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MANAGE TRAFFIC IN P2P LIVE STREAMING USING ADAPTIVE ROUTING SCHEDULING OVER VIDEO-ON DEMAND SERVICE

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ABSTRACT

P2P Computing services have extended in all the fields such as Education, Business, and Medicine etc. The development of Computer Science and Technology provides better opportunities to P2P computing and file sharing technique. While the usage of P2P technique is increasing at an unprecedented rate, but on the other side P2P computing has its own difficult to providing better service. This paper focuses on the main trouble in P2P computing, i.e. P2P network traffic. The recognition of a novel invention of smart Peer-to-Peer applications have affected in numerous innovative challenges for precisely categorizing network traffic. An extensive perception of network traffic property is consequently significant to address the recent requirements and also to extend innovative architectures that will help in improving the network performance. This paper mainly focuses on Adaptive Routing Scheduling to minimize the traffic on P2P networks. The travelling of the data from one system to another system in the P2P networks not dependent on the desired mechanism, it is learning based on the traffic available in the present status. This paper implemented by Java programming technique. On future process focuses on live implementation on P2P networks.

Keywords: adaptive routing scheduling, P2P computing, P2P live streaming, P2P traffic.

1. INTRODUCTION

At present, peer-to-peer (P2P) activity has been a significant and growing component of Internet traffic. P2P applications are among the most popular applications. However, documentation of characteristics of P2P traffic is very limited.

P2P networking refers to virtual networks of computers that replace the distinct notions of server and client nodes with the notion of peers. Despite huge differences among peers with respect to processing, connection speed, local network configuration or operating system, each member of the P2P network has the same functionality at the application layer. This functionality of peer is distinctive to conventional network systems such as DNS, wherein the operations achieved by each node have a clear difference between them.

The absence of centralized authorities in P2P networks result in a totally distributed configuration of directly connected peers. Few P2P networks also contain tiny set of special nodes that usually handle queries. The main application of such networks is file sharing among users.

While P2P networks became popular only during the last few years, the concept of P2P networking was introduced early in the evolution of network communication systems. P2P networks are distributed, decentralized networks intended to transfer and share files among equal peers. With the dramatic growth of the Internet in the early years, the popularity of the World Wide Web somewhat displaced use and development of P2P networks. However, sequences of technological developments lead to the sudden increase in P2P applications.

The increase of available bandwidth to end users with broadband technologies that provided inexpensive high-speed Internet access. Presently, lots of P2P networks are developed which supports users and file transfers in enormous amount. P2P applications have grown to be a considerable and on some links dominant fraction of Internet traffic; they contribute significantly to overall Internet traffic and performance characteristics.

However, only a few efforts were taken to describe P2P traffic. So far, the analysis and modeling community tends to neglect P2P traffic and/or assume that it follows general behavior of other traffic, although most P2P networks usually operate on top of custom-designed proprietary protocols which are not standardized. Therefore, characterizing P2P traffic is a sticky issue.

The goal of our study is to characterize P2P system behavior with a vision to understand how these systems will have an effect on the underlying network, and to realize an approach to develop P2P systems with superior performance. We are interested in the following:

i) Topology Characterization—the distribution of P2P hosts across the network, and the topology of the application level overlay connecting hosts;
ii) Traffic Characterization—the distribution of traffic volumes transmitted or received by different hosts;
iii) Dynamic Behavior Characterization—in theory, the dynamic nature of a P2P system distinguishes it from traditional distributed server systems.

a) Bandwidth management for P2P computing

With the increasing usage of broadband, more users are using Peer-to-Peer (P2P) protocols to share very large amount of files, including software, multimedia and

other applications. The traffic flows have increased at a rapid pace across a very wide area of network because of this development. If we deal with too much bandwidth utilization due to P2P traffic such as eMule, BitTorrent, numerous Gnutella clients, Kaazaa, DirectConnect, etc., conservative rate shaping techniques like limiting bandwidth by the TCP port number may not address the issue. A more sophisticated technique based on application signature identification via packet inspection may be required. Traditional rate shaping techniques are not sufficient to control new variety of applications. Ordinary desktops normally use protocols like BitTorrent for transferring files via broadband connections. But by transferring high volumes of data using BitTorrent will pressurize the network of broadband operators. Unfortunately, barring BitTorrent traffic has become practice for some broadband operators and is now a key area of contention between users and broadband operators.

