CHAPTER 8

CONCLUSIONS AND FUTURE WORKS

8.1 CONCLUSIONS

This research advances the state-of-art in an unstructured P2P systems in a number of ways by sharing the resources such as CPU cycle, storage space etc. The main objective of this thesis is to design and implement a unified algorithm for query message forwarding through an optimal path and implementing optimal reputation model so as to provide healthier environment in pure P2P overlay networks. The main purpose of building such a system is to reduce query response time, discarding unnecessary message duplications and identifying trustworthy peer through which the message transactions can be done.

This thesis has been motivated to design a query forwarding technique through an efficient path since P2P traffic contributes the largest portion of Internet traffic which is unnecessary. The RQR model avoids much of the traffic in P2P overlay connection by avoiding unnecessary message duplications and physical links. The ORM implements the security policy by comparing the trustworthiness of other peers and perform trusted interactions based on their past interaction histories. The traffic cost incurred to design such systems is less compared to earlier query forwarding and reputation models which are one of the important parameters in designing an overlay network. This method works across different approaches such as periodic approach, where predetermined time interval is considered and event driven approach, where peers can join and leave the overlay network randomly.
The proposed RQR is scalable and completely distributed in the sense that it does not require any global knowledge when each node is optimizing its logical neighbour. For the proposed RQR method, a query hit rate is about 45 percent more than the existing systems are obtained. This result is consistent with various network sizes and average number of neighbours.

The RQR is designed as simple as possible and is independent of the overlay connection. The observations of the duplicate query messages in two different overlay topologies are analyzed. This method is able to identify the duplications during transaction and discarded the duplicates. From the result it is shown that around 85 percentage of duplications are avoided by proposed method RQR, and it produces good and comparable results with SBO design. These results are very encouraging compared with those of the other techniques.

Traffic cost is an important parameter which should be considered in RQR overlay network design and it is mainly a function of consumed network resources and other related expenses. The metric for measuring the traffic cost is time delay between peers. The formula which was used to evaluate the traffic cost for an overlay network considered all the measures, which are the function of consumed resources and other related expenses. The method also support event driven approach, when only if there is a change in its logical connections with its neighbours, such as on a neighbour’s leaving or on a peer’s joining as its new neighbour. The performances of two approaches are compared, and the result shows that the average cost of each query to reach the same scope of node is reduced by about 70 percent.

The well known ORM method is proposed to identify the trustworthy peer through which the transactions can be done. This method clearly shows the total number of transactions done through the existing
overlay network and also categorizes the transactions based on their past history, such as number of satisfied transactions and number of unsatisfied transactions. The formulae use all the parameters effectively to compute the trust value of peers in P2P environment. Since the overlay network is unstructured, it supports dynamic characteristics of P2P systems. The experimentations were done with cryptographic-based model as well as reputation-based model.

The result of cryptographic-based model shows that the average number of satisfactory transactions of optimal reputation model is about 50 percent more compared to RSA Blinding cryptographic algorithm. The reputation-based models show that the proposed method is effective and outperforms the other methods by interacting through trustworthy peers. The average number of satisfied transactions is more in the proposed method than in the others due to the system design and lagging of trustworthy peers. The average number of satisfied transaction is about 50 percent, 60 percent more in the proposed ORM method compared to the P2P reputation model and Pseudo Trust model respectively.

The major contributions of this thesis are summarized as follows:

- A Unified approach for efficient path finding from an existing unstructured P2P Network

As a part of this idea, an **optimal path algorithm (OPA)** has been proposed in this thesis, which finds an efficient path among the links from source peer to destination peer. This approach supports independent working with a set of peers in all environments, and can easily be extended to other overlay networks.

- Robust Optimal path system to handle query forwarding technique in different environments
This idea gives birth to the computation of **Reduction on Query Response Time (RQRT)**, which avoids message duplications and unnecessary traffic in the existing P2P overlay connection.

- **Discarding unnecessary message duplication**
  - This is to avoid unnecessary traffic in proposed RQR design, by identifying duplicate query messages using its unique message ID. Each peer maintains a list of received messages, when a new message arrives, the peer checks whether it has already been received through other path. If this is the case, it simply ignores the incoming message.

- **Traffic cost overhead incurred by the P2P network during RQR Optimization**
  - As part of the reducing query response time, the overhead to build and maintain such an environment to be taken into account. This keeps track of the number of resources used including physical links and logical neighbours connected in an overlay network and other related expenses.

- **Minimization of number of unsatisfied transactions**
  - This idea gives birth to the contribution of **Optimal Reputation Model (ORM)** technique to address the security issues. By having the history of all transactions we can identify the trustworthy peer. The reputation based ORM technique has been proposed to identify the number of satisfied and unsatisfied transactions so as to
provide the security while transferring from source peer to destination peer.

- Integration of all factors to build completely high performance unstructured RQR System.

The results of these investigations are presented using the existing set of measures related to P2P system such as query hit rate, number of message duplications, traffic cost overhead, query response time and number of satisfied transactions. The solutions related to query response time, traffic overhead and transaction success rate were experimented locally with more number of systems. In the future, this system can be improved by considering other factors such as maintaining the statistics of peers for more stable and robust network.

8.2 ADVANTAGES AND DISADVANTAGES

This thesis also aims at addressing the multi objective optimization such as (i) Minimizing the query response time

(ii) Maximizing number of query hits

(iii) Minimizing total number of unsatisfied transactions.

The above optimizations were done with both periodic and event driven approach. In the periodic approach, set of queries can be forwarded at a predetermined interval and the response time is recorded accordingly. The event driven approach were applied during the change in its logical connections with its neighbors, such as on a neighbor’s leaving or on a peer’s joining as its new neighbor.

Advantages and disadvantages in this thesis are listed below:

Advantages

- In RQR design, every peer has its own role. Based on the environment, every peer can act as server or client.
There is no central authority in RQR design. Hence there is no single system failure. Also it supports fault tolerant.

The design of RQR is scalable. Each user is shares part of the load.

Traffic is reduced considerably, since direct communication between peers.

**Disadvantages**

- In decentralized system, every peer can perform the role of either client or the server. So every peer needs to maintain lot of information which takes much of storage area. In RQR design, every peer maintains lot of tables such as QHT, MDT, and TSR etc.

- The ORM is used to categorize the transactions as satisfied and unsatisfied transactions. As a result, the number of malicious transactions was reduced in ORM. This result proves that no computer in P2P network is reliable.

- The characteristic of RQR design changes as and when the overlay topology changes.

**8.3 FUTURE ENHANCEMENT**

- To further improve this design, it is planned to investigate the possibility of employing RQR outside the P2P area, for instance, mobile ad hoc network.

- In ORM, the reputation of the provider is considered and the reputation of the requester is ignored. This system can be extended to encapsulate the reputations of both the provider and the requester.