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WIRELESS NETWORK USING OPTIMIZED COOPERATIVE SCHEDULING

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ABSTRACT

In wireless networks for cooperative relaying, some nodes eavesdrop on the data send from the sender node relay it to the receiver node. We increase the capability of the network by optimizing relay node choosing and decreasing the count of hops. The topology control problem is then prepared as a distinct stochastic optimization trick that is decided using a stochastic estimation method. The existing systems effects in time delay in choosing alternative node due to node crash and inadequate ability to transfer the file. But each node in our proposed system encrypts and decrypts the file according to node capability to evade node crash. We choose the best node to transfer the file by assessing its impartial task and making the intervention set of the chosen relay node. The outcomes divulge that that our suggestion achieves better in the system connectivity, time factor and correct relay node choice than the multi hop communication. The performance of multi hop scheduling and Optimized Cooperative Scheduling (OCS) are compared in terms of probabilities, end to end delay, losses occurred and network capacity.

Keywords: *Wireless Networks, Optimization, Network Topology, Signal To Noise Ratio, Reliability*.

1. INTRODUCTION AND RELATED WORK

Cooperative communications are observed as a securing approach to augment spectral and power competence, system exposure, and to lessen outage possibility. An essential skill for supportive procedures is the choosing of relay. Right relay choosing methods are able to exploit the speed of communication and dependability. The system topology control is employed to decide where to arrange the links and how the links exertion in wireless systems to outline a high-quality system topology. The participating nodes form their own cooperative infrastructure by concurring to relay each other's packets.

Considering the network layer and the lower layers, we propose an OCS to increase the capacity of the network. The space diversity [1] showed performance like outage affairs and outage possibilities, measures toughness of the communications to vanishing and focal point on the Signal to noise ratio rule. It can provide the influence of space diversity without need for physical ranges using shared antennas.

The methodologies for multipath fading system model were *customer collaboration multiplicity* [2]. For the systems that increase the rate of transmission and reliability [3] in not fast fading canals, the significant presentation gauges are the outage possibility and outage facility. The precise idioms for these measures of practical cooperative diversity proposals have chosen a top relay from a relay set to promote the message. The resulting expressions are applicable for random network topology and functioning Signal to Noise Ratio (SNR) [4] and provide a functional device for system plan. The presentation of cooperative wireless networks is developed in the choice of relay. The choosing of the relay is regarded as fixed condition Markov channel [5]. The purpose of this scheme was to raise spectral effectiveness, alleviate fault transmission, and exploit the system duration.

When the received message from sender to receiver is in changed variations, uniting and recognition was taken care by [6]. Local Minimum Spanning Tree (MST) [7] announced an error accepting kind of this procedure which makes a *k*-linked topology. The main significant method utilized in ad hoc and sensor networks to decrease energy utilization and radio intervention was the Topology control [8]. The objective of this system was to organize the topology of the diagram signifying the message relations between system nodes. The force of topology power on set of connections capability [9] was done by analyzing the anticipated ability in the viewpoint of cross level optimization. The purposes of topology control were the best plans for the choice of

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neighbor and broadcast power management that are considered to exploit the capability.

Topology control with steady node quantity makes the ability not to reduce with the added number of nodes available in the system. It is required for all nodes [10] to allocate whatever part of the channel it is using with nodes in its confined neighborhood. Since the throughput provided to each client reduces to zero as the number of clients is added, networks joining lesser numbers of clients, or quality connections frequently with close by neighbor's, may be extra approximating to be get approval. Topology control in ad-hoc networks attempt to lesser node power utilization [11] by reducing transmission power and by confining interference, conflicts and succeeding rebroadcasts. The connectivity protecting and spanner structures are intervention negligible.

Most current topology control systems are motivated on regulating the physical or data link layer factors, for instance communication power and intervention, to increase the complete system presentation for example energy ingesting, intervention and system capability for Mobile Ad hoc NETworks (MANETs) [12]. The best current results were a nearby quantifiable planar distance and energy spanner with continuous limited node point [13]. Protection systems have significant effects on throughput [14] for two reasons in MANETs. First, it wants certain transparency and uses a few system sources to lessen throughput. Second, the majority earlier systems reflect protection and throughput distinctly in proposing a MANET that cannot accomplish a complete optimization of system action. A topology control structure increased throughput by intending both higher layer protection systems and lower layer systems.

In MANETs, topology control agreed enhanced spatial reuse [15] and manages extra system sources. Topology control procedures apt to improve system power norm by retaining the topology joined. MST describes the lowest subgroup of edges that retains the graph in one linked element [16]. The routing arrangements established on the connection idea were reviewed to utilize the possible performance achievement [17]. The combined problematic routing choosing in third layer and contention escaping amongst numerous links in data link layer for multi hop wireless systems attentive network was analyzed [18].

It showed that the simple procedure representing the k adjacent neighbor's efforts unpredictably well on graphs [19]. If relay nodes convey asynchronously, a refined decrypting method was used. A decrypting arrangement illustration for asynchronous supportive diversity is shown in [20] where an innovative least Mean Squared Error receiver was suggested for an ad hoc network.