Furthermore, recent P2P networks tend to intentionally camouflage their generated traffic to circumvent both potentially filtering firewalls as well as authorized issues most vociferously articulated by the Recording Industry Association of America (RIAA). First-generation P2P traffic was somewhat easily classified due to application of port numbers which were well defined specific to each network. However, an increasing number of P2P applications have the capability to use any port number, including port 80, traditionally used for Web traffic. P2P applications also support encryption. Journalists have reported a drop in P2P application traffic, but it is far more likely to simply reflect in ability to recognize it. For example, a decrease in P2P traffic could be a side-effect of P2P traffic appearing as Web or other types of traffic in increasing proportions.

b) P2P traffic identification

In general, the issue of application identification inside the IP network is not trivial. This is even more complicated and difficult in the case of P2P applications. Early P2P systems often use TCP with some fixed ports for communication. In these cases the traditional port based traffic monitoring and classification can be used to measure P2P application traffic. Nowadays the dramatic growth of P2P usage accompanied by the huge bandwidth consumption, together with the problematic content copyright concerns lead to some interventions from network operators such as traffic limiting or blocking. To overcome these limitations newer P2P applications can use both TCP and UDP connections with arbitrary ports for messaging and data transmission. These improvements make the detection of P2P traffic a challenge.

Two promising approaches of P2P traffic identification:

- Identification based on payload information
- Identification based on flow dynamics.

The first method can provide very high detection accuracy in case of well-known open P2P protocols. The advantage is in the investigation of some named P2P systems. Its drawbacks appear in high processor claim (for payload check), and the continuous change of P2P protocols, which are not available in most of the cases. Moreover, it also raises a number of legal and privacy problems. The second one is simpler to perform, but it implies heuristic methods yielding less accurate results. But it does not depend directly on actual P2P systems, thus it is more consistent and suitable for the analysis of P2P traffic aggregation. In this paper, we have chosen the second approach and present an accurate and robust simple P2P traffic identification method.

2. RELATED WORK

This paper presents a top-down, modular and decomposition based design philosophies for refining Petri net models. In manufacturing systems, this approach ensures optimization of system performance. A Petri net model created by using this method assures safeness, liveness and reversibility in manufacturing perspective. The approach is also beneficial to the designer since not much knowledge about Petri net theory is required [1].

A knowledge based algorithm is recommended which tackles the issues related to state space efficiency and explosion. A collection of methods with new techniques is exhibited. Since graphical representation and well defined structural relationship are hallmarks of Petri net model, a schedule for a manufacturing system model is achieved based on this approach by analyzing reachability graph accordingly [5].

A top down approach is presented in this study for software security evaluation and certification. It is paramount to assess the specific security non-functional features of software. Specific development and certification techniques were used according to the initial risk and vulnerability analysis. It falls in line with software quality assurance practices since it is compatible with factor, criteria and metrics model [2].

A new method which involves in-service reliability assessment and top down approach is discussed here. Traditional methods like Mean-Time-Between-Failure (MTBF), Mean-Time-To-Failure (MTTF), or failure rate prediction predicts only part based faults. This method depends mainly on LRUs data history of recent failures and has a high level of accuracy. HIRAP is one such kind method. This has more realistic MTBF benefits than the traditional methods [4].

Iterative approximating methods are generally used to assess the loss rate of a network. Two of the main concerns of this type of methods are scalability and accuracy since the searching time increases as links increase. To provide a solution, a top down step by step approach is proposed to reduce the estimation time and offers maximum likelihood estimate (MLE) solution.MLE is one of the most after south tactic used in statistical interference to achieve the desirable results. Though the solution is analytical, it is effective when compared to other methods which are normally used like EM algorithm [6].

