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Traffic Offload of OSN Server through Device to Device Communication in Wireless Networks

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ABSTRACT

The cellular networks where major transmission of data occurs is majorly affected by the traffic caused by the over demand of data by the users. This is overcome by a popular technique Device to device communication. In this paper the main aim is that, optimizing D2D communication by offloading OSN server by social network layer and the physical wireless network layer. This social aware approach is used to avoid straining of server that provides similar content to various users. Here the Base station's first transmission of the popular content, such content is now locally accessible to other mobile users in the same area. Further server will analyze the contents in the nearby location and requests have been forwarded to nearby device. If there are no nearby devices, transmission of content is done through server.

Keywords: online social networks, optimization, offload, Device to device communication

I. INTRODUCTION

A social networking website is a platform which works online,that enables users to establish a public profile and communicate with other users on the website. Online social websites in general have a new user input i.e a list of people with whom they can share a connection and then allow the user on the list to deny or confirm the connection. After connections are enabled, the user can search the networks of his/her connections to make more friends/connections. An online social networking site may also be named as a social website or a social networking website. Online Social networking sites have various rules for enabling connections, but they usually allow users to see the connections of a approved connection and also proposes further connections based on a person's enabled network. Some online social networking websites like LinkedIn are generally used for creating professional connections, whereas social sites like Facebook hedge the line between professional and private. There are various networks that are structured for a precise user base, such as political or cultural groups within a small or large given area or at times traders in financial markets. Social networking websites can be easily misunderstood with social media sites. An online social networking site is a site which has a public or semi-public profile page. An online social media site has connections and profiles, union with the tools to easily share online contents of all types.

In Future wireless cellular networks (IMT-advanced) are majorly characterized by means of high speed, a high QoS and large capicity for immeasurable number of subscribers. Next to high throughput,the energy efficiency is an significant target to establish broadband wireless access for battery driven devices. Here we analyze two related but independent technologies: network coding and device-to-device (D2D) as shown in figure 1.1a.In this both are targeted to increase QoS and energy-efficiency of wireless networks. D2D communications is seen to become a very important key feature that is to be supported by next generation cellular networks. The advantages are diverse in nature: offloading the cellular system, reduced battery

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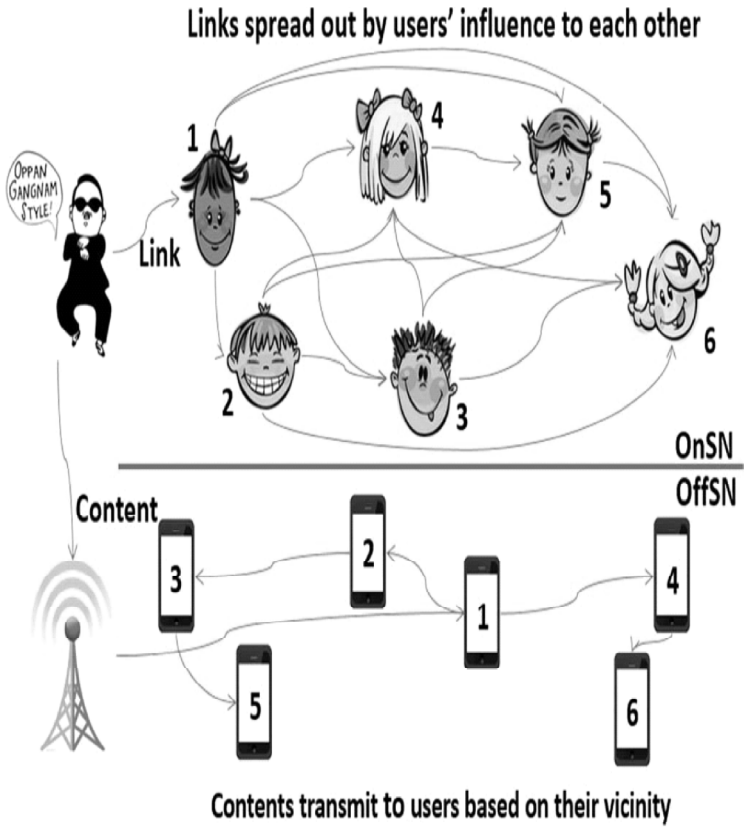

