

# Current Trends, Characteristics, Challenges and Future of P2P

Tariq Rahim Soomro

College of Engineering & Information Technology,  
Al Ain University of Science & Technology, Al Ain, United Arab Emirates  
Email: tariq.soomro@aau.ac.ae.

Rab Nawaz

Department of Information Technology, SZABIST, Dubai, United Arab Emirates  
Email: rabnawaz2k@gmail.com.

**Abstract**—Peer to peer (P2P) network is an approach of connecting computers in such a way that all connected computers share equivalent responsibility for processing data. The aim of this study to discuss the current Trends of P2P networks, which includes broad catching, new knowledge development in P2P and wireless devices in P2P. Later in this study P2P characteristics along with its challenges will be explored. Later this study will highlight on future trends of P2P such as, videos, audio casting and P2P mobile applications. Finally this study will conclude with future work in this field.

**Index Terms**—P2P, trends in P2P, P2P challenges, future of P2P.

## I. INTRODUCTION

Peer-to-peer (P2P) network usually implemented and utilized by relatively powerful modern personal computers to not only act as client but server as well. Today the modern personal computers (PCs) are equipped with fast processor, large memory, and a huge hard disk; and still using the common tasks for example, emailing and Web searching. Today's modern PCs usually act simultaneously as a client (peer) and server (peer) for several emerging applications. In this model a server peer typically consists of enormous resources and responsible to respond to all requests for any resources and data from client peer. Client peer here are usually initiating requests for resources or data from server peer, for example, Web Searching in this client/server model. In case of P2P, the job of the Server peer and Client peer is the same like Web Server and/or Web Client, but they are capable of much more. Following are the some of the advantages of P2P over client/server networking [1], [2]:

- 1) Here data and resources are sharable at both the center and at the edge of the network;
- 2) Here a peer is more reliable and scalable, single server failure means single peer failure;
- 3) Here processors are also sharable;
- 4) Here each peer, share data and resources directly

and they are directly accessible;

- 5) Here each peer, participate in distributed manner;
- 6) Here all local data and resources are sharable directly without any help of intermediate Server;
- 7) Here multipoint communication is allowed without relying on IP multicast infrastructure.

The study will review and explore the powers of P2P networking. The paper is divided into 6 sections. Section 2 will review the current trends of P2P; section 3 will explore the characteristics of P2P networking; section 4 will explore challenges of P2P; section 5 will cover future trends of P2P – how P2P can be accommodated specially in mobile application; and section 6 will conclude the paper.

## II. CURRENT TRENDS

This section will review the current status of the P2P networking.

### A. Broad-catching

Broad-catching is the term used for the downloading of digital content that has been made available over the Internet using RSS (Rich Site Summary). As connectivity speed is increasing and users are exploring new ways to access information, the demand of P2P is also increasing. Broad-catching is becoming a buzz word in the field of P2P connectivity, used to combine Bittorent and RSS feeds in such a way that each peer on Bittorent application will receive the updated information as it is available on any other peer. In this way no need to search for the latest, for example, video on demands can be seen, when received the RSS feed [3], [4].

### B. P2P Knowledge Development

P2P can use knowledge development, in which new knowledge can be developed. This new knowledge actually collects relevant information of different fields and combined it to produce new list from diverse resources. If peer is in need of some information, which is actually not available completely on any host, but it could be developed with the help of available related content.

This is only possible if all peers can define the semantic of the contents using some sort of ontology [3].

### C. Gaming on Wireless Devices using P2P Network

Currently wireless media is very powerful and capable of streaming high-quality videos. TV facility and high-quality video streaming on mobile phones are common in several countries. If current Smart-phones are capable of doing it, than they are also capable of playing games using these devices as P2P networks. The gaming architecture than capable of registering the peer at server level and searching for partner also at server level, than both peer can establish connection through server, later on both peer directly start playing the game without any role of server [3], [5].

### D. Powerful Content Search

The mechanism of P2P search is based on both centralized and/or decentralized architecture. P2P can play an important role in searching as to return result to the peer, which was fetch from different super peers. Optimization is achievable by tracking the super peers and relevancy is also achievable by returning most relevant search results. In this mechanism other super peers if searching for same search could establish close connection with that super peer and possibly share with them search queries and contents. This will no doubt reduce query resolution time [3], [6].

