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Implementation of Selfish Overlay Network Creation and Maintenance

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Abstract:
A foundational issue underlying many overlay network applications ranging from routing to peer-to-peer file sharing is that of the network formation, *i.e.*, folding new arrivals into an existing overlay, and rewiring to cope with changing network conditions. A typical overlay network for routing or content sharing, each node must select a fixed number of immediate overlay neighbors for routing traffic or content queries. A selfish node entering such a network would select neighbors so as to minimize the weighted sum of expected access costs to all its destinations. Connectivity management is called upon when having to wire a newcomer into the existing mesh of nodes (bootstrapping), or when having to rewire the links between overlay nodes to deal with churn and changing network conditions. Previous work on selfish neighbor selection has built intuition with simple models where edges are undirected, access costs are modeled by hop-counts, and nodes have potentially unbounded degrees. Overlay networks are substantially Different which prompts us to consider the following overlay network model. Selfish neighbor selection has considered the problem from two perspectives: devising practical heuristics for the case of cooperative peers and performing game-theoretic analysis for the case of selfish peers. In this paper, we implement by unifying the foregoing thrusts by defining and studying the selfish Neighbor selection (SNS) game and its application to overlay routing.

I. Introduction

An Overlay Network is a layer of virtually network topology on top of the physical network, which directly interfaces to User. Selfish overlay networks In selfish overlay routing end hosts are allowed to choose the route of the packets among themselves. Since the selfish overlay routing never bother about the global criteria, the performance of the network becomes worse. Earlier studies proved that by reaching Nash equilibrium in selfish overlay network latency and loss rate was decreased, link utilization and throughput was increased, giving an optimized output. In all the above studies overlay nodes are placed randomly in the network. This may cause deployment of overlay nodes even in the place where there is no link failure and it occupies more memory in Selfish Overlay Network (SON) since large number of overlay nodes is deployed. In this paper overlay nodes are deployed based on fuzzy logic and the merit of applying fuzzy logic is , the overlay nodes are deployed only where and when there is link failure. This paper is organized as follows. Section 2 reviews the efforts made focused on flows which experience congestion and identification of packet forwarding prioritization in routers. Section 3 explains how a selfish neighbor selection can considered based on the two perspectives: Devising practical heuristics and Providing abstractions of the underlying fundamental neighbor selection problem. Section 4 deals with the contributions made to obtain pure Nash equilibrium through iterative best response walks via local search. Section 5 describes the Overlay network model and its aspects. Section 6 deals with Deriving stable wirings and Section 7 deals with Performance evolution of stable wirings.

II. Related work

To the best of our knowledge, this is the first attempt to infer router packet-forwarding priority through system-to-system measurement. Possibly the efforts most closely related to this work are those identifying shared congestion. Such efforts try to determine whether two congested flows are correlated and share a common congested queue along their paths. If we consider the flows of different packet types along a same path, our problem becomes to identify whether these flows do not share a common congested queue. While both problems are related clearly, we usually need to simultaneously consider a much larger number of packet types That the correlation based methods used for shared congestion identification requires back-to-back probing which, in our case, translates into $O(n^2)$ pairs probing for n packet types. In addition, those efforts focused on flows which experience congestion (ignoring uncongested ones), so their probe traffic rate is low and not bursty. To identify packet forwarding prioritization in routers, one must send relatively large amounts of traffic to temporarily force packet drops by saturating the link.

III. Selfish neighbor selection

In a typical overlay network, a node must select a fixed number (k) of immediate overlay neighbors for routing traffic. Previous work has considered this problem from two perspectives:

Devising practical heuristics for specific applications in real deployments, such as bootstrapping by choosing the k closest links (*e.g.*, in terms of TTL or IP prefix distance), or by choosing k random links in a P2P file-sharing system. Notice here that DHTs like Chord *solve* a different problem.

They route queries, not data traffic. The latter is left to a separate subsystem that typically opens a direct connection to the target host.

Providing abstractions of the underlying fundamental neighbor selection problem that are analytically tractable, especially via game theoretic analysis. To date, however, the bulk of the work and main results in this area have centered on strategic games where edges are undirected, access costs are based on hop-counts, and nodes have potentially unbounded degrees. While this existing body of work is extremely helpful for laying a theoretical foundation and for building intuition, it is not clear how or whether the guidance provided by this prior work generalizes to situations of practical interest, in which underlying assumptions in these prior studies are not satisfied. Another aspect not considered in previous work is the consideration of settings in which some or even most players do not play optimally a setting which we believe to be typical. Interesting questions along these lines include an assessment of the advantage to a player from employing an optimizing strategy, when most other players .Do not, or more broadly, whether employing an optimizing strategy by a relatively small number of players could be enough to achieve global efficiency.