In order to improve the quality of VoIP calls, a proposal of multipath routing and adaptive playback

scheduling was suggested. Though choosing multipath itself is an ambiguous process. In this presentation a system is proposed for optimal multipath selection which offers finest R-factor (defined by ITU-T E-model for measuring call quality) for VoIP calls. Adaptive playback scheduling is applied at the receiver and the calls are assessed through the optimal multipath. So, decent improvement in call quality is achieved by this method [7].

This paper aims at providing details pertaining to attitude stabilization of UAV (Unmanned aerial vehicles).There had been so many shortcomings in the current approach like GPS or INS. So a vision based approach was recommended and that to catadioptic vision specifically. Rotation estimation and vanishing point derivation in catadioptric images forms is the top down method formulated by this study. Accuracy and ability to run in real time is major advantage of this method. This framework is major boon for UAV control in future for a speedy and reliable 3D image reconstruction and also implementation of optimized codes in real time embedded system [8].

Computation of technical losses using other methods in distribution systems generally requires huge and updated databases. This study suggests a top down approach to evaluate technical losses using a limited database. A complementary data coupled with load curve of the examined feeder or substation forms the basis behind this approach. On application, this method proved to be effective. It did not throw any non technical losses and showed only accepted levels of computed technical losses [9].

Efficient location management of users in mobile computing system forms the basis behind presenting this paper. Traditional systems were used to solve salability problem, but proved to be ineffective with increase in number of users. A clustering algorithm is proposed with a top down approach to address performance issues. Along with movement information and number of visits made by the users to each cell this method reduces the update cost substantially. This method proved to be very effective in large network scenarios [10].

This paper proposes a modern top down method for substrate noise checking. Three areas have been identified to address this issue, namely substrate noise generation, propagation and reception. The idea is to separate noise generation form noise reception. With this approach a new substrate noise checking tool is employed against normal LPE flow. Results have shown outstanding accuracy levels with lower simulation time [11].

The performance of a system in a given period of time is estimated in ideal routing and scheduling conditions forms the basis of this paper. Intrusion among links affects the efficiency of spectrum area. Setting adaptive array model in a multi-hop network is a viable solution and a significant improvement was also noted in the wireless multi–hop network. Permitting spatial link multiplexing and optimizing cross layers, the adaptive array decreases the waiting time considerably. Impending ability is displayed by the results of adaptive array [12].

The bottom-up approach is the normally preferred method of research in the area of inter-vehicle communication. This approach is common in general purpose networks. Unlike this network, the inter-vehicle communication has defined purpose like accident prevention and saving resources. So instead of bottom-up approach, top-down process oriented approach is suggested with clear goals in place. Applications, protocols and algorithms should be formed from these rather than building networks first. The efforts are considered worthy considering the importance of the goals [13].

This study proposes a top down approach for generating high level SPICE models using parameters of analog cell level components. This is to address the roadblocks of slow simulations in large integrated AMS designs. A standard Equation-solver is developed for calculating model parameters in order to apply the top-down tool. This can be applied for any existing SPICE model templates and can also solve direct non-linear circuit equation. DC-DC Buck Regulator circuit based SPICE model is used to reveal the efficiency and accuracy of this proposed method [14].

Hardware failures may make a computer system fail even if the software code is free of fault. So in order to avoid these kinds of circumstances, microprocessors are used. Using multiple processors is one of the approaches. But in the cases where system design is having only one processer, this approach may not work. So in order to address this issue, a top-down oriented method based on Fault Tree Analysis is used. This will eliminate complex branches and identify suspected hardware resulting in a more effective fool proof for system failures [3].

This study presents a top-down approach for monitoring IT service management, since traditional bottom-up approach is becomes very complex in large enterprises because of frequently changing business and IT scenarios. A framework is presented without a need for broad model using highest level metrics. This enables a fast and efficient monitoring of the process. Change point detection is one of the approaches because of its simplicity and easy to implement nature [15].

In this presentation, the possible solutions are discussed to tackle the problems of rate-adaptive routing and scheduling for video broadcast in backbone WMNs. A two phase method based solution is proposed. Building broadcast tree by defining new routing metric and scheduling concurrent transmissions without causing inter/intra-flow interference are those methods. These methods can improve the performance substantially when compared to existing methods which is been revealed by conducting wide range of simulations [16].