Figure 1.1a: Two way transmission

consumption, robustness increased bit-rate, to infrastructure failures and thereby also enabling new services.Contrary to competing D2D technologies like WiFi and Bluetooth, cellular D2D communication can give local service providers an access to the licensed spectrum with a controlled interference environment to circumvent the uncertainties of the license exempt band when making investment decisions. The design of an productive device-to-device (D2D) communication mode as underlay to a cellular network is a key problem to be solved. By utilizing power optimization and optimal mode selection the sum rate increases sevenfold for a D2D connection depurated by 10% of the cell radius. The sum rate maximizes is still threefold while giving a rate guarantee to the cellular user. Reusing the downlink resources is very much more confronting than reusing uplink resources because the cellular receiver can be anywhere inside the cell. We analyse the resulting signal-to-interference plus noise ratio achieved for the D2D links with finite detoriation to the cellular network. Here,the D2D communication in-between terminals is actually an enabler of terminal cooperation passes through network coding. Network coding (NC), a prominent new class of information processing and transmission techniques, is currently arriving in multi-user or multi-hop wireless networks. When comparing to traditional routing techniques, network coding activates information processing inside the intermediate nodes.Thus, performance gains in e.g., energy-efficiency, fairness, robustness, or coverage are obtained.

II. RELATED WORK

The access for video content is rapidly increasing as video sharing on the Internet has become enormously popular recently. This access, with its high bandwidth requirements, has a considerable impact on the load(strain) of the network infrastructure. This is because, more users access videos from their own mobile devices, the load in the current prominent wireless infrastructure, that has limited capacity, will be more significant. Based on observations from lots of local video sharing scenarios, we conclude the tradeoffs of using Wi-Fi ad-hoc mode versus infrastructure mode majorly for video streaming in-between adjacent

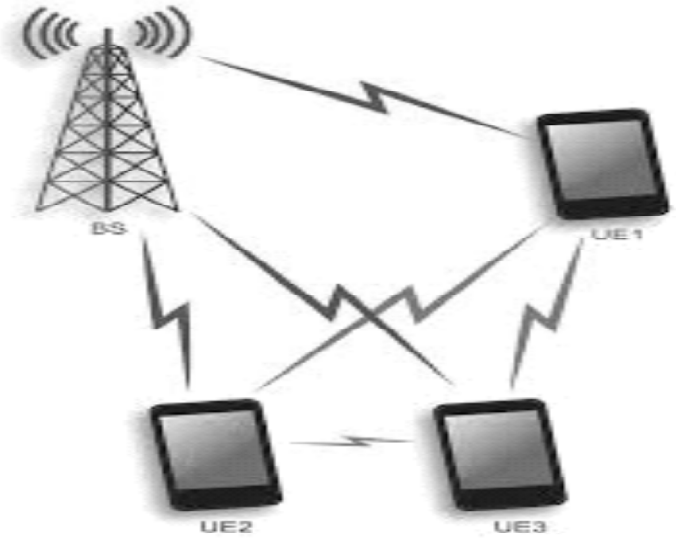

Figure 1.1b: Device to Device Connection

devices. Here the potential of direct device-to-device communication as a way of to minimize the load on the wireless infrastructure and to improve user related experiences. Now,Setting up experiments specially for Wi- Fi devices that are connected in ad-hoc mode, we collect measurements for many video streaming scenarios and compare them to the scenario where the devices are connected through access points. The results show improvements in latency, jitter and loss rate. Most importantly, the results show that the performances in direct device-to-device(D2D) streaming here is much more stable in contrast to the access point case, where various factors affect the performance causing widely unpredictable qualities[1]. There are few fundamental and interrelated issues in D2D communication. Here the very first issue is how D2D users have to access spectrum, and we consider two choices: overlay i.e orthogonal spectrum between D2D and cellular UEs and underlay i.e non-orthogonal. The second issue is how Device to Device users should choose between communicating directly or through the base station, a option that depends on distance between the potential D2D transmitter and receiver.A tractable hybrid network model where the positions of mobiles are structured and modeled by the random spatial Poisson point process, in which we provide a general analytical approach that allows a unified performance evaluation for these questions is proposed here[2]. Also there are two innovative concepts which is not present in cellular systems so far: Device-to-device (D2D) communication and additionally network coding. Both of them are reassuring techniques to increase the efficiency of cellular communication systems, mainly from a network point of view. First, we tend to study the potential gains from Device to Device communication as an underlay to the link(down) of a cellular network in an interference limited, multi-cell indoor situation. Our conclusions show that multi-antenna receivers are needed to produce enough SINRs that activates device-to-device communication, immediately when the D2D connections re-use cellular resources within the cell. For the cooperative transmission, we offer to combine wireless diversity and also the capability of increasing the max-flow of network coding[3]. UGC(User Generated Content) is reshaping the way users watch video and TV, with millions of video consumers and producers. In specific, UGC sites are establishing new viewing patterns and social interactions, delegating users to be more creative, and creating new business opportunities. Based on a enormous amount of data collected, we achieve an in-depth study of YouTube and other similar UGC systems[4].Nowadays, the existing variable of wireless capable devices has led to the development of numerous multi-hop routing protocols. In specific, due to the variations of these networks, routing protocols with well defined hierarchies have been determined. By constructing different size scenarios with 20 different possible transitions in hierarchies for 2, 3 and 4 clusters, the concussion of using such mechanism is evaluated[5].

