M. Naga Padmaja* et al.
(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.3, Issue No.5, August - September 2015, 2440 – 2444.

Hybrid Routing and Multicast Scheduling Algorithms for OFDMA Relay Networks

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Abstract: **In era of technology, Wireless communication domain growing rapidly due to user mobility & different business operator to deploy Multicast & Broadcast based applications combining video, voice & text. To compute with it; two hop Orthogonal Frequency Division Multiple Access (OFDMA) relay network are being efficiently used in combination with Multicasting which forms a promising communication model for many multiparty applications. We can achieve multiplexing gains in OFDMA network by certain multicast strategy. Grouping of relay network and cooperation between them is one way of multicast strategy. For effective use of relay network, grouping and scheduling for the same must be carried out in intelligent manner. Different scheduling algorithms have been used for different relay network to maximize the multicast flow. While using the scheduling algorithm for OFDMA relay network we have notice the problem of multicast transmission between networks when failure occurs. To solve the problem of multicast transmission when failure occurs one must use dynamic method to choose different path i.e. routing dynamically over the network. Relay network group themselves and cooperate between, also reporting for the failure.**

Keywords: **Hybrid Routing, OFDMA, Relay Networks, TCP, DVMA.**

I. INTRODUCTION

In mobile and wireless local area networks, wireless communication just happens on the last connection between a base station and the remote end framework. In multi-hop remote systems there are one or more middle hubs along the way that get and forward bundles by means of remote connections. Multi-hop remote systems have a few advantages: Compared to coordinates with single remote connections, multi-jump remote systems can expand the scope of a system and enhance integration. In addition, transmission over numerous "short" connections may require less transmission force and vitality than over "long" connections. Also, they empower higher information rates bringing about higher throughput and more proficient utilization of the remote medium. Multi-bounce remote systems maintain a strategic distance from wide arrangement of links and can be conveyed in an expense proficient manner. If there should arise an occurrence of thick multi-bounce arranges a few ways may get to be accessible that can be utilized to build robustness of the network.

Unfortunately, protocols produced for altered or cell arranges and in addition the Internet are not ideal for multi-hop remote systems. This is specifically the case for steering conventions, where totally new unicast, multicast, and show directing conventions have been created for (portable) specially appointed and sensor systems.

On the transport layer, the Transmission Control Protocol (TCP) is the accepted standard in the Internet and with a specific end goal to permit interoperability; TCP must be bolstered in multi-hop remote systems also. Then again, numerous convention components, for example, blockage control and lapse control in view of affirmations don't work productively in multi-bounce remote systems because of different reasons, for example, dispute and control parcel overhead. Indeed, even on application level new ideas are obliged to bolster revelation of support discovery and services.

II. RELATED WORK

Relays: Different works [1], [2]–[3] have explored the capability of relay-enabled wireless networks to give enhanced scope and limit. Planning of unicast information has gotten higher accentuation [4]–[5], [6], [7], [8], [9] so far in these systems. The majority of the prior works [10], [11] concentrated on TDMA variations where the booking choice lessens basically to choosing whether to utilize a transfer or not and for which specific client. They don't abuse different OFDM channels and the subsequent differences accessible over the hand-off and access bounces. Then again, OFDM planning answers for routine cell systems [12], [13], [14] can't be specifically stretched out to two-bounce transfer systems, where stream protection crosswise over jumps frames an essential part. The later works [15]–[16] have taken a gander at utilizing differences and spatial reuse [17] picks up in transfers utilizing OFDMA. In any case, every one of these works are confined to unicast information.

Multicasting: Dissimilar to unicast experiments, the OFDMA scheduling takes a shot at multicast information have to a great extent been confined to one-hop cellular networks [18]. These arrangements can't be specifically continued to hand-off systems, where the way of multicast movement and its show leeway is fundamentally changed on the entrance jump. Multicasting with transfers has gotten expanded consideration as of late. Data theoretic works have taken a gander at limit limits for a multicast framework with transfers. Utilization of system coding at transfers to encourage multicasting has likewise been contemplated in Layered feature, being a prominent application for multicast, has been improved for transfers in keeping in mind every one of these works have taken a gander at different parts of multicast transmission with transfers, they don't fuse OFDMA planning. Notwithstanding making the issue fundamentally diverse, consolidation with OFDMA booking is likewise a critical segment in cutting edge broadband access systems like LTE and WiMAX. In this bearing, our earlier work considered the joining of multicast and unicast activity in hand-off systems with OFDMA and gave some booking heuristics to the concurrence of heterogeneous movement. On the other hand, it didn't consider session multiplexing or its tradeoff with transfer participation that emerges inside multicast planning and, thus, did not address the multicasting issue with transfers thoroughly.