The existing system studied multi hop broadcasts and not cooperative broadcasts. The system capability and concert of multi hop wireless systems would reduce as the number of hops traversed raises. The capability is reduced when the number of nodes enhances. This procedure does not assurance the system connectivity. The existing procedure decreases the energy by lessening the communication range. Extended connections are detached and message is sent through multi hops. The existing processes reflects the lessening of interference and it does not take into attention of all the other issues like the right choice of the relay node, optimizing the connection capability to evade failure or decreasing the count of hops. The existing system increases the system capability by believing connection large metrics and regarding the system as a whole.

2. PROPOSED SYSTEM AND ARCHITECTURE

A representation of the architecture of the proposed system shows the transfer of files through different transmissions for several nodes in wireless network as illustrated in Figure 1.

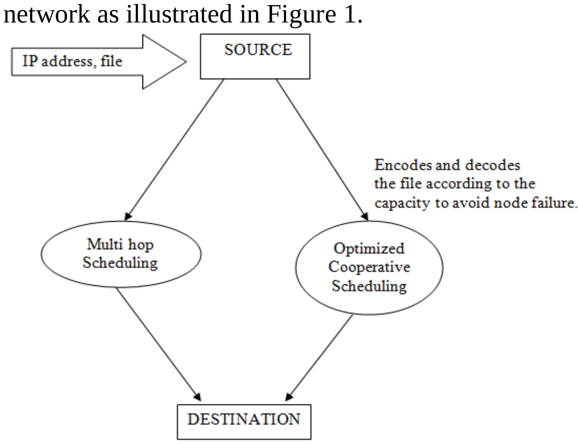

Figure 1: Architecture diagram

The proposed OCS topology control scheme takes into consideration multi hop and cooperative communications. Proposed scheme performs transmission mode choice; relay node variety and intervention minimization. OCS amplifies the ability by dividing the long link into too many hops locally. Simulations are performed to show the effectiveness of the proposed the system as opposed to the existing one. We have a proposed system which is able of developing the

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system ability by optimizing the capability, relay node choosing, transmission node selecting and reducing the number of hops.

The Internet Protocol (IP) address and file to be transferred is given as input for connection to the network. All nodes are designed with the different capacity. When a file is transferred through a particular node through multi hops, it first checks whether it has the capacity to transfer the file. If the node has enough capacity, it transfers the file successfully. Otherwise, it transfers the file to another node. When a file is transferred through OCS as shown in Figure 2 (Annexure), the file is decrypted and encrypted according to the capability of each node so that the node failure is prevented. The objective function for each node is estimated and interfering set is made for different types of transmissions and best relay for communication is chosen.

3. VARIOUS ALGORITHMS

3.1. Network Connection Algorithm

The inputs are the IP address and a file to be transmitted and the output is the network connected.

The *algorithm* is given as follows:

1. Check whether the IP specifications given are correct

1.1. If it returns true

1.1.1. Establish connection with the client

1.1.2. Start transmitting the file

1.2. else

1.2.1 Connection not established.

Connection capability and interfering model differ for dissimilar connections. *Direct transmissions* are the predictable point-to-point communication. Let $\gamma 0$ denote the received SNRs from the source to the destination. Given a trivial outage possibility ε, its outage connection capability is given by

$$C^{\varepsilon}_{DT} = \log_2(1 + \gamma 0 \ln(1/1 - \varepsilon)).$$

The Interfering set of a Direct Transmission is the combination of Coverage sets of the source node and the destination node: $IDT = Cov(S) \cup Cov(D)$.

3.2. Multi hop Scheduling Algorithm

The input is the files to be transferred and the output is the successful file transmission. The *algorithm* is given below:

1.1. Gather node neighborhood for a set of vertices r and edges s in a graph. Edge achieves awareness of its neighborhood.

1.2. Initialize the edge traversed to be null.

1.3. Set the new graph as a set of vertices and edge traversed.

1.4 Assign edge with least coverage as M. The cardinality of the set of nodes is the edge coverage.

1.4.1. Transfer every edge with coverage of M to the edge traversed. i.e., the maximum of a systematic set is ≥ the lowest of the same set, for the entire edges.

1.4.2. Find the shortest route of r – s in new graph and assign it to SP.

1.5. If the least interfering route for edge SP ≤ J |r,s| repeat from 1.4 steps.

1.6. Notify every edge on SP to endure in subsequent topology.

The J-spanner assets of the primary graph are the shortest route linking a couple of nodes *r; s* on the subsequent topology is lengthier by a constant factor than the shortest route between *r* and *s* on the certain system. The interval of a route corresponds to the number of its edges in J-spanners. The edge neighborhood of a spanner is termed as entire edges that can be got over a route SP beginning at *r* or *s*. Neighborhood awareness at every edge can be attained by local flooding.

Multi hop Scheduling are a two hop communication which devours two time periods. The messages are transmitted from the source to the relay in the first period and the messages will be forwarded from the relay to the destination in the second period. Let $\gamma 1$ and $\gamma 2$ denote the received SNR from the source node to the relay and from the relay to the destination node, respectively.

