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# AN APPROACH FOR TRAFFIC OFFLOADING IN NETWORK ENVIRONMENT

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**ABSTRACT**

*Now-a day's data traffic in the internet environment is increasing day by day. With the invention of various applications, video, text messages over the internet the amount of data uploaded or downloaded in the internet environment is increasing at a greater pace. A recent study by Cisco [4] has warned that the data traffic over the internet will increase more. The predication has been made till 2018 where the traffic will become three times faster with the available IP traffic range. The 3G traffic is currently overloaded because of these mobile data due to which both the service provider and the mobile customer are facing the problem of data traffic in the mobile network. In this survey we have investigated that due to the limitation in bandwidth the mobile service providers are not able to manage traffic over the internet. The customers face the problems of delay in sending or receiving packets over the network. Although researchers are finding different solutions to solve this problem from our survey we have analyzed that data offloading approach from one network to another is the effective solution to manage the data traffic over the internet at minimal cost.*

*Through this survey, we have studied different approaches to data offloading in internet environment to minimize the traffic efficiently. In this survey, we have done the comparative study of different solutions. The solutions in the study include choosing, at least, two networks at a time to perform data offloading. Further we have investigated which solution will prove best to manage the data traffic.*

***Keywords: Traffic Offloading, Data Offloading And Network Environment.***

## I.INTRODUCTION

The social network has begun to attract a number of users towards the internet environment which has exponentially increased from browsing the social networking site from personal PCs to the mobile social network. Recently the survey has stated that the applications which are running on mobile devices and broadband services have resulted in the greater explosion in 3G cellular networks which is getting overloaded. Although there are many strategies available for performing traffic offload we will limit our survey with the discussion of two approaches that have been proposed to solve the issue 1) and network based solution 2) Opportunistic approach. In this survey, we have discussed both the approaches.

From both the approaches, we have identified that data can be offloaded with multiple accesses to the network environment.

The network-based solution as discussed in [1] used simultaneous multiple access to the network environment where data offloading is performed between the two networks. Here in [1] the network which is selected for data offloading is a WiFi network because it has no bandwidth limitation as with the use of WiFi or Bluetooth when used reduces the cost of offloading. In this work, the author has also shown the implemented results of how WiFi is used for offloading the data when 3G is getting overloaded and how they have reduced the delay tolerance with this simultaneous multiple access approach.

In [2] shows that the network-based approach when selected for offloading the data the access to the simultaneous network must pass the gateway as it provides security and firewall protection.

Further, there is other cellular based approach like target set selection problem which uses femtocell and WiFi network for offloading purposes.

Through this survey, we will discuss both the approaches in brief.

## II.NETWORK BASED APPROACH

According to the QUALCOMM the network based approach

Must have an algorithm designed to identify the best possible networks available in the vicinity. Further, there should be a mechanism which checks the strength of the network. Furthermore, the method adopted for selecting the networks for performing traffic offload must consider the other metrics. While selecting the WiFi or other connections, the internet connectivity should be checked along with the fast accessibility.

The major challenge for performing load balancing in a network environment is to identify the different type of traffic approaching to the UE and selecting the appropriate traffic offloading approach. Algorithm must me designed to identify the available multiple access network and make the device capable of handling different types of traffic approaching the UE (User Equipment).

### 2.1 Ipflow managemet

The user smartphones are well equipped with dual sim card because of which two network connection run either sequentially or simultaneously. To avoid data traffic, mobile operators are now switching to WiFi network. When the user moves to the WiFi network the data running in the 3GPP network connection are then moved into the WiFi network to avoid data traffic over the 3Gpp network. During this process, mobile operators have to perform handover mobility while moving from one network to another. During this process, user experiences the delay in receiving the data packets and at the same time seamless offloading need to be performed where the user is unaware that they have been moved to the WiFi network. The major challenge during this process is delay tolerance and reliability in packet delivery.

In [1] the WiFi and LTE networks are defined as primary and the secondary network. Receiving, at least one of the first uplink packets associated with user equipment from one of the first radio access network, modifying the value of the data count variable when the first uplink packet is received over the second radio access network. If the uplink packet which is received from the second radio access network is a WiFi then give all the primary access permissions to WiFi. Primary access can receive and send both uplink and downlink packets over the

primary network. The PGW (Packet Gateway) replaces the existing 3GPP connection with WiFi which allows sending and receiving of the data packets in the user equipment. During this context infrastructure supports IP flow mobility i.e. internet flow mobility management where both 3GPP and WiFi both acts as a primary network. The flow binding is decided by the service provider.

Through the survey, it has been investigated that mobility handover can be performed by IP flow management [1].