Network Model: We consider a downlink OFDMA-based, relayenabled, two-hop wireless network as shown in Fig. 1(a). A set of M MS are uniformly located within the macro cell. A small set of R RS are added to the midway belt of the network (R<M).

$$(P_R<P_B)$$

MS farther from the base station (BS) connect with the RS that is closest to them based on highest signal-to-noise ratio (SNR). The one-hop links between BS and RS are referred to as relay links, between RS and MS as access links, and between BS and MS as direct links (equivalent to relay links for scheduling purposes). Downlink data flows are considered and assumed to origi-nate in the Internet and destined toward the MS. All stations are assumed to be half-duplex. Let PB, PR denote the maximum power used by the BS, RS for their transmission which is split equally across all subchannels, and no power adaptation across channels is assumed, given the marginal gains resulting from it. A set of total OFDM subchannels is considered, with two models for grouping of subcarriers to form a subchannel: distributed permutation (DP) and contiguous permutation (CP). As the name suggests, the subcarriers con-stituting a subchannel are chosen randomly from the entire fre-quency spectrum in DP, while adjacent subcarriers are chosen in CP. In DP, a single channel quality value (averaged over en-tire spectrum), which is common to all its subchannels, is fed back by an RS/MS. This allows an RS/MS to employ a common rate on all subchannels. While the random choice of subcarriers in a subchannel eliminates channel diversity, it helps average out interference and reduce feedback. On the other hand, in CP, the high correlation in channel gains across adjacent subcarriers helps leverage subchannel diversity, whereby an RS/MS can employ different rates to suit different subchannel gains through scheduling. However, this requires feedback on all subchannels from RS/MS. Note that the measurement, feedback, and choice of rate levels (modulation and coding levels, MCS) are standardized [1] for the two modes and directly provided by the MS (through RS) and RS to the BS in uplink frames, which the BS then directly uses for scheduling its transmissions to the RS and MS. Hence, for scheduling purposes, it suffices to model the rates being same (DP) or different (CP) on different subchan-nels for a user.

Scheduling Model Frame Structure*:* We consider a synchronized, timeslotted system (WiMAX, LTE) with BS and RS transmitting data in frames. Every frame consists of several time-slots and has to be populated with user assignments across channels for LTE (no channel sharing across slots) and user assignments across both time-slots and channels for WiMAX. To address both models generically, it is sufficient to consider the problem with one time-slot per frame since channels in other time-slots can be considered as additional channels available to the time-slot under consideration [6], [15]. Furthermore, the slotted frame structure allows us to decouple the scheduling of unicast and multicast traffic, with our focus being on the latter. For multicast scheduling, assignments are made with respect to sessions, where multiple MS and corresponding RS can be subscribed to a session. K multicast sessions with backlogged buffers are considered (extensions to finite buffers is discussed in Section VI). As advocated in the relay standard [1], [9], each frame consists of a relay and an access zone, where the scheduling of the half-duplex relays are time-divisioned with that of the BS, i.e., BS/RSto-MS transmissions in the relay zone first followed by RS-to-MS transmissions in the access zone. Furthermore, simple receivers are considered at the MS and hence cooperation and combining of data transmission from the BS and RS to MS across frames is not leveraged. The BS is respon- sible for scheduling both the relay and the access hops in each frame, thereby resulting in per-frame schedules. While time di-visioning between the hops eliminates the reuse of channel re-sources across hops, it still allows for channel reuse to be lever-We consider the simple yet effective

Alamouti space-time code aged within the access hop through scheduling. The resulting session assignments to relay-hop channels for the current frame and the access-hop channels for the following frame are indicated by the BS to the RS and MS through a small control re-gion in the frame called the MAP. The MAP follows the preamble in the frame [1] and is transmitted at the lowest modulation and coding.