The outage connection capability is given as $C^{\varepsilon}_{MT} = 1/2 \log_2 (1 + 1/(_{1/\gamma 1 + 1/\gamma 2} \ln 1/1 - \varepsilon))$ where ε is link associations. The communication of each hop has its individual interfering that occurs in different periods. Interference sets in periods are

$$I_{S\to R} = Cov(S) \cup Cov(R) \quad \text{and}$$

$$I_{R\to D} = Cov(R) \cup Cov(D).$$

The end-to-end interfering set of the multi hop connection is concluded by the maximum of the two interfering sets. Interference Multi-hop Scheduling is

$$IMS = \max\{I_{S\to R}, I_{R\to D}\}.$$

3.3. Optimized Cooperative Scheduling

The system capability evaluation is calculated as its objective function that takes into attention both connection capability and interfering. The system connectivity and path size are observed as restrictions for the optimization trick. The OCS system describes formulates topology control as a distinct stochastic optimization problem. A distinct

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stochastic estimation method is then accepted to resolve the trick.

OCS uses the static Decrypt-and-Advancing (DA) relaying system with one finest relay that is nominated practically before communications. The relay node decrypts and re-encrypts the indicator from the source node, and then forwards it to the receiver in the DA relaying. The two indicators of the source and the relay are decrypted by Highest Ratio Joining at the receiver. So, the outage capability is expressed as

$$C^{\varepsilon}_{CT} = 1/2 \log_2 (1 + \ln (1/\mu\ \varepsilon)).$$

Interference Cooperative Transmission:

$$ICT = Cov(S) \cup Cov(R) \cup Cov(D).$$

Cov denotes the neighbor set of source S, relay R or destination D. The step size μ constraint switches the rapidity of conjunction, the steady condition and the tracing performance. ε is the predictable objective value for the configuration. The input is any files and IP address and the output is the successful file transmission. The *algorithm* is given below:

1.0. Choose arbitrarily the first optimal configuration for a neighbor connection at 0^{th} iteration that belongs to a possible result space.

1.1. Calculate the optimal configuration for topology control to be a product of number of signed message blocks, signed data packet and nominated relays.

1.2. Set the state likelihood vector at 0^{th} iteration to be ε.

1.3. Initialize approximation of best relay collection.

1.4. Choose a relay node arbitrarily and evaluate the objective value.

1.5. The most regularly visited state is determined by the present sample and the previous state.

2.0. Estimate the visited state order by giving the best configuration of neighbor connection at the each iteration.

2.1. Another configuration is generated consistently from the neighborhood space.

2.2. Evaluate the sampling most regularly visited state in the state likelihood vector.

3.0 Set the experimental state occupation chance as the visiting frequencies of every probable result.

3.1. If the objective value is greater than the previous objective value

3.1.1. Accept the node as the current visiting state in the next step.

else

3.1.2. The present node will be the current visiting state.

4.0 Update approximation of best maximize.

4.1 The occupation chance of the states is reorganized.

4.2. If the occupation chance of the new node is greater than the present node

4.2.1. The new node is selected as the relay node and data is transmitted.

else

4.2.2. The present node is the relay node and the data is transmitted.

4.3. The state likelihood vector is updated at the each iteration.

5.0. Go to step 2.0.

This is a distinct procedure to choose the optimal connection configuration. The objective of all the connection configurations is the throughput. Let $P_i(t)$ denote the number of packets that reach in the system during period t and I ranges from1 to N(nodes). We analyses $P_i(t)$ as a distinct time arrival procedures, interconnected with time periods and system. R be an arbitrary variable *stochastically* less than an arbitrary variable Q. So for all real values w: $P[R > w] \leq P[Q > w]$. A discrete time values with respect to rate and arrival procedure is denoted as $P_{sum}(t)$ = sum of $P_i(t)$. Thus the discrete stochastic optimization is done for OCS algorithm.

Table 1 shows the network capacities for 2,12,22,32,42,52,62 and 72 bytes for both transmissions. Table 2 and table 3 shows losses and delay occurred in various bytes like 2,12,22,32 for Multi hop Scheduling and OCS.

4. RESULTS AND EVALUATION

The software used to simulate our work is dot net and c#. The screenshots helps us to understand and evaluate the system. The user connects with the network by entering IP address and attaches a file by clicking the browse button. After pressing that button, the 'Open' dialog box will be opened. Any one file is selected for transmission. As shown in Figure 3, the successful attachment of the file is denoted by the green tick symbol and now file can be transferred. The destination form allows the user to specify the folder to save the file as shown in Figure 4. Figure 5 shows that the destination location is selected for saving the transferred file. Once the destination location is selected, the path is specified in the form as shown in Figure 6.

Figure 7 shows that the specification of a wrong IP address results in file transmission error. The status specifies that the file has been transferred successfully as shown in Figure 8. On providing the correct IP address and the file to be

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transferred, the file transfer by multi hop transmissions is simulated is shown in Figure 9. Figure 10 shows that the simulation of node failure occurred due to insufficient capacity.