In [3] and [5] the author has highlighted the method of smooth handover between LTE/WiFi through MPTCP with simultaneous use of multiple internet connections where single TCP connection is used for interacting with multiple interfaces simultaneously.

### 2.2Gateway Management

The non-interference of LTE/WiFi [10, 11] over the 3G network interface becomes more convenient for selecting the WiFi for traffic offloading approach. WiFi being an unlicensed ISM (Industrial, Scientific, and Medical) most of the service providers like Vodafone are deploying their networks as WiFi. In [8] IP flow mobility is considered for flow mobility as it allows smooth handover with less modification at the mobile node. It allows the movement of data packets from one network to another network still maintaining the session between the networks. When the user on the 3GPP comes in contact with the WiFi network the data packets which were assigned for 3GPP networks have been moved to WiFi network. In [7, 8] the WiFi and the 3GPP networks are in communication with the mobile access gateway (MAG) which acts as a gateway interface for both the networks

## III. OPPORTUNISTIC APPROACH

In femtocell traffic offloading approach where traffic offloading takes place between the small transmission ranges using the Bluetooth or the WiFi device where user exchange information or deliver information to other which has been received from the network source. While exchanging the data, there are many security problems. While using femtocell to perform traffic offload customer should have an internet connection available on their mobile phones. Femtocell is not recommended because of its small cell size there transmission power is inefficient.

In cellular traffic offload opportunistic approach is considered to be more efficient. The target set selection [6] method is used which follows greedy, heuristic and random algorithm to solve the cellular based problem. Here the author has discussed about selecting target users using greedy approach. Considering the target subscribers are well under the internet connectivity where the social media information is distributed among all the subscribers. Further the author has highlighted that depending on service provider for transmission of social media content may result in delay or limited content delivery because the service provider is single but number for customers are high. Further, the author has suggested the method of selecting the opportunistic method through target-set where the data from the service provider is transferred to one of the user from the selected target users. The user which is selected by the service provider is that user which is close in range of the service provider. The author has used push method for transferring the information and pull for receiving the information from the close user in the target-set. Furthermore, the author suggests that by using target-set

selection approach the traffic on the service provider is reduced because of load distribution among the target users.

## IV.PROPOSED SOLUTION

In the proposed solution we have suggested another method for traffic offload by implementing the dispatch proxy in our network environment to support the flow of data packets between the networks. We have selected network based approach as we have limited our scope with achieving simultaneous internet connection with personal computers where we will manage the traffic approaching the device through gateway .To achieve this we have followed the routing protocols of IPv4.Further, from the survey we have found that opportunistic method is adopted with the cell phone where the data which is shared is a social media information. Furthermore, IP flow mobility either with IFOM with MPTCP. In our proposed work we have achieved traffic offloading method along with simultaneous internet connection so to achieve this we have selected IP flow mobility management approach with dispatch-proxy.

We have selected dispatch-proxy as a third party, as the reliable interface for communication. All the protocols and mobility for traffic management is decided in dispatch-proxy. The algorithms for identifying the networks and mobility management along with delay tolerance are implemented through dispatch-proxy. Further, we will make an attempt to achieve reduced delay-tolerance within the dispatch-proxy. Our outputs for delay-tolerance are in progress we will discuss that in our upcoming research.

### 4.1Dispatch Proxy

Dispatch-proxy is implemented in the network environment to initiate the simultaneous use of network connection to perform data offload.

In the proposed solution we don't need to manage the metrics which is by default decided by the OS (Operating System) depending upon the bandwidth size, speed of the internet, cost, hop count, load, MTU (Maximum Transmission unit), reliability, ticket (Measurement of delay).Depending upon these parameters metrics assign priorities to the network selected for data traffic in the internet environment. Lower the metrics value higher the priority and higher metrics are the opposite.

The metrics can be set in the dispatch proxy environment according to user preference or can be set to equal priorities to enable data transfer with simultaneous network connected to dispatch proxy.

### 4.2 Selecting Network-based approach

From the survey, we have found that network-based solution is more efficient. In our proposed solution we have selected the network based approach for offloading the network traffic. In the proposed solutions we have discuss the algorithm for managing the traffic that approaches the device.

The proposed solutions adopted the gateway management approach to manage the traffic in network environment. We have also found that gateway management approach solves most of the issues relating with security because of the IpSec already present in the network layer.

We have divided our work in three modules to perform traffic offloading.

- Identifying the available network through the device.

- Selecting multiple network connections.
- Making use of simultaneous networks to perform data offload.
- In our proposed method we selected the node.js environment as node.js is considered as the efficient environment for networking and it is specially designed for network related work.
- Through node.js we have implemented the algorithm for indentifying the multiple networks and also implemented the algorithm to dispatch data traffic through with the simultaneous use of more than one network.