III. EXISTING SYSTEM

WITH the next-generation wireless networks moving toward smaller (micro, pico) cells for providing higher data rates, there is a revived interest in multihop wireless networks from the perspective of integrating them with cellular networks. With a decrease in cell size, relay stations (RS) are now needed to provide extended coverage. In this context, two-hop relay-enabled wireless networks have become a dominant, mandatory component in the 4G standards (WiMAX 802.16m, 3GPP LTE-Adv) due to the plethora of envisioned applications (hotspots, office buildings, underground tunnel access, etc.) they support. Disadvantages:

1. Only return a single channel quality value.

2. No multicast scheduling.

IV. PROPOSED SYSTEM

Evaluation of the proposed solutions reveals the efficiency of the scheduling algorithms as well as the significant benefits obtained from the multicasting strategy. We evaluate the proposed solutions in an event-driven simulator that incorporates realistic physical-layer effects.

In two hop relay network with multicasting scheduling algorithm relay station only do the work of reporting. Hence the proposed system could be efficiently used with the combination of OFDMA relay network and their cooperation with each other with addition of dynamically changing the route rather than reporting the failure to specific server or client. In this paper, DVMA delay variation multicast algorithm is implemented. We can effectively increase the performance of the network by increasing the throughput. It can be achieve it by applying efficient multicasting algorithms with socket programming.

Client: In this module, client will check the destination path and ready to transfer the data from one node to other node. In client there are no of nodes are created and with node mobility.

Server: In the module, server will monitor the data which is moving for client (source) to server (destination) with the help of medium nodes. Here we can transfer text & voice files from source to destination.

OFDMA: In two hop relay network with multicasting scheduling algorithm relay station only do the work of reporting. Hence the proposed system could be efficiently used with the combination of OFDMA relay network and their cooperation with each other with addition of dynamically changing the route rather than reporting the failure to specific server or client.

V. EFFICIENT MULTICASTING ALGORITHMS

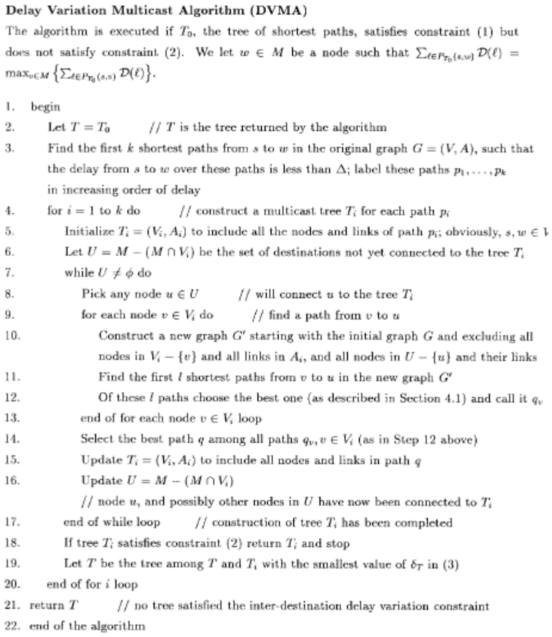
Let be the tree of shortest paths from source to the nodes in the destination set *M*. Let us also assume that meets the delay requirement (1), but that it does not meet the delay variation requirement (2). The DVMA, described in detail in Fig. 1, can then be used to search through the space of *candidate* trees (i.e., trees spanning and the nodes in) for a feasible solution to the DVBMT problem. DVMA either returns a feasible tree, or, having failed to discover such a tree, it returns one which: 1) satisfies the delay constraint (1) and 2) has the least value of *among the trees considered by the algorithm.* We now describe the basic idea behind the operation of DVMA.

DVMA repeats the following three steps as long as .

1) Select a destination node.

2) Find a "good" path from a node to that uses no nodes in other than , and no links in .

3) Construct a new tree by including all nodes and links of this path to the initial tree , and update to exclude and any other destination nodes along this path.



Delay Variation Multicast Algorithm (DVMA)

The algorithm is executed if T_0, the tree of shortest paths, satisfies constraint (1) but does not satisfy constraint (2). We let $w \in M$ be a node such that $\sum_{\ell \in P_{T_0}(s,w)} \mathcal{D}(\ell) = \max_{v \in M} \left\{ \sum_{\ell \in P_{T_0}(s,v)} \mathcal{D}(\ell) \right\}$.

