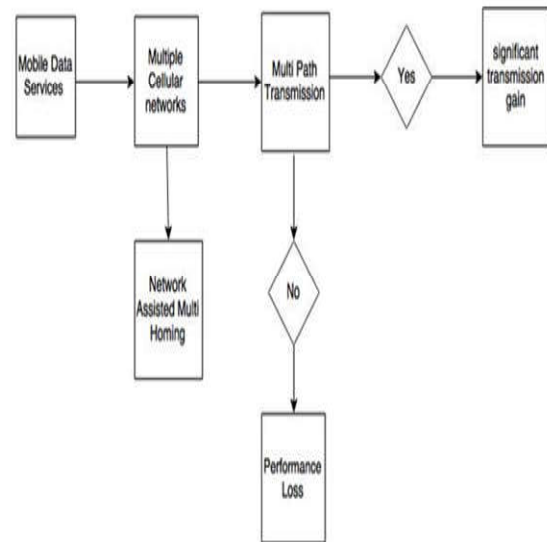


Fig. 3. Data flow diagram

Baseline is estimated using the formula below

$$U=C-T/ C$$

Where,

U-> Baseline estimation

C-> Bandwidth capacity

T-> Throughput

Flow Chart

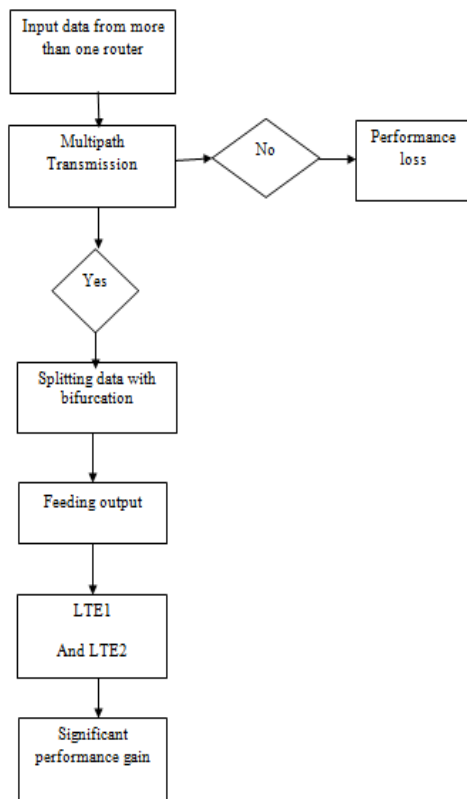


Fig.2 Flow diagram

The Fig.2 and 3 shows flow diagram and data flow of the system which gives the overall flow of the system.

- Data from the server it may be more than one router here we are created five routers.
- Server detects the multiple interfaces if there is no multiple interfaces performance loss occurs.
- If the server finds out the multiple interfaces it sends data to another cellular network.
- Data is splitted using bifurcation router.
- The splitted data packets are sent to multiple interfaces like LTE1 and LTE2.
- With this we achieved performance gain and maximum throughput.

RESULTS AND DISCUSSION

The results are compared between existing system and proposed system. In the proposed system there is no packet loss and maximum throughput with high baseline estimation. For the simulations, NS3 simulator is used for both non IP and IP networks.