III. PROPOSED WORK

In proposed system, Online Social Network (OSN) users can post their Text, Image and Video to public or friends. Also like any other social sites,the user can chat with friends, view others profile, change their domain picture and cover picture. If any of the user need to view the video posted by their friends, user need to download the post from OSN server. The server continuously maintains all users download history and current gps position of the all OSN users. So, when the user request for a video to be downloaded, the server first search for the nearby devices and if available it searches for the user requested content is available in their device ,if the content is available .server gives response as nearby device available and user can transfer data from the nearby mobile device. If the video requested by the user is not available in nearby devices, Post will be automatically downloaded from the OSN server,as shown in figure 3.1. This prevents the user from wasting the mobile data unnecessarily because if the video is available in nearby device, the video can be received directly via Bluetooth, where connecting to server is not needed. Also speed of transfer increases and time to deliver video decreases.

3.1. Social Networking Web Application

In Social Networking Web applications, the OSN web applcation is built as social networking application in which new user can register for the services. The registration fields are validated user is able to login with his credentials. The user's can set Cover picture, Profile photos and can add friends. The friend request will be dispatched to end user account and will be readily available once he logged in. He can accept/reject the friend request. The friend list is shown in the right panel and can be able to chat with the recipient private manner.

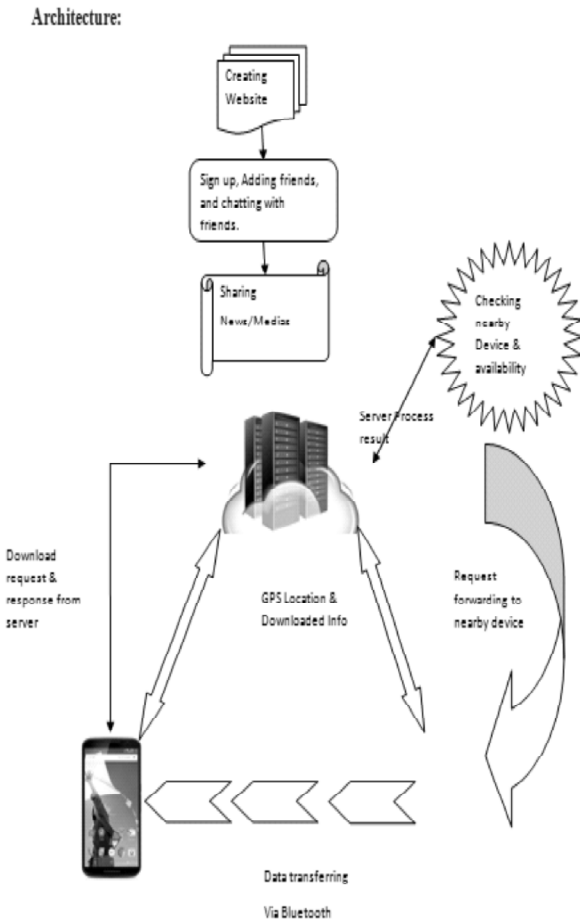

Figure 3.1: System Architecture

Technology used in this phase is the usage of AJAX while chatting. **Ajax** (Asynchronous JavaScript and XML) is a pack of web development technique that uses web technologies on the client side to establish asynchronous Web applications. Using Ajax,the web applications can send data to and retrieve from a server in an asynchronous manner, that runs in the background,without the hindrance with the behavior and display of the existing page. Here AJAX technique is majorly used in chat window, so if a user chats with his friend, the receiving end user need not refresh his page to receive his message, message is received automatically.Here when the user types message and presses send option immediately the chat window alone is refreshed,that works in background. Ajax is not a technology, but a group of technologies. CSS and HTML can be used in combined way to style and mark up information. The Document Object model is achieved with JavaScript to dynamically display and enable the user to communicate with the information submitted . XMLHttpRequest and JavaScript the object contribute a method for exchanging data in an asynchronous manner between server and browser to avoid full page reloads.