In overlay network distribution system, P2P (Peer-to-Peer) computing is the most sought-after. In P2P systems, super peer network depicts a modern centralized topology design. Hence this overlay helps in enhancing the performance of P2P applications, especially live

streaming. This paper presents a solution to address the issue of node failure in super-peer network. A gossip protocol based on Firefly algorithm is suggested as a solution. From a group of peers, it selects the fail over node in super peer network to maintain the overall performance of the network. In order to achieve this, a PeerSim simulator was used to simulate this network model [17].

This paper talks about managing video contents in P2P computing effectively. Usually popular data segments are placed on the cache. Cache replacement algorithms replace old data segments by new data segments. Because of unavailability or lower presence of old data segments, the data contents are less found. Multilevel cache addresses this issue by protecting the old data segments and hence the speed is increased. Clusters based on bandwidth are suggested to deal with connectivity issues. In this, the video server identifies the highest bandwidth and the redirects service to it [18].

Video streaming is one of the popular usages of P2P computing. In VoD the data segments are accessed from the neighboring peers and not from the servers. Cache containing popular data segments is downloaded from a video server or a neighboring peer. New data segments replace old data segments by cache replacement algorithm. To avoid the loss of old data segments though being popular the concept of multi level cache is used. This maintains the old data and increases the rate of success. This algorithm effectively handles the data segments [19].

This study reveals the introduction of mesh based peer to peer network to avoid overload problem in servers. Downloading data could be a challenge when large numbers of users try to access the server. This mesh network overcomes the issue since there is no master/slave relationship among the clients and is appropriate for live streaming. The requested data from the server is stored in the cache of the peers. New data segments are stored in the head part and the old ones in the tail part. By synchronizing the tail part with neighboring peers, unavailability of data at the peers can be addressed [20].

3. PROPOSED WORK

a) Adaptive routing and scheduling

Machine learning is a key for building autonomic systems. Here, a new network simulator that captures real-world complexities and introduces learning-based methods for efficient job routing and CPU scheduling in the networks they simulate. The results based on their experiments show that machine-learning methods outperform heuristic and hand-coded approaches. The adaptive system components can work better together rather than individually.

An adaptive routing, i.e. the path chosen by a packet might not rely only on its source and destination, but also on the existing circumstances in the network. Adaptive routing has several advantages over oblivious routing:

Good routing results are possible with deterministic adaptive routing strategies. Deterministic oblivious routing tactics may perform poorly in certain conditions and is known from the Borodin-Hopcroft lower bound.

Most of the adaptive routing tactics can acclimatize swiftly to nodes or edges which are defective in the network, while in unaware routing defective nodes or edges may disconnect the certain source-destination pairs and therefore may require the computation of the new path system, which may be expensive.

The congestion of adaptive routing strategies can be better than what can be achieved by oblivious routing strategies for oblivious routing on the mesh.

The optimization model proposed above computes high-quality paths for all flows. In this part, we suggest a centralized topology management and greedy heuristic multipath routing system that can be used to calculate worthy paths in a given network configuration, although trying to capitalize on the aggregate end-to-end throughput.

Adaptive routing judges the circumstances, wherein multiple service nodes can be visited by every job in the network. It is an extension of max-weight scheduling where rather than each job visits only a single service node.

An algorithm for energetic routing traffic over a multi-hop network by employing congestion gradients is Adaptive routing. This can be applied to wireless communication networks, including sensor networks, mobile ad hoc networks (MANETS), and heterogeneous networks with wireless and wire line components. In order to study areas like product assembly systems and processing networks, Backpressure principles can also be applied.

b) Adaptive routing algorithm

Algorithm Part 1: Path allocation
Input: Path Allocation Request (PAR)
Output: None

```
f = flow identifier in PAR
S = set of links that can reach f's destination
IF (|S| > 1) THEN
    MIN = Minimal Value Among All Vo[l], l ∈ S
          //Vo is Minimum value of l which is
            //belongs to the set S.
    For l ∈ S Do
    IF (Vo[l] > MIN) THEN
  S = S − {l}
    End
  End
Lo = a random element in S
                // Lo current outgoing link
Increase Vo [Lo] by 1
Else
        Lo = the first element of S
End
Record the incoming link Li of f
```