IV. Contributions

A combination of modeling, analysis, and extensive simulations using synthetic and real datasets. Our starting point is the definition of a network creation game that is better suited for settings of P2P and overlay routing applications – settings that necessitate the relaxation and/or modification of some of the central modeling assumptions of prior work. In that regard, the central aspects of our model are bounded degree, directed edges, non-uniform preference vectors, and representative distance functions. Our first technical contribution within this model is to express a node's "best response" wiring strategy as a k-median problem on asymmetric distance and use this observation to obtain pure Nash equilibrium through iterative best response walks via local search.

V. Overlay network model and aspects

Overlay network creation has focused on physical telecommunication networks and primarily the Internet. Overlay networks are substantially Different which prompts us to consider the following overlay network model.
We start by relaxing and modifying some of the central modeling assumptions of previous work. In that regard, the central aspects of our model are:

Bounded Degree: Most protocols used for implementing overlay routing or content sharing impose hard constraints on the maximum number of overlay neighbors. For example, in popular versions of Bit Torrent a client may select up to 35 nodes from a neighbors' list provided by the *Tracker* of a particular torrent file [4].1 In overlay routing systems [8], the number of immediate nodes has to be kept small so as to reduce the monitoring and reporting overhead imposed by the link-state routing protocol implemented at the overlay layer. Motivated by these systems, we explicitly model such hard constraints on node degrees.

Directed Edges: Another important consideration in the settings we envision for our work relates to link directionality. Prior models have generally assumed bi-directional (undirected) links. This is an acceptable assumption that fits naturally with the unbounded node degree assumption for models that target physical telecommunication networks because actual wire-line communication links are almost exclusively bidirectional.
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Non-uniform preference vectors: In our model, we supply each node with a vector that captures its local preference for all other destinations. In overlay routing such preference may capture the percentage of locally generated traffic that a node routes to each destination, and then the aggregation of all preference vectors would amount to a origin/destination traffic matrix. In P2P overlays such preference may amount to speculations from the local node about the quality of, or interest in, the content held by other nodes. Other considerations may also include subjective criteria such as the perceived capacity of the node, its geographic location, or its availability profile.

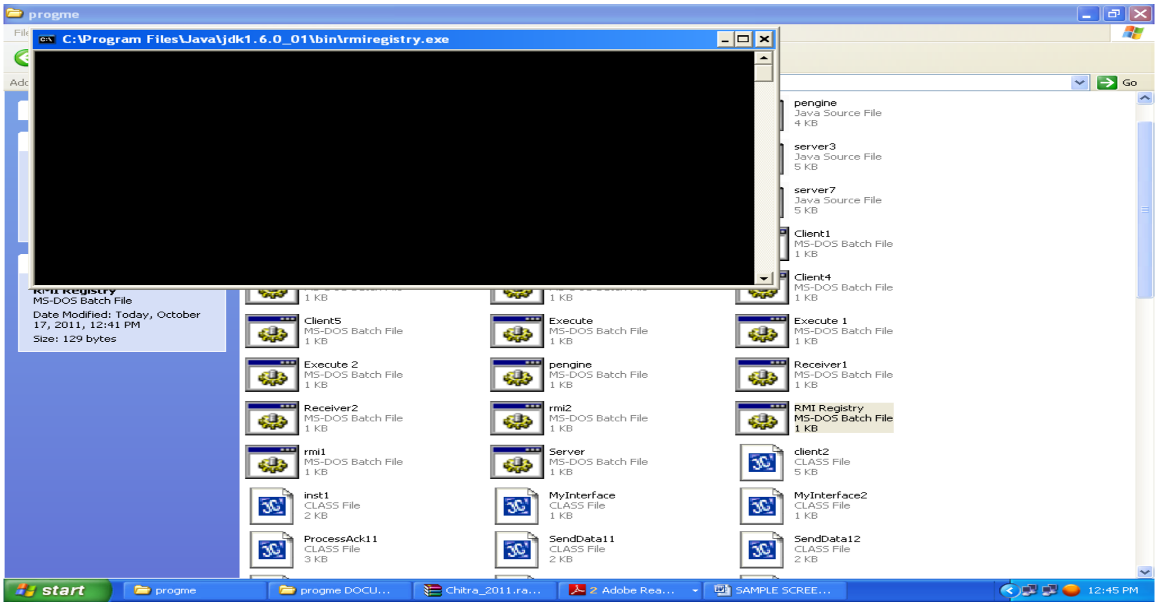
VI. Deriving stable wirings

Connections between the SNS game and facility location:
When all the wires have the same unitary weight, then the distances are essentially hop counts link cost of a node to connect to other nodes to be taken into account