## III. CHARACTERISTICS

P2P can be found as distributed, centralized and hybrid network [7]. According to reference [8] there are 9 characteristics of P2P systems and they are:

- 1) Relevant resources are located at the peer
- 2) All resources are shared by peers are voluntarily nature
- 3) Widely distributed and largely replicated resource locations
- 4) The norm of P2P is variable connectivity – here peers are often active for limited time only and operation behind firewalls is possible
- 5) Server and Client functionality is combined
- 6) Direct interaction between peer-to-peer is possible with interference of any intermediate peer (Server)
- 7) All peers are autonomous and having same rights
- 8) No need of central control
- 9) Self organizing mechanism

## IV. CHALLENGES

The recent robust performance of processors cost of memory and emergence of current broadband access though DSL (or cable in some cases), allows the emergence of a P2P. P2P use modern PCs to spread contents among other peers as P2P application builds an overlay of connecting these peers. Current P2P suffer from several limitations as follows in reference [9]:

- 1) Due to uncontrolled interference among peers,

live video streaming or even telephony results face poor quality or lack of service is encountered

- 2) The overlay built by peers not synchronized with the underlay (actual network) due to inefficient use of network resources and poor performance
- 3) The design is based on free-riding mechanism and selfish user behavior
- 4) Security is absence, and it is not possible to give guarantee on contents – quality and diversity, and integrity.

In Short, P2P is currently popular and will grow to be popular as low cost alternative client/service delivery tool. However, current P2P, lack the quality service of such standards; not secure; and no doubt uncontrolled [9]. And according to reference [8] there are several quality challenges of P2P, which includes “distributed character”; “undefined scale”; “peer fluctuation”; “peer heterogeneity” and “static configurations are insufficient”. Other important challenges are: “video streaming over P2P”, [10]; “Supporting non-linear and non-continuous media access over P2P” [11]; “support complex and heterogeneous decentralized environments” [12]; “stability of target systems”; “the latency of forward of nodes among multiple layers”; “dependability of communications among nodes” and many more [13].

## V. FUTURE OF P2P

P2P is becoming more popular as broadband speed is increasing, but today’s P2P is not the same, which researcher and developers are looking at it. P2P need to bring some revolution as Napster did in late 90’s or Skype did it in last decade. Following are few fields, where P2P can play an important role [14]:

- 1) *Search engines* – P2P can play as future of search engines as every node (user) will be crawler itself
- 2) *Video and audio casting* – P2P can play video streaming from multiple users as a copy of a file available in different parts of the world. The project “Joost” has been started by the creators of Kazaa and Skype. It will work like a TV on demand service, but will be based on P2P, where clients connect to the network and download TV programs.
- 3) *Mobile P2P applications* – with the emergence of smart phones, there is a huge possibility that mobile P2P applications will be created as there are several PC P2P applications, for example, Mobile P2P messengers, mobile P2P file sharing, mobile P2P IP telephony, audio and video mobile P2P streaming and other media. Skype P2P and BlueTalk are the good example already developed.
- 4) *E-commerce* – P2P can enable e-commerce to remove the centralized system and promote C2C along with B2B and B2C. For P2P e-commerce, several things to be considered, for example, secure communication, transparent transactions

and standardized workflow based on sales process. Also P2P e-commerce advertisement and location awareness is the main concerned.

- 5) *P2P grid* – P2P grid will be composed of an extremely large number of individual machines, for example SETI@home project and Folding@home project [15]
- 6) *P2P cloud* – P2P is integrating its techniques into cloud to get reliable cloud storage, which is future of storage infrastructure [16]
- 7) *Multimedia P2P* – multimedia P2P is a not only popular currently, but will be more power tool in future, by introducing and identifying the emergence of network protocols and quality of service support over P2P networks [17]
- 8) *P2P LTE SON* – P2P will play an important role in LTE Self-Organizing Network (SON), the possibility of use of P2P technologies for search algorithm, topology aware and load balancing aspects etc. [18].

## VI. CONCLUSION AND FUTURE WORK

In this paper Authors has given overview and introduction to P2P network, then discussed its current trends like broad-catching, new knowledge development and wireless in P2P, challenges were explored, characteristics of P2P were discussed, and then future applications of P2P networks, were explored too. For example, role of P2P in search engines; audio & video casting; mobile applications; e-commerce; from grid to cloud; multimedia; and self-organizing networks are few examples. P2P network is very vast and still being discovered and developed, not only for file transfer, but also real time media streaming, VoIP, distributed computing, etc. The future of P2P will see new emergence in technology advancements.

## REFERENCES

- [1] Introduction to Windows Peer-to-Peer Networking. (2006). [Online]. Available: <http://technet.microsoft.com/en-us/library/bb457079.aspx>
- [2] Peer-to-Peer.(September 2012) [Online]. Available: [http://www.usj.edu.lb/moodle/stephane.bazan/exposes/Peer\\_to\\_peer.doc](http://www.usj.edu.lb/moodle/stephane.bazan/exposes/Peer_to_peer.doc)
- [3] New Trends in P2P Networks. (2009). [Online]. Available: <http://www.slideshare.net/adamkasi/new-trends-in-p2-p-netwoks>
- [4] Robbie Hott and Sean Krems. Analysis and Simulations of Incentives to Seed in BitTorrent. [Online]. Available: <http://www.robbehott.com/cs/pdfs/incentivesseed.pdf>, Retrieved September 2012
- [5] W. Tzu-Ming et al., “New P2P Sharing Incentive Mechanism Based on Social Network and Game Theory,” in *Proc 26th International Conference on Advanced Information Networking and Applications Workshops*, 2012.
- [6] N. Zeilemaker and J. Pouwelse, “Open source column: Tribler: P2P Search, Share and Stream,” *ACM SIG Multimedia Recrods*, March 2012, vol. 4, no. 1.
- [7] T. R. Soomro, M. S. Laghari, and H. Wahba, “A2AShare: Towards Multilingual Academic P2P,” in *Proc International Conference on Sociality and Economics Development. Kuala Lumpur Malaysia*, June 17-19, 2011.
- [8] Dr.-Ing. Kalman Graffi. (20 April 2011). P2P Characteristics and Applications. [Online]. Available: <http://www.cs.uni-paderborn.de/fileadmin/Informatik/FG-TI/Lehre>