Record the outgoing link Lo of f
Update the access time t of f

Algorithm Part 2: Explicit adaptation of switch s
Input: Explicit Adaptation Request EAR
Output: None
f = flow identifier in EAR
r = recommended core or aggregate switch in EAR
Li = current incoming link of f Lo = current outgoing link of f
If r and s are connected and sending f to r can lead to the destination of f then
L = the outgoing link connecting r
IF Vo[L] >= Vo[Lo] then
Move a flow currently on L to Lo
Move f to the outgoing link L
Update the link variables of changed links
Else
Forward EAR to Li
End
End

This algorithm is composed of two algorithm named as PAR (Path Allocation Request) and EAR (Explicit Adaptation Request). The PAR algorithm splits each peer as vertices and the connection between each peer with suitable line called as edge. Actually this edge is imaginary line. We fill all edge in a set which defined as S. Find the shortest link in that Set. We assigned that least value will be first preference to select the peer. The EAR also consider that Outlink and Inlink edges also. After losing the current peer. The next peer location will be find by PAR algorithm and the how that peer will give the correct response to that node is given by EAR. If one node is selected as peer, it will be eliminate from the S. Then the next lowest value will be come in front for future peer. It also this computation will do every time. Because we can't assume which node lose its peer at which time. So these two algorithms will execute every time.

4. RESULT AND IMPLEMENTATION

a) Parameter consideration

The Adaptive routing is utilized to obtain the utmost likelihood parameters of a statistical model in cases where the equations are not able to be solved directly. Usually, these models comprise of dormant variables besides the unknown parameters and known data observations. The outcome is that, this algorithm accomplishes outputting a description of the set of all hypotheses constant with the training models and utilizing programming language Java implemented without clearly specifying all of its members. Mentioned below are the parameters considered to execute the desired outcome

Distance
Nearest path
Jitter
Speed (rate)
Traffic
Transfer rate

Once the parameters are set, the eventual step is setting up the threshold of the traffic. Here threshold set has 200 peers which mean that up to 200 peers the server will provide service considering here that every peer with 20 kbps speeds. After accomplishing the threshold point, 200 peers automatically the Un-Supervised Machine Learning Algorithm takes accountability to supply services. Thus, whatever the peers are appealing to the server, the whole appeal is made in line. And then based on any one of the scheduling concept that convey work to the concerned peer, that peer will provide service to the requested peer . Server provides service to client peer when Un-SMLA is employed after the threshold point based on the parameters like Distance of the peers, nearest path of the client/server, Jitter status, Traffic situation and Transfer rate.

b) Software setting and running procedure

In order to measure the traffic from P2P network, the below mentioned software's must be established:

- Winamp: It is software to measure the traffic from server peer to client peer video buffering.
- Plugin: oddcastv: This software has the ability to unite and convey the data to client peer.
- Icecast server: This software plays the role of a web server. When a client initially connects, it provides a burst of data thereby remarkably decreasing the start up time for listeners that do substantial buffering. However, it also enables to considerably boost latency between the source client and listening client.

The difference in the packet arrival time which is the uneven hold-up in the release of audio or video packets is referred to as Jitter.

Traffic = CONSTANT
Jitter = CONSTANT
Initial threshold no. of peer=250
Initial Bandwidth = 30kbps

As the number of listening client increases, Traffic is automatically increases. The bandwidth will be established based on the number of listening clients involved in the network. Fig.1 as shown below is calculated while running the programming

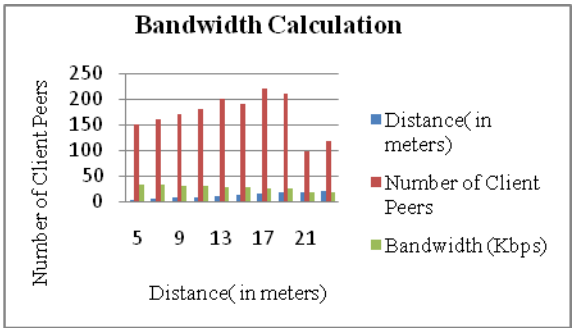

Figure-1. Bandwidth calculation.