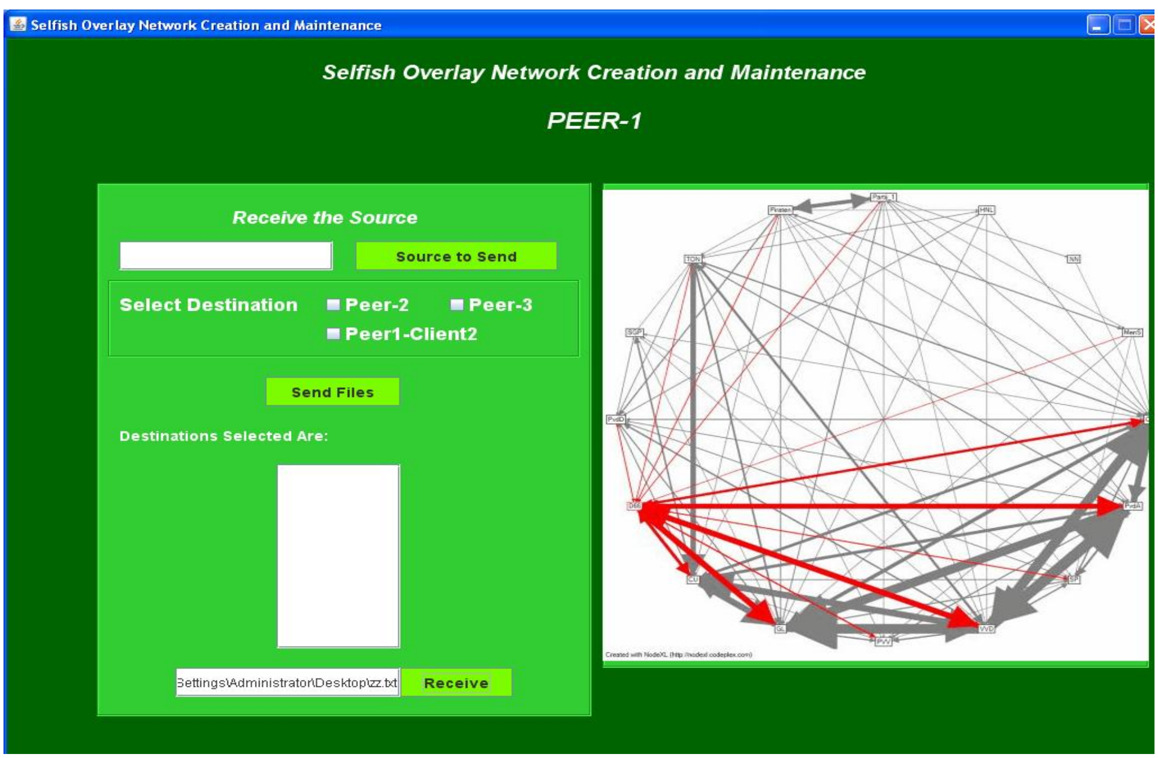
Stable wirings through iterative best response:
We obtain stable wirings through a simple iterative best response method in which nodes apply iteratively their best response until no unilateral improvement can be obtained based on hop-count distance best responses in several real topologies.