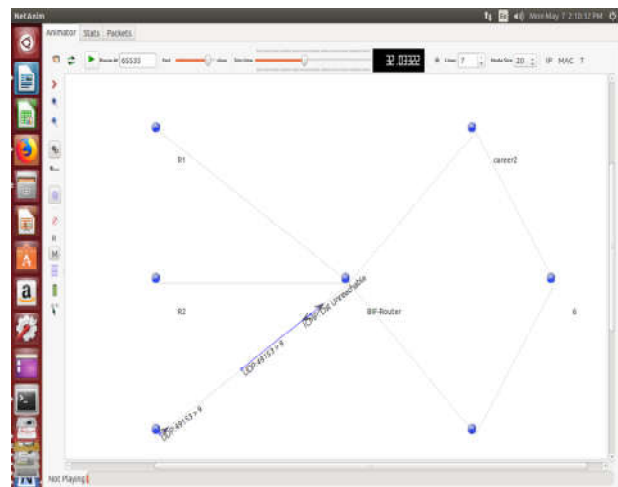


Fig. 4 Sending data from server to the bifurcation router

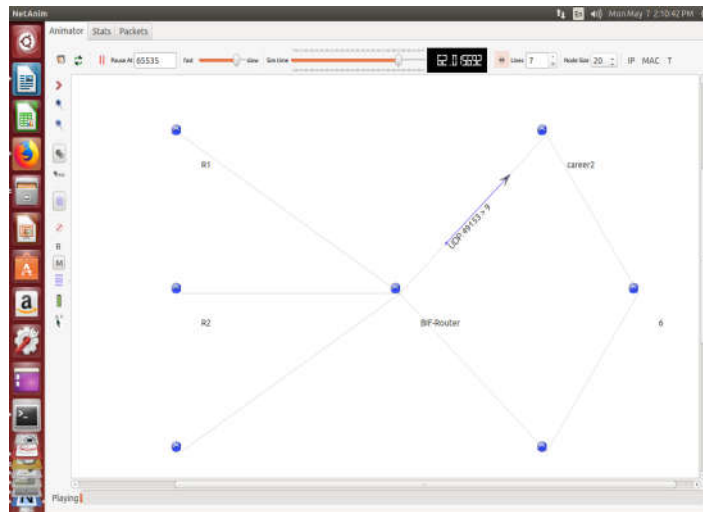


Fig 5. Sending splitted data packets from Bifurcation router to carrier.

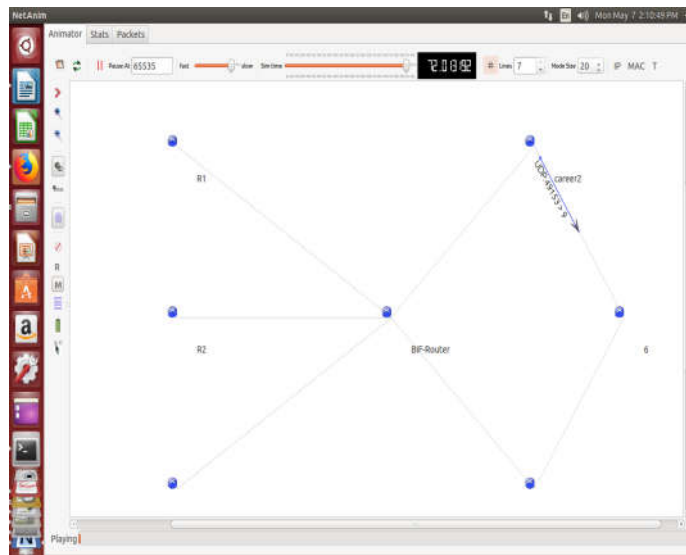


Fig 6. Sending splitted data packets from carrier to multiple interfaces.

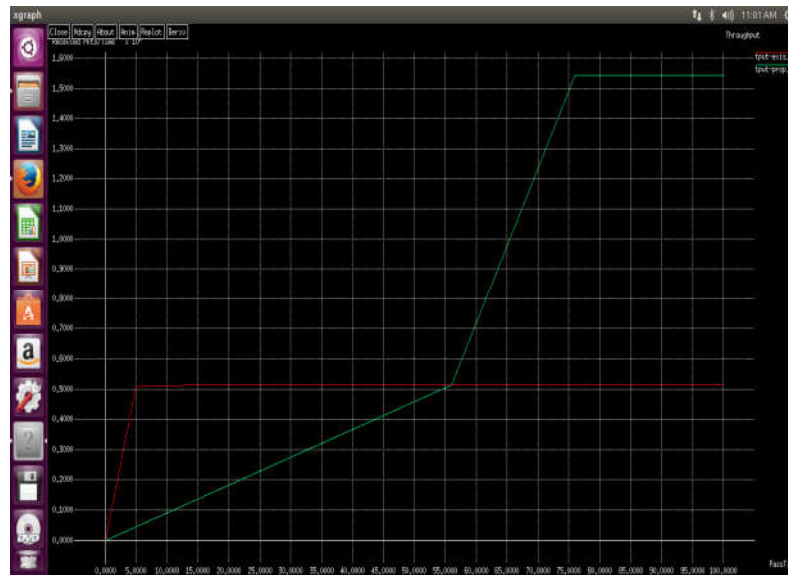




Fig 8. Baseline estimation between existing and proposed system

Table 1. Comparison between existing and proposed system

| Time in sec | Existing system(Baseline estimation) | Proposed system(Baseline estimation) |
|-------------|--------------------------------------|--------------------------------------|
| 0 | 0 | 0 |
| 56 | 0.124685 | 0.485806 |
| 66 | 0.125932 | 0.971612 |
| 76 | 0.126183 | 1.45742 |
| 100 | 0.126813 | 1.45742 |

This supports the operating systems like Linux, freebsd. For multiple interfaces like LTE(Long term evolution) and WIFI, LENA LTE is used it is also an open source based network simulator which is fast in speed and used for both GSM and CDMA networks. In the Fig4 data is sending from server that is router to the bifurcation router without any packet loss. In the Fig5 and Fig6, splitted data packets are sending from the bifurcation router to multiple interfaces of host through carriers without any packet loss.

Conclusion

In this paper Multi-network access has been proposed for achieving high performance gain. Architecture for network assisted multi-path transmission in cellular networks was described and compared with the existing system. Proposed system is created for multipath TCP and dynamic routing is created with its own IP address. Ns-3 simulation is used to evaluate performance which saves the time and memory with high throughput and baseline estimation.

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