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Efficient Mobile Peer-to-Peer Approach for Multi User Video Streaming over Heterogeneous Access Networks

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Abstract: Wireless networks allow users to connect to the server and allows access from it. So multiple users may interested to access the resource from server through the wireless medium. Such criteria lead to increase the count of the number of clients which probably makes the server busy and makes a burden in the server. This leads to the delay in service for the all other users. To deal with such burden caused by multiple clients, this proposed method deals peer to peer streaming process which dynamically access data from its neighbouring clients by forming cooperative network. Here forming cooperative networks which allow the user to access directly from the neighbour who already accessed the same video. When more number of clients requesting the server at the same time, then the priority is given to the client who is first gave the request to that video content by means of First Comes First Serve (FCFS) then server makes the process of ARED (Automatic Request Dispatch). In ARED, the server process the first requesting client and then dispatching the all other requests from different clients automatically at the same time, without redirecting each client independently, to the client that owns the data. By doing so, the additional task of handling each request direct is avoided and overload in server is minimized.

Keywords: Wireless networks, peer-to-peer, ARED, FCFS, Video streaming.

I. INTRODUCTION

In traditional mobile streaming networks such as 3G wireless networks, all mobile peers pull video streams from a server [1]. Such criteria lead to high streaming cost and problem in systems throughput. i.e., network throughput and lifetime. When multiple mobiles are connected to the server for the same content then the server have the responsibility of finding the first requested client and have to redirect all other clients to the user who own the data. Existing system makes use spanning tree algorithm which finds out the first member who gave the request first, and these clients are processed first, then other client requests are redirected to this client who owns the data from server. This process increases the burden in the server, and makes the streaming progress with poor quality.

Usage of prim's algorithm takes more memory spaces and it will take long time to execute. And also sending dummy message to finding the weights for the nodes are also leads to higher streaming cost. Scalable video coding is efficient for the small applications. For Real time video streaming splitting is easier but merging & continuity checking is difficult. In large network if users are requesting at the same time then server will get the confusion of defining which user to service first. This leads to additional process to the server. Clients are wasting time when searching data in the server before redirecting to clients who owned the data.

To make a steaming process quicker and timely efficient providing an opportunity for direct access to the client who owns the data without forwarding the request to the server. Clients will checks the availability of same video content in the neighbor nodes, and if it is available then they directly access from those available clients without forwarding request to the server. Pre availability video stream checker is used to find the availability of the video streams from the nearest clients at first. If the files are available it is accessed from the nearest clients without direct communication between the servers. If the file is not present means client request is redirected to the server.

When multiple clients are enters into the cooperative network, service is provided in First comes first serve (FCFS) basis. Remaining requests are redirected to the first client from the server. This is achieved by Automatic Request Dispatch (ARED). Here the server work is distributed to a client who makes the cooperation among them. This makes the streaming process efficient too. When clients directly get access from the neighbour clients then there is a less amount of burden in the server which makes the server burden free. Here streaming is efficient because the searching time of clients in the server is avoided.

II. Related Work

Man-Fung Leung [1] proposed and investigates a scalable and cost-effective protocol to distribute multimedia content to mobiles in a peer-to-peer manner. This protocol, termed Collaborative Streaming among Mobiles (COSMOS), makes use of peer to peer data sharing to achieve high performance. In COSMOS, only a few mobile peers pull video contents through a telecommunication channel. The server contents are shared from the free broadcast channel (such as Wi-Fi and Bluetooth) they share the descriptions to nearby neighbours in an ad-hoc manner. The main drawbacks are, Sending large packets through WiFi, Bluetooth will increase the delivery delay of the video frames. If any content distributor is fails means, find the adjacent peers are difficult.

Randeep Bhatia [3] proposed ICAM, Integrated Cellular and Ad hoc Multicast, to increase 3G multicast throughputs through opportunistic use of ad hoc relays. In ICAM, a 3G base station delivers video streams to proxy mobile devices with better 3G channel quality. The proxy mobile devices then redirect the packets to the receivers from the ad hoc network. Reducing the 3G downlink data rate of each multicast receiver's proxy does not lead to maximum throughput for the multicast group. Here, the proxy server must be a trusty one. If the proxy server act as a hacker means the entire system will fail & Quality of service will denied. Proxy server needs more essential configuration like security, confidentiality etc.