When a node fails to transfer file, then an alternate relay node is selected for transmission is shown in Figure 11. On providing the correct IP address and the file to be transferred, the file transfer by OCS is simulated is shown in Figure 12. Figure 13 shows that the node failure is prevented by decoding and encoding the file according to the node capacity. The file has been received and saved in the specified location is shown in Figure 14. A graph comparing the probabilities of both OCS and Multi hop Scheduling is shown in Figure 15. Figure 16 shows OCS and Multi hop Scheduling end to end delay in terms of number of nodes and time. Delay is less in OCS. Figure 17 shows the losses occurred in OCS are comparatively less. Finally, Figure 18 shows that the network capacity utilized is more for OCS.

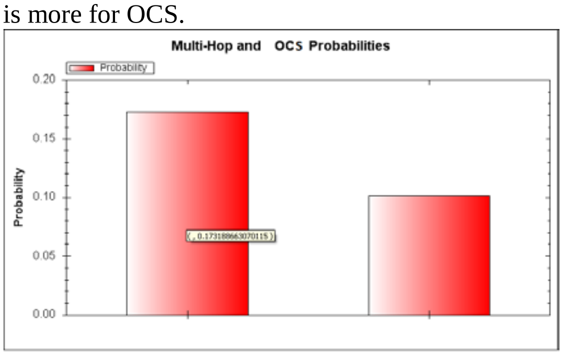

Figure 15: Multi hop Scheduling and OCS Probabilities

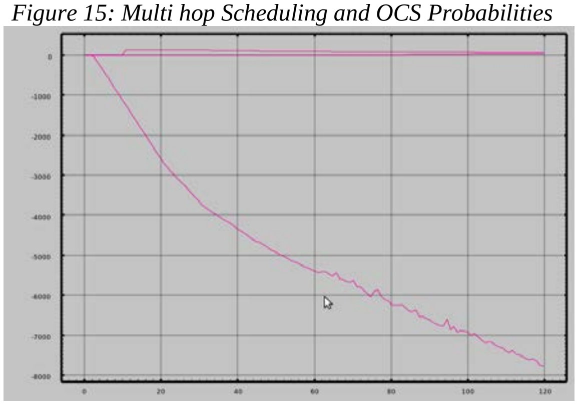

Figure 16: Multi hop Scheduling and OCS end to end Delay

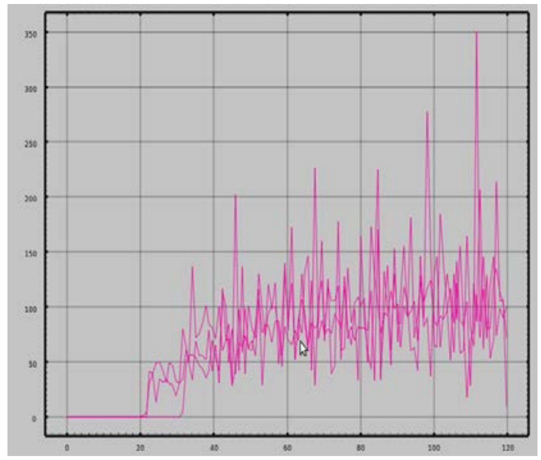

Figure 17: Losses occurred during Multi hop Scheduling and OCS

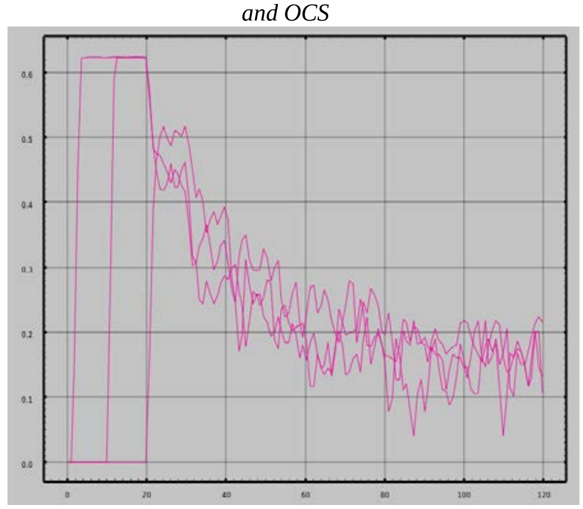

Figure 18: Multi hop Scheduling and OCS Network capacity

5. CONCLUSION

We have obtained a capability enhanced cooperative algorithm to increase the system ability in wireless systems. Our proposal is unique in that we jointly optimize relay node collection, transmission mode collection and decrease the number of hops. Unlike previous results that often results in time delay in choosing alternate node due to node failure and insufficient capacity to transfer the file, each node in our proposal decodes and encodes the file according to node capacity to avoid node failure. It also decides on the best node to transfer the file to by evaluating its objective function and forming the interfering set of the particular relay node. The outcomes expose that that our proposal achieves well in increasing the system ability and it overtakes the multi hop based results. The performance of multi hop Scheduling and OCS are compared and proved that OCS has better performance than multi hop Scheduling.

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A number of probable developments to our procedure and simplifications of our model deserve advance study. The system can be advanced to track the dynamic alterations in mobile networks of greater measure. It can be intended to put up active traffic designs.