/PG2011/lecture/UPB\_\_SS2011\_\_PG-Framework\_\_Lecture-02\_\_P2P-Characteristics-Applications.pdf

- [9] Nano Data Centers, P2P Challenges. (September 2012). [Online]. Available:[http://nanodatacenters.eu/index.php?option=com\\_content&view=article&id=47:p2p-challenges&catid=39:general-view&Itemid=58](http://nanodatacenters.eu/index.php?option=com_content&view=article&id=47:p2p-challenges&catid=39:general-view&Itemid=58), Retrieved
- [10] N. Ramzan, H. Park, and E. Izquierdo, “Video streaming over P2P networks: Challenges and opportunities,” *Signal Processing: Image Communication*, vol. 27, no. 5, pp. 401-411, May 2012.
- [11] Z. W. Zhao. “Challenges in Supporting Non-linear and Non-Continuous Media Access in P2P Systems.” [Online] Available: <http://www.comp.nus.edu.sg/~zhaozhe1/files/dsp003-zhao.pdf>
- [12] Montresor et al., “Topic 7: Peer to Peer Computing,” *EURO-PAR 2012 Parallel Processing, Lecture Notes in Computer Science*, 2012, vol. 7484, pp. 363.
- [13] J. Yu and H. Wang, “Towards the design of network structure of data transmission system based on P2P,” *Advances in Intelligent and Soft Computing*, 2012, vol. 169, pp. 339-344.
- [14] Readwire. (2007). P2P: Potential Future Applications. [Online]. Available:[http://www.readwriteweb.com/archives/p2p\\_potential\\_future\\_applications.php](http://www.readwriteweb.com/archives/p2p_potential_future_applications.php)
- [15] PanKaj et al., “P2P business applications: Future and directions,” *Communications and Network, Scientific Research*, vol. 4, pp. 248-260, 2012
- [16] Xu et al., “Integration of Cloud Computing and P2P: A future storage infrastructure,” in *Proc International Conference on Quality, Reliability, Risk, Maintenance, and Safety Engineering*, 2012.
- [17] Huang et al., “Multimedia P2P networking: Protocols, solutions and future directions,” *Peer-to-Peer Networking and Applications*, vol. 5, no. 4, pp. 309-311, 2012.
- [18] H. Zhang, “Peer to peer technologies in future LTE self-organizing network,” in *Proc. Computing, Communication and Application Conference*, 2012, pp. 127-132.



**Tariq R. Soomro** has been associated with several Universities, Colleges and Educational Institutions for last several years. Dr. Soomro born in Village Dehat, District Naushahro Feroze, Sindh, Pakistan on 12<sup>th</sup> September 1970. He received his B.Sc (Hons) and M.Sc in Computer Science from University of Sindh, Jamshoro, Sindh, Pakistan in 1992 and 1994 respectively. He received his Ph.D. in Computer

Applications, in 1999 from Zhejiang University, Hangzhou, China.

He is currently associated with College of Engineering & Information Technology, Al Ain University of Science & Technology, Al Ain, United Arab Emirates as an ASSISTANT PROFESSOR. He has in hands 38 publications, published in various national and international journals and conferences. His research interests are GIS, IDNS, P2P, ITIL, Telemedicine, Databases and Programming, to mention the few.

Dr. Soomro is a senior member of IEEE, IEEE Computer Society, IEEE Geosciences & Remote Sensing Society, Senior Member IACSIT, Life member of Computer Society of Pakistan (CSP), Member of Project Management Institute (PMI) and Global member of Internet Society (ISOC). He received the ISOC Fellowship to the IETF 68 in 2007.



**Rab Nawaz** is an Oracle Certified Associate (DBA & Developer) and has been associated with several Organizations for last few years. Mr. Rab Nawaz born in Bahawalpur, Punjab, Pakistan on 4<sup>th</sup> August 1981. He received his B.Sc from Pakistan in 2000, MCS from Pakistan in DBMS in 2004 and currently he is completing his MSIT degree from SZABIST, Dubai, UAE.

His research interests are Databases, Programming and High Availability of Databases to mention the few.