ThomasWiegand [5] proposed H.264/AVC video coding standard of the ITU-T Video Coding Experts Group. So the maintenance cost is increased depending upon the network conditions & channel utilization. Dynamic peer's allocation needs more challenges in security & integrity. This standard defines how the video frames can be splitted, encoded, compressed. For dealing with multiple clients, server needs different kinds of compression algorithms, encoding schemes, splitting procedures. So, Server load will indirectly increased.

Liang Zhou[9] Proposed an important issue of supporting multi-user video streaming over wireless networks is how to optimize the route scheduling by intelligently utilizing the available network resources while, at the same time, to meet each video description Quality of Service (QoS) requirement. Here the entire frequency band is divided into multiple channels, and each radio can only access one channel at a time. Therefore, if each network node has multiple radio interfaces, it can then utilize a larger amount of bandwidth, and hence achieve a higher system capacity.

Liang Zhou [10] Proposed and investigate the optimal system scheduling for competing multiple description (MD) video streams in a resource-limited wireless multi-hop network. By joint optimization of MD, rate control and multipath routing, optimal joint rate control and routing algorithm to solve this problem with constraints that arise from the MD streams among multiple users via multiple paths. At the time of simultaneous resource allocation, more energy between the nodes is necessary. This algorithm doesn't deals with sleep scheduling algorithm. So Energy handling is something difficult.

Ganesh[14] proposed to COMBINE makes a number of novel contributions over prior work in this area, including: (a) a framework of incentives for collaboration that addresses several practical issues including the unification of monetary and energy costs, and on-the-fly estimation of the energy cost of communication in a system in operation; (b) a protocol for collaborative group formation and workload distribution that is energy efficient and adaptive to fluctuations in network conditions; and (c) an application-level striping procedure that eases deployment by avoiding the need for special-purpose proxies in the Infrastructure. Collaborative Downloading is only possible in cooperative networks. This will need lots of authentication from server. If the peers are not willing to provide the required services means the entire system will fails to operate.

A. Motivation

In traditional mobile streaming system such as 3G cellular networks, users in the range of a base station “pull” streams from a remote server [1]. Such kind of pulling leads higher streaming cost and mobile users should wait long time to get the requested files. The server contents are shared from the free broadcast channel (such as Wi-Fi and Bluetooth) they share the descriptions to nearby neighbours in an ad-hoc manner. The main drawbacks are, Sending large packets through WiFi, Bluetooth will increase the delivery delay of the video frames. If any content distributor is fails means, find the adjacent peers are difficult. The proposed scheme reduces energy consumption and distributes load among mobile peer nodes. In this scheme a peer to peer (p2p) overlay network is build among the mobile nodes to facilitate cooperative data sharing in order to relieve the traffic bottleneck at the base station. In particular energy conservation, each mobile user (MU) in p2p overlay shares a data item in a cooperative zone.

B. Problem Definition

The main goal of this system is, to deal how efficiently clients can access the video frames to the nearest mobile stations without accessing server. The mobile stations can access the video frames through the adjacent nodes, when the load is heavy.

The video streaming focus four criteria’s:

- Simultaneous access of server will increase the server load.
- In large network server will get confusion to define the task for multi nodes.
- Network lifetime and throughput (Quality of service) rapidly decreases.
- Clients are wasting time when searching data in the server before redirecting to clients who owned the data.

III. SYSTEM MODEL

A. Methodology

A method is described to compute the optimal resource allocation at each node in a distributed fashion. i.e) First Come First Serve (FCFS) flow selection algorithms for delay efficient flow selection. The flow selection and resource allocation process is adapted for each video frame according to the channel conditions on the network links. Allocation and flow selection algorithms provide notable performance gains with small optimality gaps at a low computational cost.