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ANNEXURE

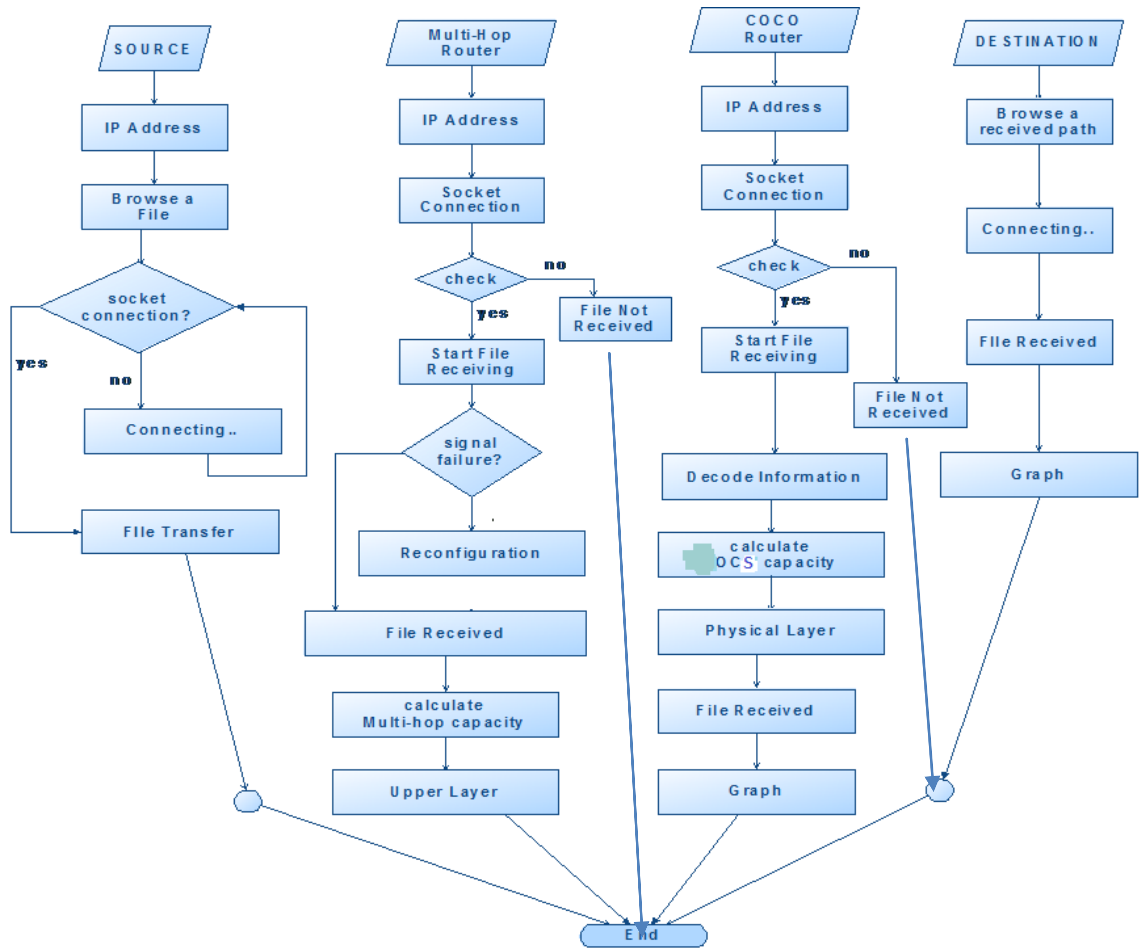

Figure 2: Overall Data Flow Diagram

Table 1: Network capacities for various bytes in both Multi hop Scheduling and OCS

Out2	Out12	Out22	Out32	Out42	Out52	Out62	Out72
0.0 0.90000000 002	0.0 0.900000000 002	0.0 0.900000000 002	0.0 0.900000000 002	0.0 0.900000000 002	0.0 0.900000000 002	0.0 0.900000000 002	0.0 0.90000000000 0002
0.45160 3.60000000 001	0.0 3.600000000 001	0.0 3.600000000 001	0.0 3.600000000 001	0.0 3.600000000 001	0.0 3.600000000 001	0.0 3.600000000 001	0.0 3.60000000000 0001
0.62148 5.40000000 004	0.0 9.900000000 021	0.0 9.900000000 021	0.0 20.69999999 996	0.0 30.59999999 998	0.0 40.49999999 964	0.0 50.39999999 949	0.0 60.2999999999 9933
0.62421 9.00000000 018	0.63329 13.50000000 004	0.0 20.69999999 996	0.0 30.59999999 998	0.0 40.49999999 964	0.0 50.39999999 949	0.0 60.29999999 933	0.0 80.1000000000 0023

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Table 2: Losses occurred in both Multi hop Scheduling and OCS