VII. Implementation of peer and client

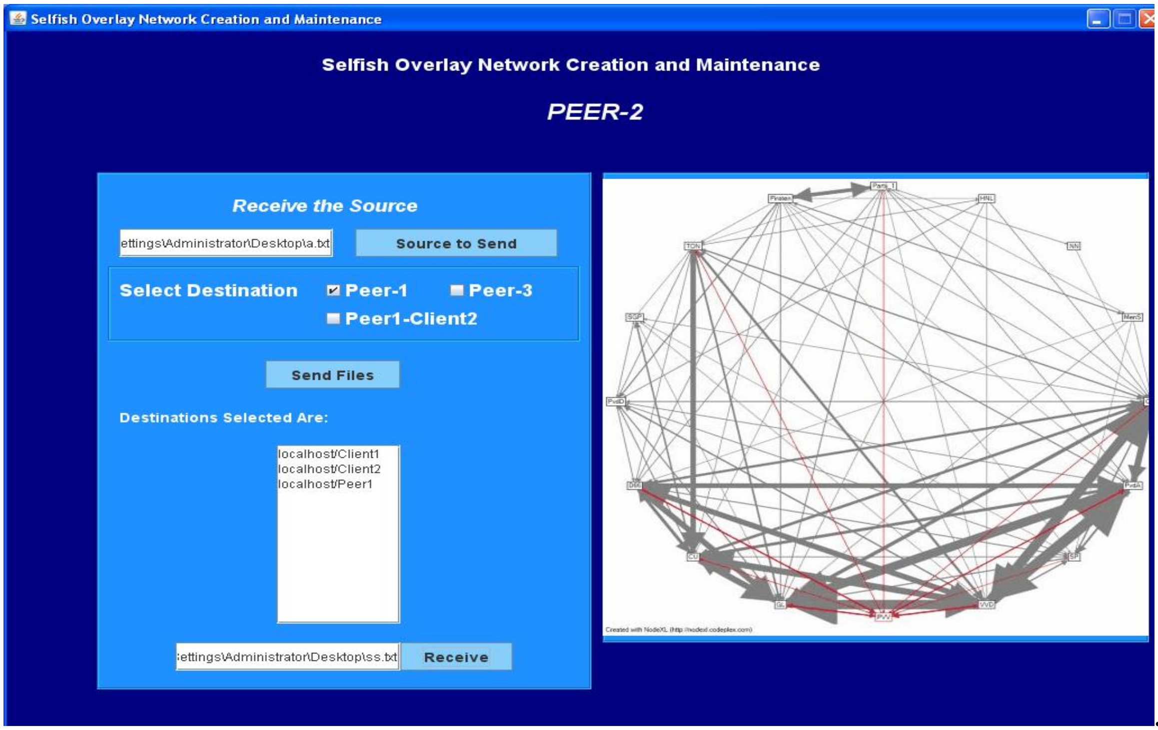
Start RMI registry



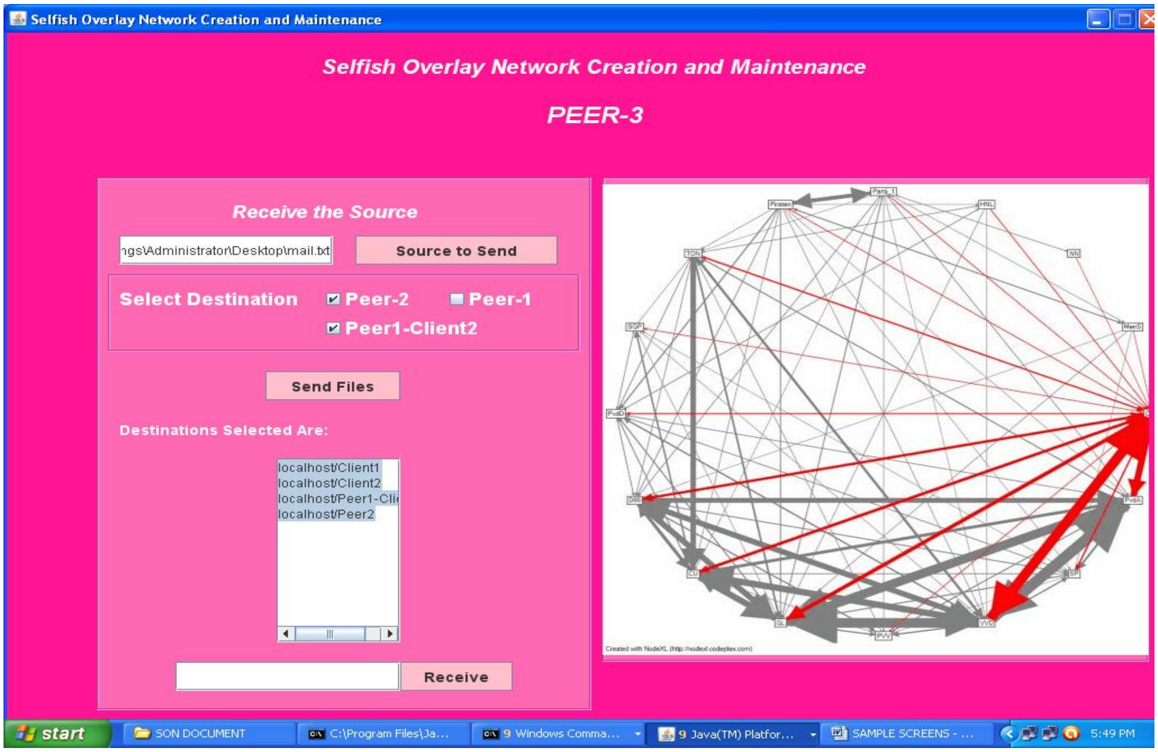
Peer-1



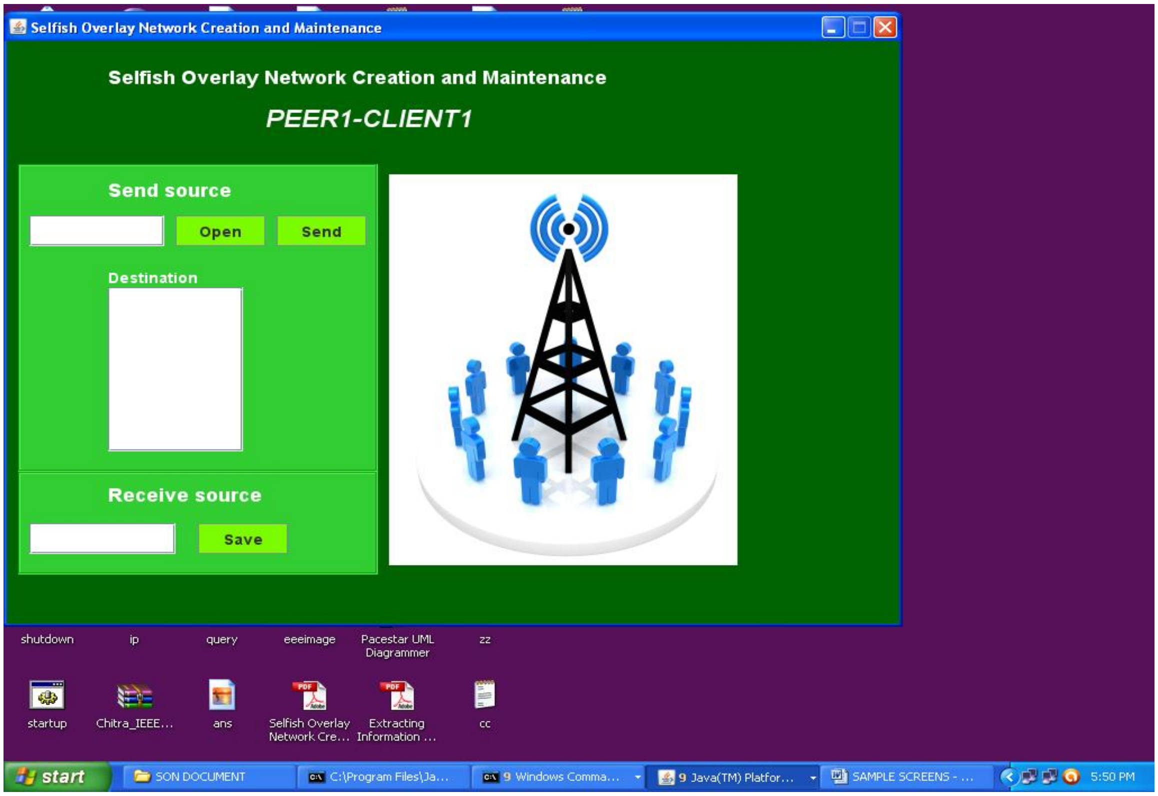
Peer-2