B. System Architecture

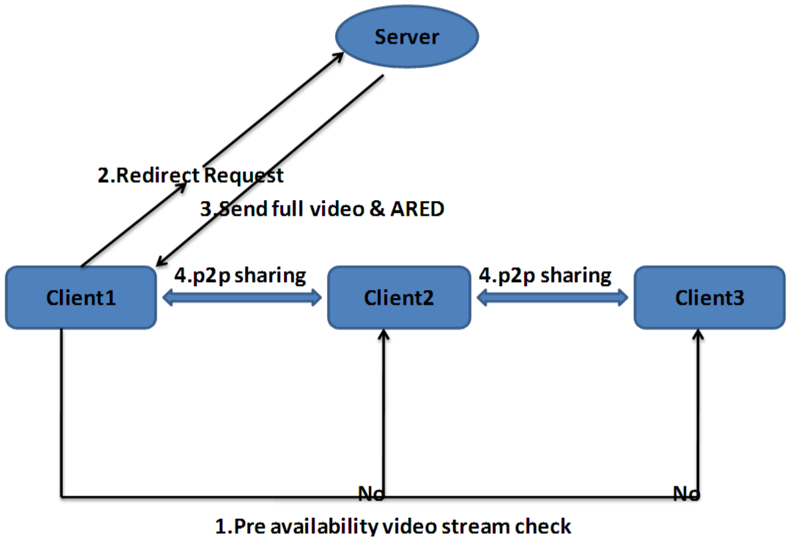

Fig. 1. Proposed system with server access

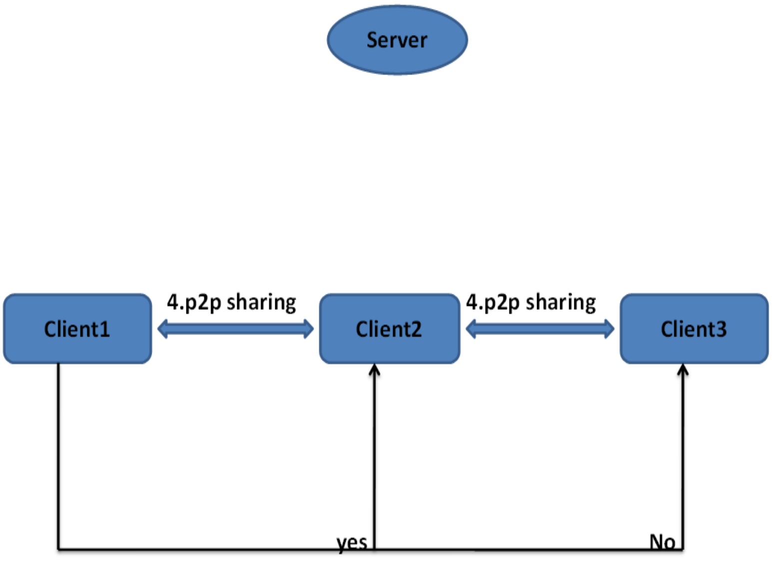

Fig. 2. Proposed system without server access

The first module defines the Peer-to-Peer Multi client login. Username ,IP Address,Port number is is received from the clientsr for confidential service provision. When the Server identifies all the client details, the Clients & servers are cooperative in nature. Now server is started between all the nodes. Because all the nodes are comes under cooperative networks. It is essential for multi client data transfer with confidential data sharing. It is used to restrict access from external users trying to gain access to internal network devices.

The second module defines Pre availability video stream checker (PAVC). When multiple clients are enter into the cooperative network and request the same video, using pre availability video stream checker (PAVC) checks the nearest clients first. If the file is present means directly it is accessed from the nearest clients. This way we can avoid the direct server access. Otherwise the request is redirected to the main server.

The third module defines the First come first serve (FCFS) flow selection & service provision. With first come, first served, first request is processed first. All other requests are in line will be executed next. When more number of client request the server at the same time, then the priority is given by means of First Comes First Serve (FCFS). This task is easier to execute.

The fourth module defines Automatic Request Dispatch. In ARED, the server process the first requesting client and then dispatching the all other requests from different clients automatically at the same time, without redirecting each client independently, to the client that owns the data. By doing so, the additional task of handling each request direct is avoided and overload in server is minimized. Here the server work is distributed to clients which makes the cooperation among them efficient one and makes the streaming process efficient too.

IV. SYSTEM DESIGN

A. Peer-to-Peer multi Client login

The main goal of this system is real time video file sharing from the adjacent clients without accessing server. Username ,IP Address,Port number is is received from the clientsr for confidential service provision. When the Server identifies all the client details, the Clients & servers are cooperative in nature. Now server is started between all the nodes. Because all the nodes are comes under cooperative networks. It is essential for multi client data transfer with confidential data sharing.

It is used to restrict access from unauthorized users trying to gain access to internal network devices. The Intelligent firewall (IF) does not restrict outbound requests to the Internet while incoming requests from the Internet are tightly managed from administrator. The only way to pass through a firewall from the Internet is to be invited by an internal user. The Intelligent firewall (IF) tracks each internal user's outbound requests with corresponding responses from the Internet. The registered users are permitted for p2p sharing and it is approved by the firewall and restrict the external who doesn't have a registered request is rejected. An Intelligent firewall's registration process uses "port numbers" to keep track of the flow of incoming and outgoing data requests and responses. A unique port number is registered and opened to a specific Internet address when an outbound request is made and the response comes back to the same port for validation by the firewall. Only registered clients are allowed through the firewall. It is possible to manually setup unique port numbers on a firewall to "forward" incoming data requests from the Internet.