When calculating the bandwidth, the Jitter is the primary factor to affect the bandwidth. So fig.2 is based on the Jitter bandwidth increments.

Number of Client Peer = 250
Jitter = CONSTANT
Initial threshold no. of node=250
Bandwidth initial = 30kbps

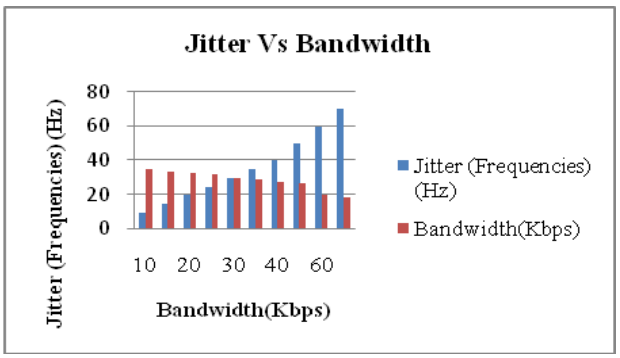

Figure-2. Jitter vs. bandwidth.

The Figure-3 shows P2P networks traffic, when a number of peers connected to the P2P networks, the adaptive routing scheduling works the following steps.

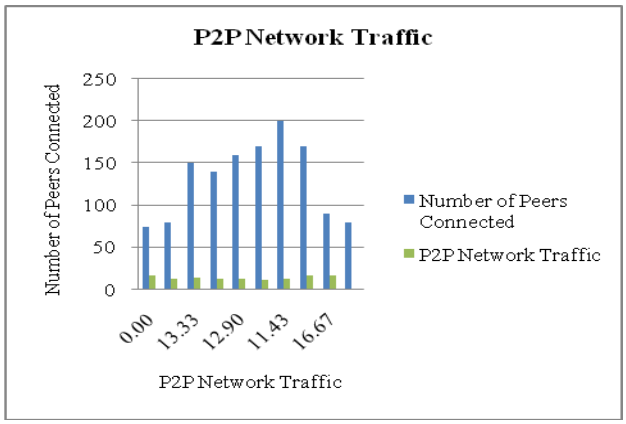

Figure-3. P2P networks traffic.

1) Path allocation request - PAR

The first Step is called The Path Allocation Request (PAR). The PAR algorithm divides every peer in the P2P networks considers as **Vertices** and the connection between each peer in the P2P networks in with suitable line called as edge. Actually this edge is imaginary line. We fill all edge in a set which defined as set of links that can reach flow identifier's destination. Find the shortest link in that Set. We assigned that least value will be first preference to select the peer.

2) Explicit adaption request - EAR

The second step is Explicit Adaption Request (EAR). The EAR also consider that P2P Networks Outlink and Inlink edges. After losing the current peer, the next peer location will be find by PAR algorithm and the how that peer will give the correct response to that node is given by EAR. If one node is selected as peer, it will be eliminate from the Set of Links. Then the next lowest value will be come in front for future peer. It also this computation will do every time. Because the nature of P2P network any time any client can leave from the network and any time can join the P2P network. So these two algorithms will execute every time.

5. CONCLUSIONS

P2P systems can be used to provide anonymized routing of network traffic, massive parallel computing environments, distributed storage and other functions. Most P2P programs are focused on media sharing today, P2P traffic is the main obstruction though the P2P network serves many purposes. Only when we get rid of the traffic, better service can be accomplished. Taking this challenge into consideration, these papers primarily focus on traffic study by using adaptive routing, scheduling observation to find the traffic effortlessly. The traffic relies on unseen listening peers in the statistics of traffic. And to obtain the utmost possibility approximation of peers, the proposed adaptive routing scheduling algorithm is an iterative technique. It is divided into two parts; the first part of the algorithm provides the next peer location using the Path Allocation Request (PAR). The next part of the algorithm travels about the how the peer will give the correct response to the node is given in Explicit Adaption Request (EAR). An Employing real time environment and also fuzzy systems would be part of future work.

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