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1.  begin
2.    Let $T = T_0$        // $T$ is the tree returned by the algorithm
3.    Find the first $k$ shortest paths from $s$ to $w$ in the original graph $G = (V, A)$, such that
      the delay from $s$ to $w$ over these paths is less than $\Delta$; label these paths $p_1, \ldots, p_k$
      in increasing order of delay
4.    for $i = 1$ to $k$ do        // construct a multicast tree $T_i$ for each path $p_i$
5.      Initialize $T_i = (V_i, A_i)$ to include all the nodes and links of path $p_i$; obviously, $s, w \in$
6.      Let $U = M - (M \cap V_i)$ be the set of destinations not yet connected to the tree $T_i$
7.      while $U \neq \phi$ do
8.        Pick any node $u \in U$        // will connect $u$ to the tree $T_i$
9.        for each node $v \in V_i$ do        // find a path from $v$ to $u$
10.         Construct a new graph $G'$ starting with the initial graph $G$ and excluding all
            nodes in $V_i - \{v\}$ and all links in $A_i$, and all nodes in $U - \{u\}$ and their links
11.         Find the first $l$ shortest paths from $v$ to $u$ in the new graph $G'$
12.         Of these $l$ paths choose the best one (as described in Section 4.1) and call it $q_v$
13.       end of for each node $v \in V_i$ loop
14.       Select the best path $q$ among all paths $q_v, v \in V_i$ (as in Step 12 above)
15.       Update $T_i = (V_i, A_i)$ to include all nodes and links in path $q$
16.       Update $U = M - (M \cap V_i)$
          // node $u$, and possibly other nodes in $U$ have now been connected to $T_i$
17.     end of while loop        // construction of tree $T_i$ has been completed
18.     If tree $T_i$ satisfies constraint (2) return $T_i$ and stop
19.     Let $T$ be the tree among $T$ and $T_i$ with the smallest value of $\delta_T$ in (3)
20.   end of for $i$ loop
21. return $T$        // no tree satisfied the inter-destination delay variation constraint
22. end of the algorithm
```

Fig: 1, Delay Variation Multicast Algorithms.

Socket Programming:

In C# the network programming through its namespaces likes System.Net and System.Net.Sockets. A Socket is an End-Point of to and From (Bidirectional) correspondence connection between two projects (Server Program and Client Program) running on the same system. We require two projects for conveying an attachment application in C#. A Server Socket Program (Server) and a Client Socket Program (Client).

C# Server Socket Program: A C# Server Socket Program running on a PC has an attachment that bound to a Port Number on the same PC and listening to the customer's approaching solicitations.

C# Client Socket Program: A C# Client Socket Program need to know the IP Address (Hostname) of the PC that the C# Server Socket Program lives and the Port Number dole out for listening for customer's solicitation .

Once the association is set up in the middle of Server and Client , they can convey (read or compose) through their own attachments.

Network programming in windows is conceivable with attachments. An attachment is similar to a handle to a record. Attachment programming takes after the record IO as does the Serial Communication. You can utilize attachments programming to have two applications correspond with one another. The application are normally on the distinctive PCs yet they can be on same PC. For the two applications to converse with each either on the same or diverse PCs utilizing attachments one application is by and large a server that continues listening to the approaching solicitations and the other application goes about as a customer and makes the association with the server application. The server application can either acknowledge or reject the association. In the event that the server acknowledges the association, a dialog can start with between the customer and the server. Once the customer is finished with whatever it needs to do it can close the association with the server. Associations are costly as in servers permit limited associations with happen. Amid the time customer has a dynamic association it can send the information to the server and/or get the information.

VI. CONCLUSION

We considered the problem of multicast scheduling in two-hop OFDMA relay networks. We showed that intelligent grouping of relays for cooperation is needed to address the tradeoff between cooperation and session multiplexing gains. We designed efficient scheduling algorithms (with performance guarantees) at the core of the multicast strategy to address the tradeoff and maximize aggregate multicast flow. Dynamically changing the route rather than reporting to the source and destination may have been proving a useful change in existing system. In this paper, Delay Variation Multicast Algorithms is implemented and shows the working process.

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