3.2. Sharing Posts with Access Control:

In Sharing posts with Access Control,the user's can post some News, Images and Video and some other information. These posts can be shared with friends with access control. The shared posts can be viewed by friends if they have proper access control once they login. Friends can reply to the posts with some comments and like/dislike the posts. Here concept of Huffman coding is used for image compression while posting pictures in webpage. Huffman coding is a type of prefix code optimal in nature that implements lossless data compression. Here when the user posts image of a variable sized image, the image is compressed and stored in the server. So the algorithm works as follows

1. Spawn a leaf node for each symbol and queue it to the priority queue.
2. While there is atleast 2 node in the queue:
   i. Remove the two nodes of highest priority (lowest probability) from the queue
   ii. Spawn a new internal node having these two nodes to be as children and with probability equal to the sum of the two nodes' probabilities.
   iii. Spawn/add the new node to the queue.
3. The left out node is the root node and therefore tree is complete.

Because in general efficient priority queue data structures requires O(log *n*) time per every insertion, and a tree with maximum of *n* leaves has 2*n*–1 nodes, so concluding this algorithm operates in O(*n* log *n*) time, where *n* denotes the number of symbols.

Input

Alphabet quotient A= $\{a_1, a_2 \ldots\ldots a_n\}$ which is the symbol alphabet of size n. Set W= $\{w_1, w_2 \ldots\ldots w_n\}$ which is the set of positive symbol weights(usually proportional to probabilities) w_i = weight(a_i),$1 \le i \le n$

Output

Code C(A,W) = ($c_1, c_2 \ldots\ldots c_n$) which is the tuple of (binary) codewords,where C_i is the codeword for a_i,$1 \le i \le n$.

Goal

Let L(C) = $\Sigma_{i=1}^{n} wi \times length(ci)$ be the actual weighted path length of code C.Condition: L(C) ≤ L(T) for any code T(A,W).

3.3. Reviews/Likes, Posts/Views through Android Application

Here in review,posts through Android application, users first need to install the OSN app in their Android phone and user need to login with their valid account. After login server can able to maintain their **gps** position

Of the user and Bluetooth MAC address and IMEI. The Server keeps track of all the users gps coordinates and the downloaded file contents if a download request rises from the user. A service thread will be run in android application which regularly updates the gps coordinates to the server if any change occurs. The gps position is intimated only if there a change notified which reduces the communication overhead between the client and server. The server will be in a push mode whenever a post is triggered to the android mobile device. Our Image compression technique enables the user to view compressed image without blur and reduce the data usage. All the post can be viewed in android and web application.

3.4. Downloading/Transferring of Data via P2P

If any of the user need to view the post eg(Video/Image) the request is sent OSN Server which will look up for the nearby devices. If there is one or more devices in close proximity, the server will check for the historical download requests of each nearby user for content. If the content is available with any of the user, server triggers both the nearby devices (Content requester, Content dispatcher) in back end Service Thread that already running in the mobile devices to initiate a Bluetooth communication. Here we handled both paired as well as unpaired devices and this is through pre sharing of Bluetooth ids by server to neighboring devices. After successful Bluetooth initialization the contents will be transferred from source mobile to destination mobile. The privacy of the entire user is retained by having pseudo identities for all the communications. The users are not aware of peer to peer communication that is happening in the back end, hence ensuring the security. Here nearby search Algorithm used for searching of nearby device. Nearest Neighbor depends critically on the distance metric

- Normalize Feature Values:
  All the features should have the similar range of values (e.g., [–1,+1]).
  Otherwise, features with larger ranges will behave as most important
- Remove Irrelevant Features:
  Irrelevant or noisy features add random perturbations to the actual distance measure and hurt performance
- Learn a Distance Metric:
  – One approach: weight each feature by its mutual information with the class. Let $wj = I(xj;y)$. Then $d(x,x') = \Sigma j=1\ n\ wj(xj – x'j)2$
- Mahalanobis distance:
  $DM(x,x') = (x – x')T\Sigma\text{-}1(x – x')$
- Smoothing:
  Find the *k* nearest neighbors and have them vote. This is especially good when there is noise in the class labels.

IV. CONCLUSION

Thus the proposed system using the social aware approach, limits the strain of OSN server by receiving the data from the nearby device without directly getting connected to server, and also saves the mobile data of users. The two users are connected by means of Blutooth.The user side is fully secured by giving option,what type of files can be accessed by the server,thus making sure that user knows which files can be shared to others through server.By this user is also provided with privacy This is a proposal to the existing social networking sites.

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