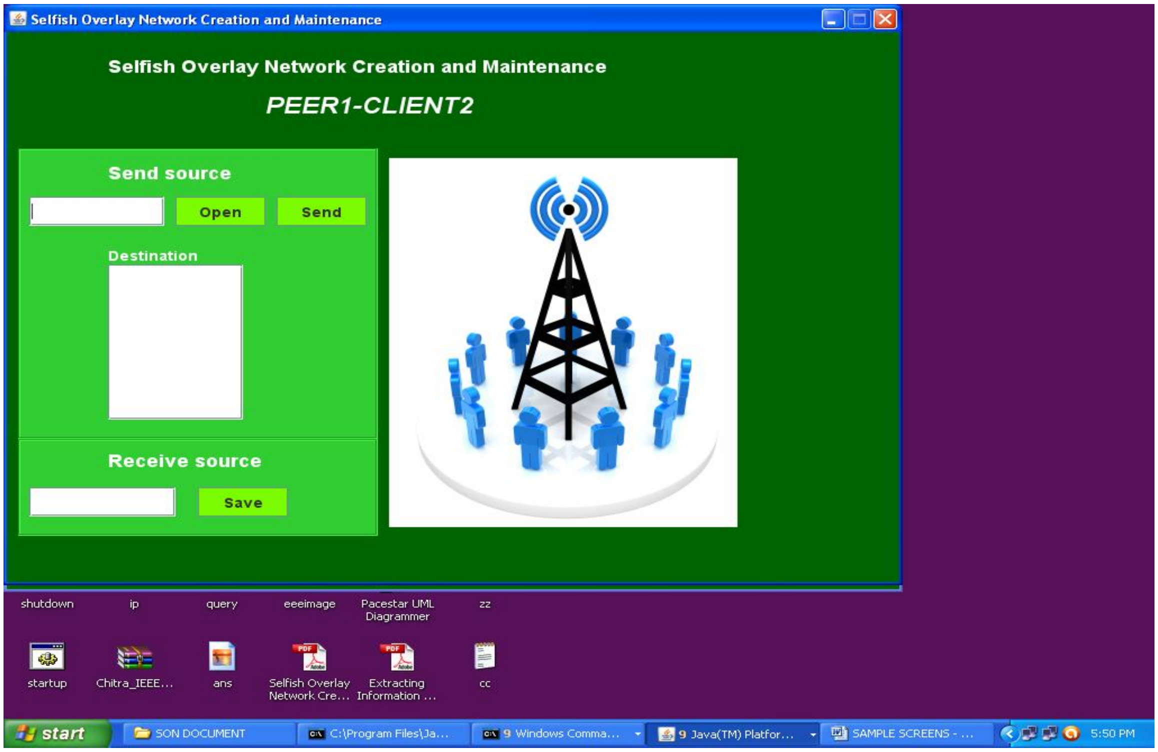

Selfish Overlay Network Creation and Maintenance
Selfish Overlay Network Creation and Maintenance
PEER-2
Receive the Source
ettings\Administrator\Desktop\a.txt
Source to Send
Select Destination
Peer-1
Peer-3
Peer1-Client2
Send Files
Destinations Selected Are:
localhost/Client1
localhost/Client2
localhost/Peer1
ettings\Administrator\Desktop\ss.txt
Receive