The firewall is programmed by its network administrator to open specific ports and will then directly forward all data that is received on that port to a specific internal network address. Port number forwarding can be dangerous because it opens a hole in the firewall for Internet probing and network entry. Network security is now partly the responsibility of the device receiving the forwarded data. A mobile that are receiving data from a forwarded port on the firewall must have well architected security features because they will be directly visibly to Internet users and hackers. Many private network devices do not have adequate security provisions because they were designed for use only by known users on safe internal networks. Device Port forwarding works with traditional Internet service providers because they don't restrict incoming ports from the Internet and they leave management of firewall protection to the customer. This is not the case with wireless-based Internet service providers. These providers typically use a filters or firewall that blocks the incoming requests that would normally be handled by the user's firewall. This filters or firewalls does not impact consumers who send outbound web requests to the Internet, but it does fully block inbound requests from hackers and unfortunately, from well-intended mobile users looking to make connections with their wireless devices.

Advantages:

- Clients can access the contents from adjacent peers without their authentication.
- Confidential at the same time efficient video delivery.
- No need to wait for direct server service.

B. Pre availability video stream checker

In demo application peer to peer connection is established through the COSMOS protocol. Normally, a server is a base mobile station that is bound to a specific port number. The client communicates with server through GPRS. Initially mobile peers give the service request through the same. And now the client just waits, listening to the sever response for a client to make a connection. The server knows the port number, IP Address of the machine on which the client is running and the port number on which the client is listening. To make a peer to peer connection request, the client tries to rendezvous with the server on the server's machine and port. The mobile peers also need to identify it to the server so it binds to a local port number that it will use during this connection. This is usually assigned by the admin system. If everything goes as per the protocol, the server accepts the connection. Upon acceptance, the client & server gets peer to peer connection and also its remote endpoint set to the address and port of the mobile client. When more than one clients entering into the cooperative zone, same procedure is repeated for all the clients. If the connection is accepted, the client and server can now communicate by writing or reading video streams.

Now all the peers can act as a server for cooperative content sharing. If and requested video is in nearby mobiles, then they are directly accessed from the nearest peers without direct server access. This way we can reduce the streaming delay and telecommunication cost.

Advantages:

- If the content is available in adjacent clients means peer-to-peer connection is established for cooperative content sharing.
- Additional task of redirect request is avoided.

C. First come first server (FCFS) flow selection and service provision

The third module defines the First come first serve (FCFS) flow selection& service provision. With first come, first served, what request comes first is handled first; the next request in queue will be executed once the one before it is complete. For real time video broadcast multiple mobile users are interested to access the same content. So server may get confusion with multiple requests. Existing system uses prims minimum spanning tree flow selection. This method is something difficult to execute. When more number of clients requesting the server at the same time, then the priority is given to the client who is first gave the request to that video content by means of First Comes First Serve (FCFS). This task is easier to execute.

The First-Come-First-Served (FCFS) scheduler is one of the most common schedulers designed for best-effort networks where no QoS guarantees are required. The design and implementation of this scheduling algorithm is very simple without any complications, since the only data required by scheduler to make a scheduling decision is the arrival-time of the packet to the scheduler, then the algorithm take place by serving the packet arrived first without looking to the type of the packet, the packets are considered as equally-likely (same treatment). In this algorithm the scheduler has a limited buffer size in which successful scheduled packets will be queued in, once a new packet arrives the scheduler it will be resides in the tail of the buffer (queue) if it's time constraints can be achieved, if we were dealing with the standard FCFS scheduler, then the scheduler will drop the packet if its time-constraints are not met, but using this new version of FCFS there will be another chance to accept the packet by replacing it with the last packet being in the scheduler before the new packet arrive, if this replacement process didn't conflict any timing constraints for both packets, then the replacement process take place, otherwise the new packet will be dropped.

The FCFS scheduler will be efficient for dealing with dynamic real-time systems especially hard real-time systems, it could be used with real-time systems where there is flexibility in the timing-constraints for the real-time jobs, and it will be more efficient when dealing with best-effort traffic. FCFS can be used in real-time systems where the number of real-time tasks are small (non heavy traffic), in this way the advantage of using a simple algorithm will help in decreasing the overhead time due to the scheduler processing and so more efficiency.