Loss2	Loss12	Loss22	Loss32
0.0 0.90000002	0.0 0.90000002	0.0 0.900000002	0.0 0.9000000002
0.0 1.8	0.0 1.8	0.0 1.8	0.0 1.8
0.0 2.70000002	0.0 2.70000002	0.0 2.700000002	0.0 2.7000000002
0.0 3.60000001	0.0 3.60000001	0.0 3.600000001	0.0 3.6000000001
…	…	…	…
0.0 22.4999993	0.0 20.6999996	0.0 31.49999979	0.0 40.499999964
41.1111107 23.3999991	1.11111112 21.5999994	4.444444446 32.39999977	4.4444444446 41.999999963
38.8888886 24.2999999	3.33333333 22.4999993	47.77777779 33.99999976	28.888888889 42.299999962
48.8888886 25.1999989	30.0 23.3999991	55.55555557 34.19999974	62.222222221 43.199999996
42.2222221 26.9999986	13.3333332 25.1999989	54.44444443 35.99999972	22.222222221 44.999999957

Table 3: Delay occurred in both Multi hop Scheduling and OCS

Delay2	Delay12	Delay 22	Delay 32
0.9000000000000002	0.0 0.9000000000002	0.0 0.900000000000002	0.0 0.9000000000002
1.8	0.0 1.8	0.0 1.8	0.0 1.8
2.7000000000000002	0.0 2.7000000000002	0.0 2.70000000000002	0.0 2.7000000000002
-593.600000001	0.0 3.6000000000001	0.0 3.600000000000001	0.0 3.6000000000001
-1914.5	…	…	…
-322 5.40000000004	0.0 81.000000000028	0 10.80000000000002	0 20.699999999996
-454 6.30000000007	0.586116 82.800000000004	127.56088 11.70000000000003	74.71757 21.599999999994
-586 7.20000000011	1.099063 83.700000000045	129.01748 12.60000000000003	…

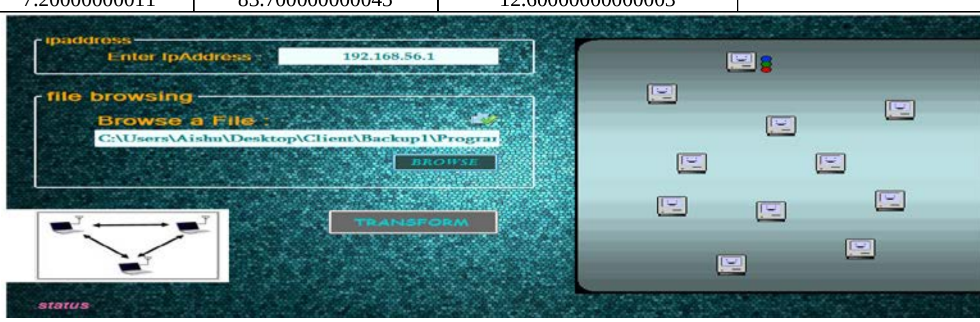

Figure 3: Source Form attach a file

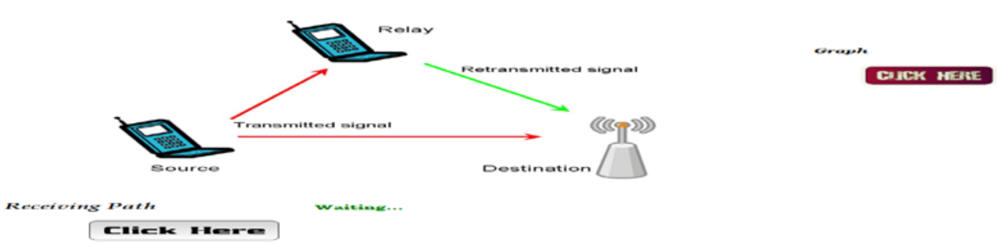

Figure 4: Destination form

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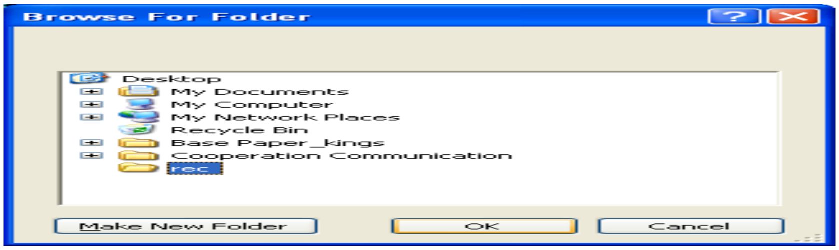