Peer-3

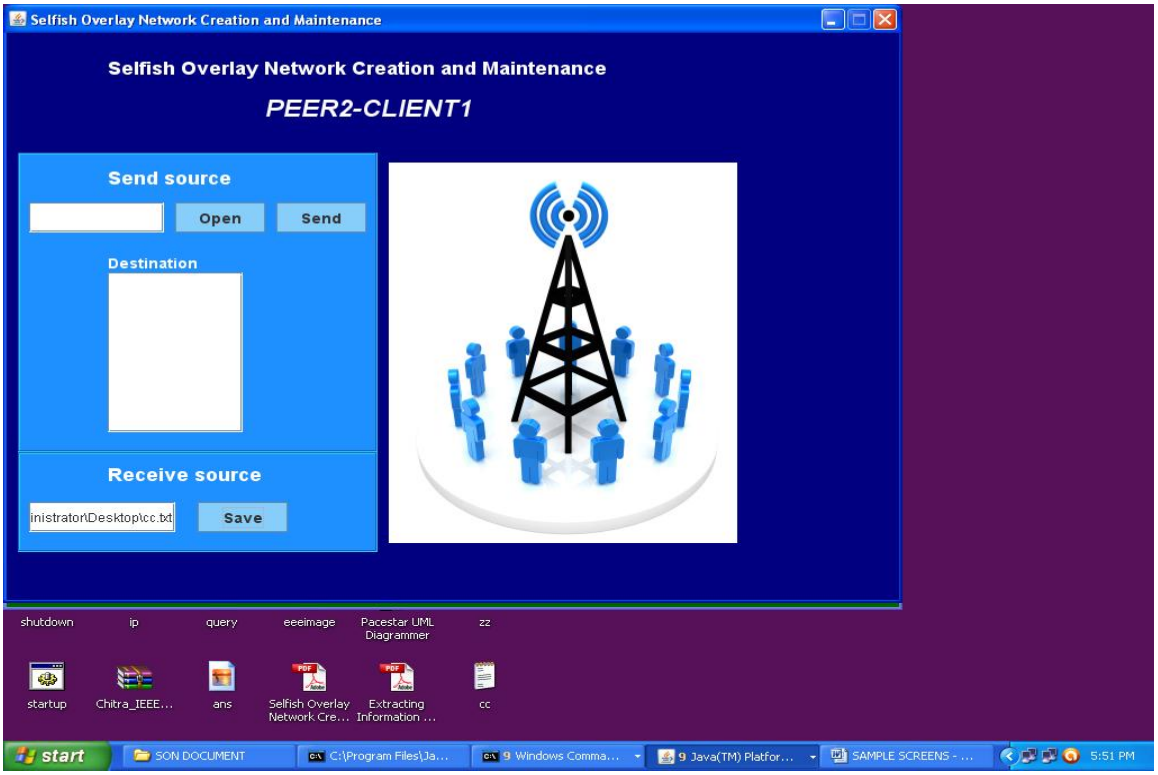

Selfish Overlay Network Creation and Maintenance
Selfish Overlay Network Creation and Maintenance
PEER-3
Receive the Source
ngs\Administrator\Desktop\mail.txt
Source to Send
Select Destination
Peer-2
Peer-1
Peer1-Client2
Send Files
Destinations Selected Are:
localhost/Client1
localhost/Client2
localhost/Peer1-Cli
localhost/Peer2
Receive
start
SON DOCUMENT
C:\Program Files\Ja...
9 Windows Comma...
9 Java(TM) Platfor...
SAMPLE SCREENS - ...
5:49 PM