Advantages:

- FCFS flow selection use only Queue, so the implementation easy.

- Sending dummy message and waiting for the response is also leads to higher streaming cost. FCFS doesn't have any conflicts.

D. Automatic Request Dispatch (ARED)

Server will collect all the requests in First come first serve (FCFS) priority basis. Then the server makes the process of ARED. In ARED, the server process the first requesting client and then dispatching the all other requests from different clients automatically at the same time, without redirecting each client independently, to the client that owns the data. By doing so, the additional task of handling each request direct is avoided and overload in server is minimized. Here the server work is distributed to clients which makes the cooperation among them efficient one and makes the streaming process efficient too. When clients directly get access from the neighbor clients then there is a less amount of burden in the server which makes the server burden free. Here streaming is efficient because the searching time of clients in the server is avoided.

Furthermore, as video streams are supplied by multiple mobile peers, Cooperative video stream sharing is robust to mobile peer failure. Since broadcasting is used to disseminate video data, Cooperative video streaming is highly scalable to large number of mobile users. In Cooperative content streaming, peers autonomously determine whether to broadcast packets or not in order to efficiently use of the channel bandwidth. Now peers can effectively share video streams, and hence substantially reduce, streaming cost and end-to-end delay. As broadcast scope is small and peers can often obtain a number of streams from its neighbours, Cooperative streaming achieves low delay and excellent stream continuity.

Advantages:

- Multiple clients can share the contents at the same time without any delay.
- Sever overload reduced.
- Energy consumption reduced.

V. EXPERIMENTAL RESULTS

A. Existing Approach

Assume client server communication need 1 second for transferring messages & giving response. Server will receive the requests in different time units, because the clients may present in various locations. Weights are assigned based on the client requests. Here nearest client will get the service at 4^{th} second. Now peer-to-peer connection is established. Prims algorithm will take little time to find the nearest client. Through p2p video streaming technique client2&3 will receive the streams in 7^{th}&8^{th} second.

B. Proposed Approach

Here the proposed method deals with FCFS flow selection and pre availability video stream checking. Assume here also client server communication need 1 second for transferring the message, response passing. Server will provide the services to the first client immediately. So client1 receive the contents in 4th second. Now client2 & client 3 receives the contents at 6^{th} second through p2p sharing without server access. Here approximately 40% of energy is saved. This can avoid sever overload & it will increase the network lifetime.

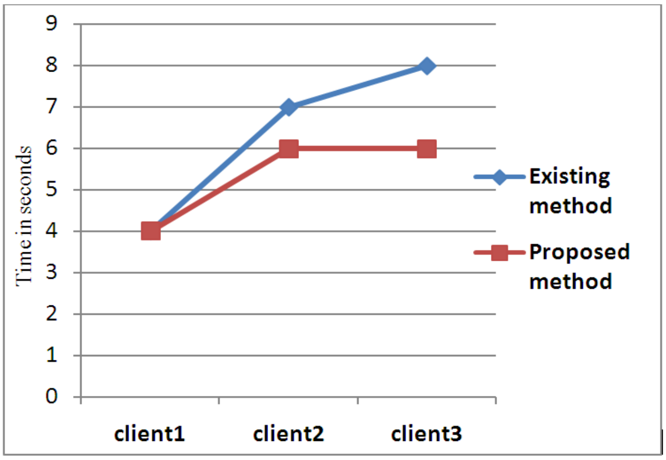

Fig. 1. Performance Analysis

VI. CONCLUSION AND FEATURE WORK

In this proposed scheme increase the scalability and network performance of video streaming to distribute multimedia content to a group of mobile devices. Collaborative video distribution may improve the video streaming with delay efficiency. Each peer randomly selects and pulls an available video description through a telecommunication link. It shares the description with its neighbours by broadcasting it so that its neighbours obtain more descriptions without increasing their streaming cost. Through peer-to-peer video streaming clients can get the services from the adjacent peers without forwarding request to the server. This way we can avoid the streaming delay. The proposed scheme reduces energy consumption and distributes load among mobile peer nodes. In this scheme a peer to peer (p2p) overlay network is build among the mobile nodes to facilitate cooperative data sharing in order to relieve the traffic bottleneck at the base station. In particular energy conservation, each mobile user (MU) in p2p overlay shares a data item in a cooperative zone. By doing so, the additional task of handling each request is avoided and overload in server is minimized. In future we planned to use Tree vertex Splitting algorithm to handle the traffic and overload between peers.