Figure 5: Browse folder dialog box

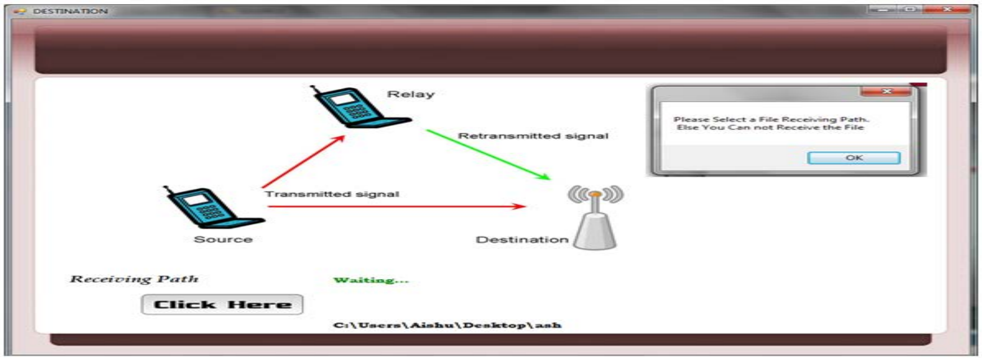

Figure 6: Destination path specifications

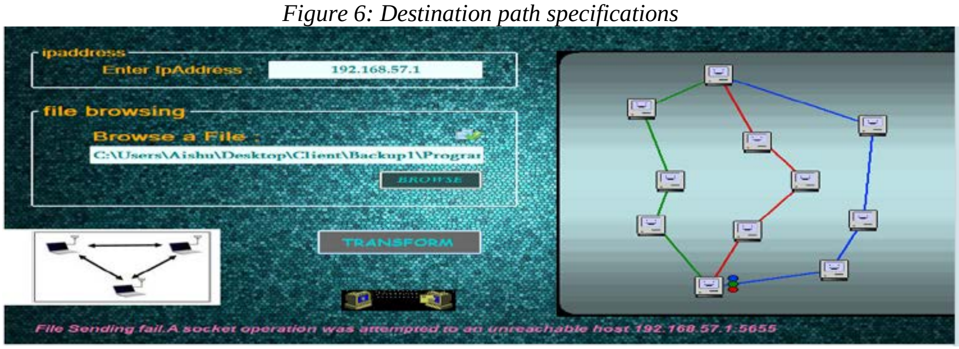

Figure 7: File transmission error

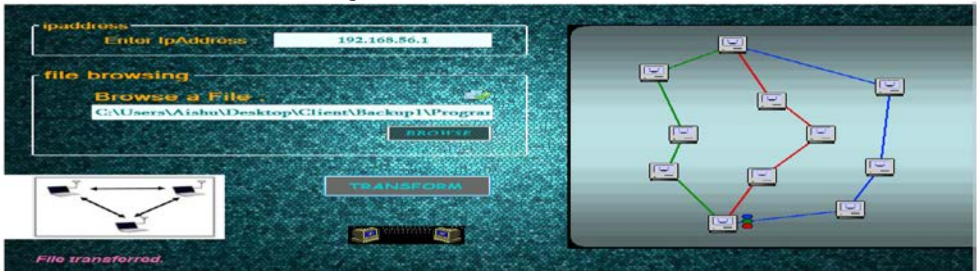

Figure 8: Successful file transmissions

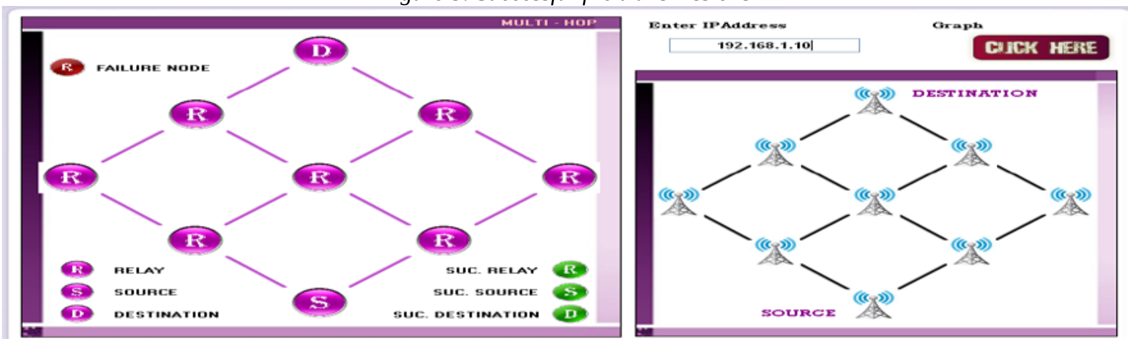

Figure 9: Multi hop Scheduling

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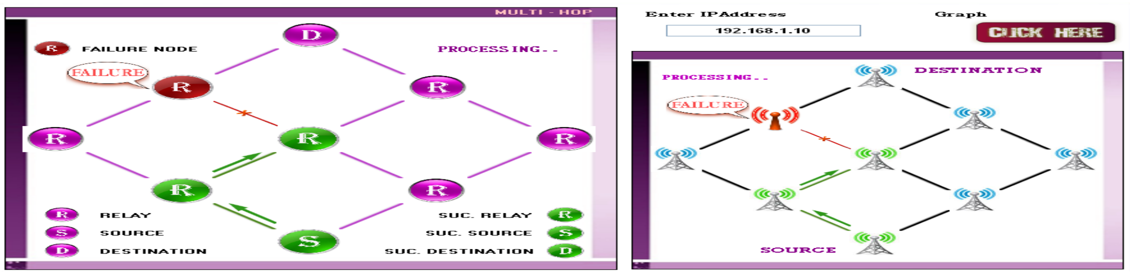