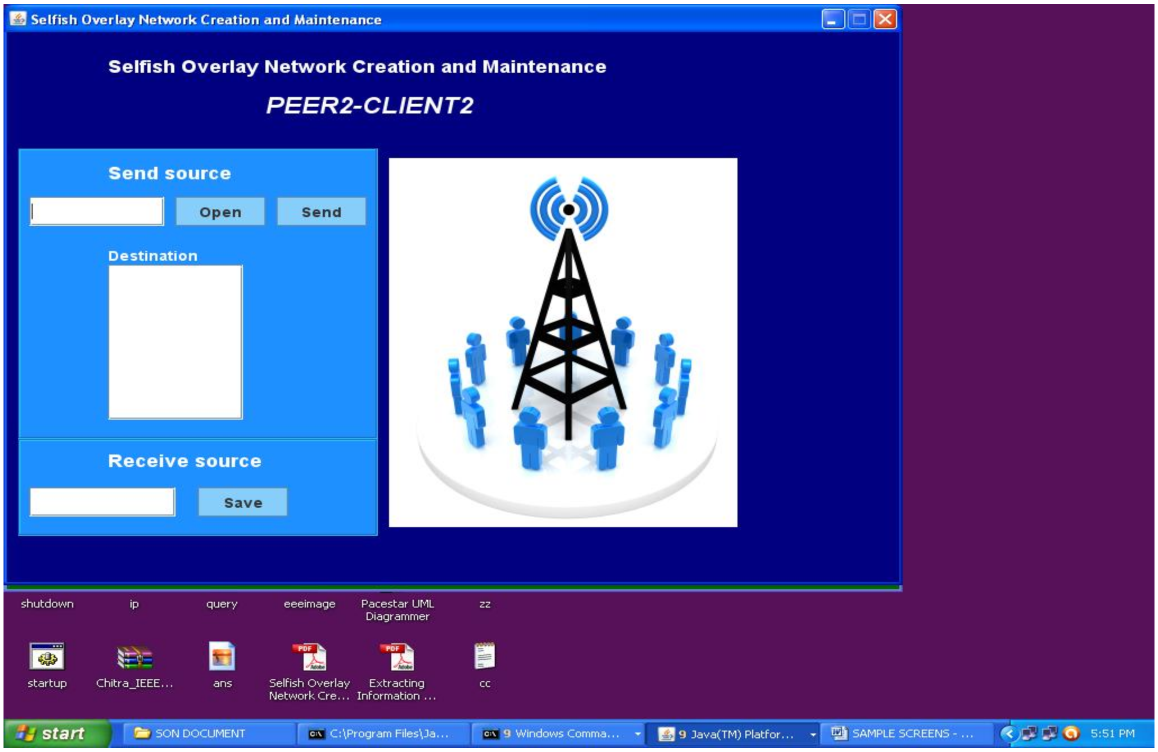
Peer1-Clients



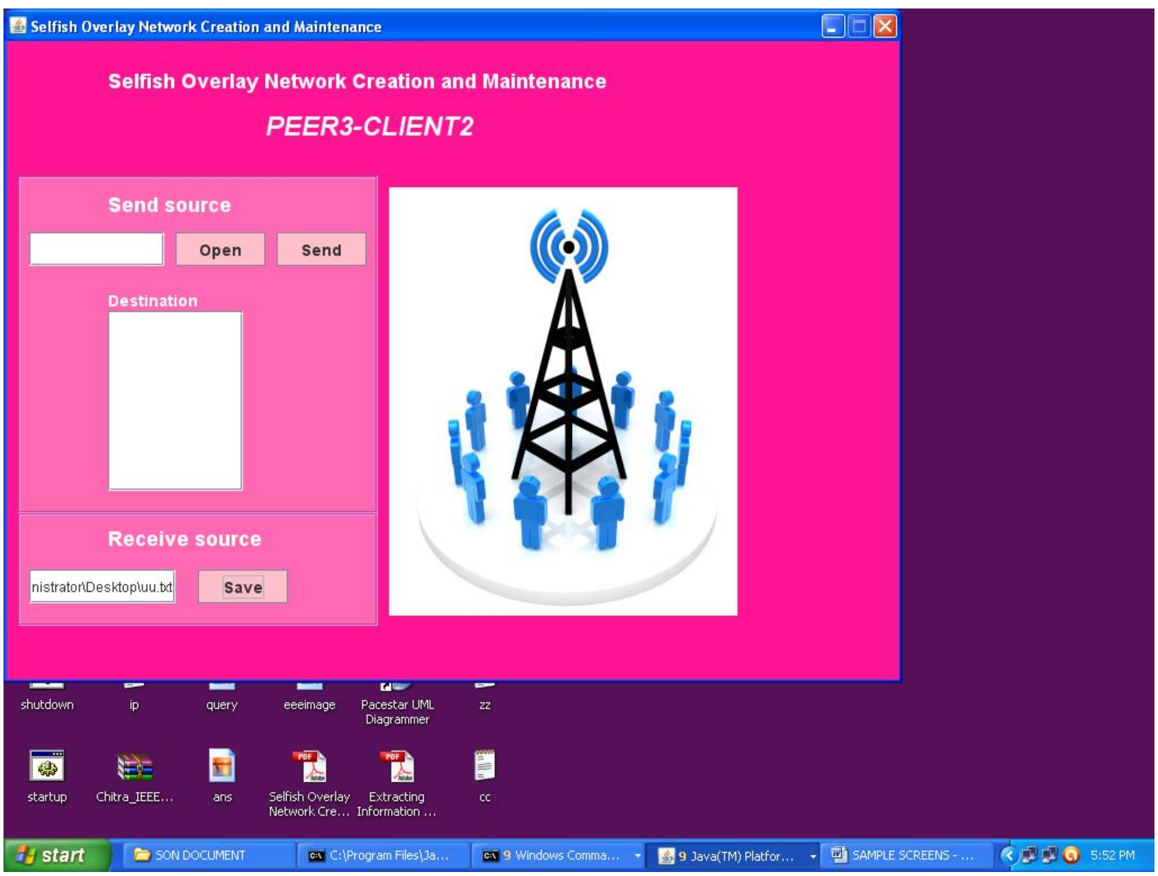


Peer2-Clients





Peer3-clients



VIII. Conclusion

In this paper, we have shown that a best response (*i.e.*, selfish) selection of neighbors leads to the construction of overlays with much better performance than those constructed by simple random and myopic heuristics We implemented them and evaluated their performance against heuristic wirings. In all the cases the performance of best response was way higher, especially for large values of out-degree. selfish neighbor selection under strictly enforced neighbor budgets and has come up with a series of findings with substantial practical value for real overlay networks. We have shown that a best response selfish selection of neighbors leads to the construction of overlays with much better performance than those constructed by simple random and myopic heuristics. The reason is that by being selfish, nodes embark on a distributed optimization of the overlay that turns out to be beneficial for all. Feature we have to implement reliable multicast, security provisioning, power efficiency, congestion control, scalability, and efficient membership updates. It is difficult to design a multicast routing protocol that takes all these issues into consideration, that is, a one-size-fits-all design.

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