References

1. M.-F. Leung, S.-H. G. Chan, and O. C. Au, “COSMOS: peer-to-peer collaborative streaming among mobiles,” in Proceedings of IEEE International Conference on Multimedia Expo (ICME) (invited), Toronto, Canada, July 2006, pp. 865–868.
2. M.F. Leung and S.-H. Gary Chan,“Broadcast-Based Peer-to-Peer Collaborative Video Streaming Among Mobiles,” IEEE Trans. Broadcasting, vol. 53, no. 1, pp. 50-61, Mar. 2007.
3. R. Bhatia, L.E. Li, H. Luo, and R. Ramjee, “ICAM: Integrated Cellular and Ad Hoc Multicast,” IEEE Trans. Mobile Computing, vol. 5, no. 8, pp. 1004-1015, Aug. 2006.
4. H. Wu, C. Qiao, S. De, and O. Tonguz, “Integrated Cellular and Ad Hoc Relaying Systems: iCAR,” IEEE J. Selected Areas in Comm., vol. 19, no. 10, pp. 2105-2115, Oct. 2001.
5. T. Wiegand, G. Sullivan, G. Bjontegaard, and A. Luthra, “Overview of the H.264/AVC Video Coding Standard,” IEEE Trans. Circuits and Systems for Video Technology, vol. 13, no. 7, pp. 560-576, July 2003.
6. H. Schwarz, D. Marpe, and T. Wiegand, “Overview of the Scalable Video Coding Extension of the H.264/AVC Standard,” IEEE Trans. Circuits and Systems for Video Technology, vol. 17, no. 9, pp. 1103-1120, Sept. 2007.
7. D. Wu and R. Negi, “Effective Capacity: A Wireless Link Modelfor Support of Quality of Service,” IEEE Trans. Wireless Comm.,vol. 2, no. 4, pp. 630-643, July 2003.
8. H. Luo, R. Ramjeey, P. Sinha, L.E. Li, and S. Lu, “UCAN: AUnified Cellular and Ad Hoc Network Architecture,” Proc. ACMMobiCom, Sept. 2003.
9. L. Zhou, X. Wang, W. Tu, G. Muntean, and B. Geller, “Distributed Scheduling Scheme for Video Streaming over Multi-Channel Multi-Radio Multi-Hop Wireless Networks,” IEEE J. Selected Areas in Comm., vol. 28, no. 3, pp. 409-419, Apr. 2010.

10. L. Zhou, X. Wang, Y. Li, B. Zheng, and B. Geller, "Optimal Scheduling for Multiple Description Video Streams in Wireless Multihop Networks," IEEE Comm. Letters, vol. 13, no. 7, pp. 534- 536, July 2009.

11. K.-J. Peng and Z. Tsai,"Distortion and Cost Controlled Video Streaming in a Heterogeneous Wireless Network Environment," Proc. IEEE Int'l Symp. Personal, Indoor and Mobile Radio Comm., Sept. 2006.

12. X. Zhang and Q. Du, "Cross-Layer Modeling for QoS-Driven Multimedia Multicast/Broadcast over Fading Channels in Mobile Wireless Networks," IEEE Comm. Magazine, vol. 45, no. 8, pp. 62- 70, Aug. 2007.

13. Xi Zhang and Qinghe Du, "Cross-Layer Modeling for QoS-Driven Multimedia Multicast/Broadcast over Fading Channels in Mobile Wireless Networks," IEEE Trans. Wireless Comm., vol. 6, no. 8, pp. 3058-3068,Aug. 2007, IEEE Communications Magazine , August 2007.

14. Ganesh, Ananthanarayanan, VenkataN.Padmanabhan "COMBINE: Leveraging the Power of Wireless Peersthrough Collaborative Downloading"MobiSys'07, June 11–14, 2007, San Juan, Puerto Rico, USA.

15. Lina Al-Kanj, WalidSaad and ZaherDawy, "A Game Theoretic Approach for Content Distribution over Wireless Networks with Mobile-to-Mobile Cooperation" 22nd Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications, September 13, 2011.

16. Amin Abdel Khalek, ZaherDawy "Energy-Efficient Cooperative Video Distribution with Statistical QoS Provisions over Wireless Networks" IEEE Transactions on Mobile Computing, Vol. 11, No. 7, July 2012.

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