Figure 10: Node failure

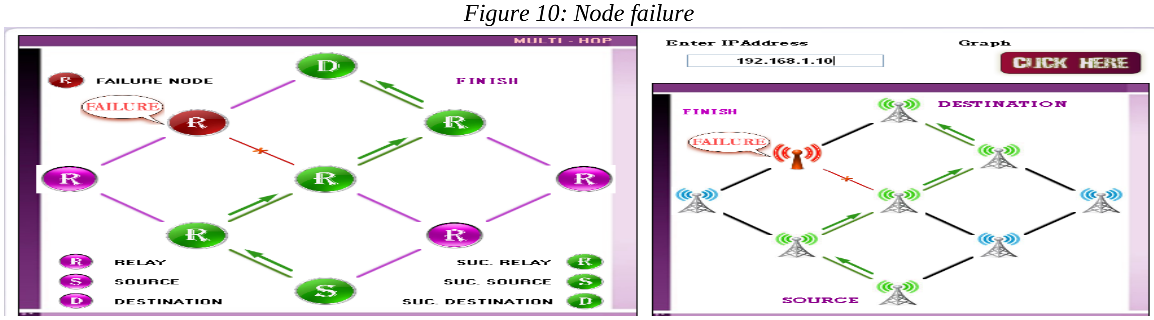

Figure 11: Selecting an alternate relay

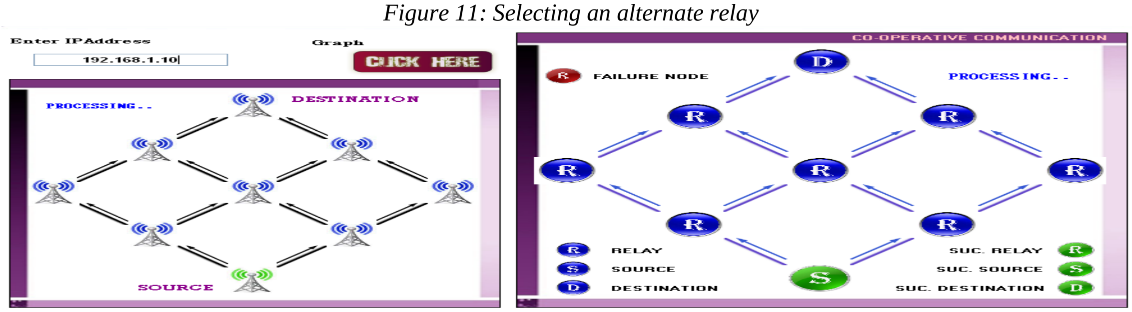

Figure 12: Optimized Cooperative Scheduling

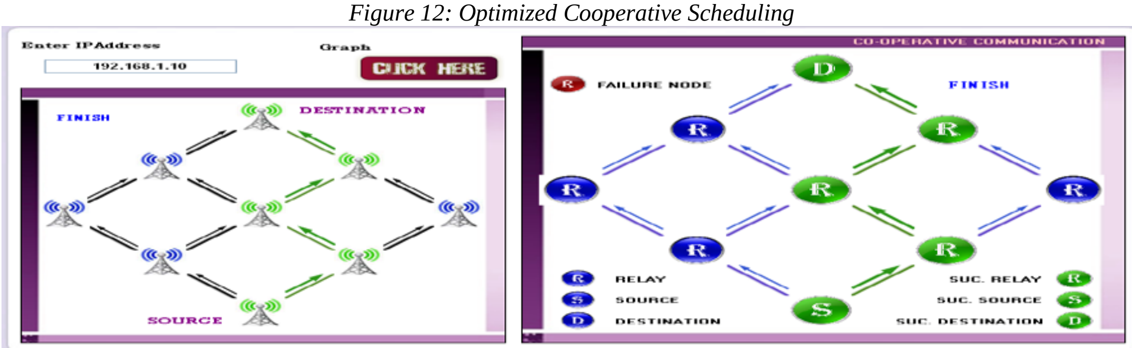

Figure 13: File transferred in OCS

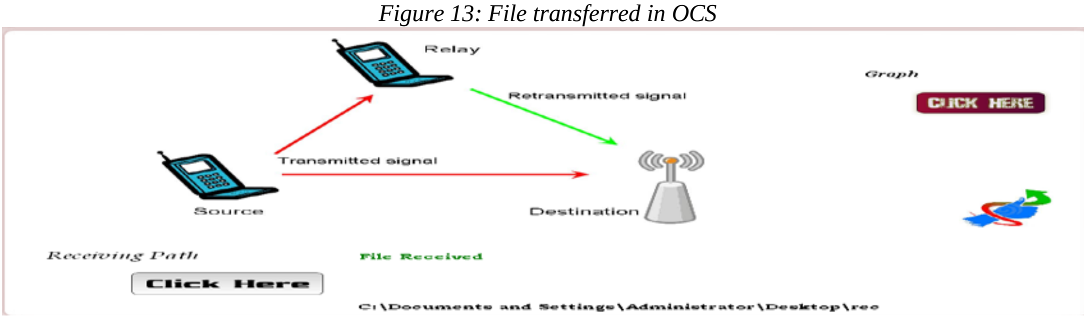

Figure 14: Destination Status