We have proposed an algorithm for traffic management through gateway interface.

### 4.3Establishing the two Network Connection

Algorithm-1:

- With node.js, we have obtained simultaneous connections to the networks.
- In our proposed work we have implemented the dispatcher for transferring the data packets.
- Both the networks will interact simultaneously with the gateway interface.
- The gateway interface will decide to which network data has to be transferred depending on the priorities.
- Attempt for transferring the data from one network to another is also proposed in the solution.

### 4.4Connect to Gateway Interface

Algorithm-2

Step-1: The network device N1 connects to gateway interface using the physical interface PIF-1.

Step-2: The network device N2 tries to connect with the gateway interface using the physical interface PIF-2.

Step-3: The network device N1 gets connected to the gateway interface via PIF-1.

Step-4: The network device N2 wants to connect with the gateway interface via PIF-2 and sends the value 1.

Step-5: the dispatch proxy initiation within the node.js environment is performed.

Step-6: The gateway interface if ready with the dispatcher will send the value 1 acknowledging to the network N2.

Step-7: The gateway interface then sends the message to N1 that it is connected with N2 also.

Step-8: Gateway interface will now start data transfer to both the N1 and N2 networks.

Step-9: From the above steps both the gate- way interface can forward the data packets associated with N1 and N2.

Step-10: Now the dispatch proxy can move the flow smoothly with less delay.

Step-11: The dispatch proxy can forward the data packets from N1 to N2 when N1 is overloaded within the same session.

Step-12: The dispatch proxy can forward the data packets from N2 to N1 when N2 is overloaded within the same session.

**4.5Figures and Tables**

| ID | NID | UE | Gateway | Interface |
|---|---|---|---|---|
| 1 | N1 | 3GPP | G1 | PIF-1 |
| 2 | N2 | WiFi | G2 | PIF-2 |

**Fig. 1. Network Information Received through Gateway Interface**

| ID | NID | UE | Gateway | Dispatch Status | Interface |
|---|---|---|---|---|---|
| 1 | N1 | 3GPP | G1 | Forwarding to N1 | PIF-1 |
| 2 | N2 | WiFi | G2 | Forwarding to N2 | PIF-2 |

**Fig. 2. Forwarding Status of Dispatch Proxy**

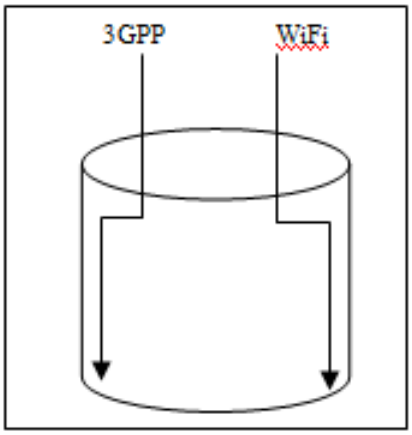


**Fig. 3. Simultaneous use of two networks.**

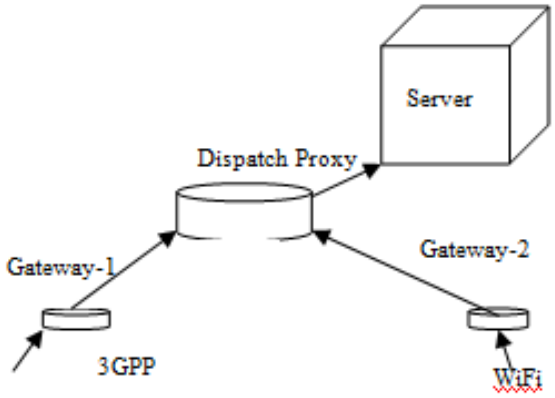


**Fig.4. Gateway Interface through Dispatch-Proxy**

## V.CONCLUSION

In this paper, we have reviewed several methods to perform traffic offload and have identified that the network-based offloading is more efficient than cellular based. The network-based approach has less security threat because IpSec is already present in network layer of TCP/IP.

Further, we have also identified that choosing WiFi network for data offloading solves the problem of bandwidth limitations. Furthermore, we have also analyzed the challenges that may reduce the efficiency of smooth offload.

Challenges:

- To achieve reduced delay in accessing the other network.
- To maintain the session while still performing the handover between the two networks. To achieve simultaneous access to both the network.
- We further investigated that network-based management through gateway interface is the efficient approach to perform traffic offloading.
- The method discussed when applied in the mobile network [1] has to perform handover while moving from one network to another by still keeping the current session running on the previous network.
- The mobile network and the network provider need to be concerned while performing the handover between the multiple network interfaces. The major challenge will be to perform smooth handover with reduced amount of delay.

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