**Content/Location-Aware P2P-CDN Hybrid Architecture with Integrated RTT/Bandwidth-Based Peer Selection Protocol**

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A thesis submitted to the

Department of Computer Science […]

**FIRST DRAFT**

**October 12, 2013**

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**INTRODUCTION**

**REVIEW OF RELATED LITERATURE**

**P2P-CDN Hybrid Architecture**

In order to provide streaming services that will provide satisfactory Quality of Service (QoS), technologies such as Content Distribution Networks (CDNs) and  Peer-to-Peer (P2P) systems have been used to deliver and distribute content to the client side. A CDN structure, which uses dedicated servers to serve clients in assigned areas, provides reliability but has large costs for deployment and maintenance [6]. P2P systems make use of the bandwidth of all connected peers therefore making it much more scalable but it also has several drawbacks like its dependency on the number of seeders, the slower rate of outgoing streaming content, etc [6].

Recognizing that both CDN and P2P technologies have both their respective sets of advantages and disadvantages, several papers have already explored forming P2P-CDN hybrid architectures. J. Wu et. al in [7] already proposed PeerCDN a 2-layered architecture for streaming with an upper server layer employing CDN assisted by a lower layer utilizing P2P with *Strong Nodes* as the intermediary between the two layers. C. Chen and F. Shen in [1] recommended a system that lets high capacity peers act like CDN servers while the others serve as *Content Peers* in order to efficiently distribute content. Such architectures exploit the dependability of a CDN and the scalability of a P2P system in order to provide efficient and satisfactory streaming services.

**Group-Based CDN-P2P Hybrid Architecture (G-CP2P)**

In the original CDN-P2P architecture, peers are chosen without any bias. Randomly choosing peers in a CDN-P2P could create long connection setup time and excessive latency. This peer selection method also leads to long delays and unnecessary Internet traffic.  Group-Based CDN-P2P Hybrid Architecture (G-CP2P) [4] deals with the problems previously stated. The area covered by a CDN server is further divided into multiple areas. Each division inside the coverage of the CDN server is handled by a *SuperPeer*. G-CP2P works by choosing SuperPeers, peers that are physically close to a CDN server. These SuperPeers maintain peer-id lists, channel information, and peer status in the overlay it is assigned to. Since the CDN is not the only one that manages the peers, communication between the overlays is also vital.

Content Addressable Network (CAN), due to its binning technique which considers the physical location of peers, is used as a Distributed Hash Table (DHT) algorithm for the SuperPeers. In CAN, peers are allocated to zones randomly. G-CP2P evaluates the Round Trip Time (RTT) of the peers to place them in a zone where other peers are physically near, hence location aware. In the area covered by the CDN, there are several landmarks which new peers use to estimate its location. New peers arrange the RTTs to these landmarks to know which bin it belongs to. After the new peer knows its bin, it will contact the nearest SuperPeer and ask if there is a sub-overlay for the channel requested. A sub-overlay is a group of peers streaming the same channel. If there exists such a sub-overlay, the SuperPeer will reply with the list of peers in it. Otherwise, the new peer will send a request signal to the SuperPeer who will then send messages to other SuperPeers. Other SuperPeers, which have sub-overlays for the requested channel, will be returned and the new peer will select the sub-overlay with the most peers.

**Adaptive and Efficient Peer Selection (AEPS)**

G-CP2P can still be improved by integrating an optimal peer selection scheme in grouping peers into sub-overlays. The efficiency and quality of the media content being streamed depends on the scheme adopted in selecting peers. Hsia, Hsu, and Miao in [2] proposed a novel peer selection protocol called Adaptive and Efficient Peer Selection (AEPS). This protocol guarantees a reduction in start-up delay and high delivery quality by combining the advantages of RTT based and available bandwidth (ABW) based schemes.

RTT is measured using an ICMP (Internet Control Message Protocol) message sent by a requesting peer. The candidate peer with the shortest RTT is selected as the parent to the requesting peer. Because geographical location is involved, RTT-based schemes are more accurate than random-based ones. However, this scheme may still select incompetent peers as parents since no information regarding the ABW of the path is given [2].

The quality of the media content stream hinges on the ABW of the path [3]. A high quality stream is equivalent to a large ABW value, which is why the candidate peer with the greatest ABW is chosen. Accuracy in peer selection is guaranteed though not the efficiency since ABW computation consumes a lot of time. AEPS is both accurate and efficient because it is a combination of RTT-based and ABW-based schemes. The basic structure of the AEPS consists of an index server, candidate peers, a streaming server, and a requesting peer. The index server carries metadata about the streamed content and peers involved [5]. The first stage of AEPS requires the requesting peer to demand from the index server a list of candidate peers. The next stage measures the RTT of each candidate peer returned by the index server. The one with the least RTT is chosen for the verification stage. The ABW between the requesting peer and the selected candidate peer is computed to verify if the latter can support the bandwidth requirement. If it is capable, then it is selected and peer connections are established. Otherwise, it is neglected and the requesting peer chooses another candidate based on the measured RTT for the verification process.

**Integrating G-CP2P and AEPS**

AEPS has been demonstrated to achieve efficient and high quality streaming in P2P as a result of accurate peer selection and optimal bandwidth assurance. Similarly, the G-CP2P has been shown to provide improved rates of media delivery and connection setup as it uses location and content awareness in a P2P-CDN architecture. Recognizing that this architecture can be further improved by using a more efficient peer selection protocol than the traditional random-based one, the proponents of this paper suggest incorporating the AEPS scheme into the aforementioned P2P-CDN framework. G-CP2P provides efficiency but it does not guarantee the quality of the content. AEPS can address this gap by ensuring that a high quality stream is delivered to a client with improved speed due to its use of RTT and bandwidth in peer selection.

**METHODOLOGY**

**DISCUSSION AND ANALYSIS OF RESULTS**

**APPENDIX**

**FUTURE WORK**

**TIMELINE**

|  |  |
| --- | --- |
| **November 2013** | |
| Week 1 |  |
| Week 2 |  |
| Week 3 |  |
| Week 4 |  |
| **December 2014** | |
| Week 1 |  |
| Week 2 |  |
| Week 3 |  |
| Week 4 |  |
| **January 2014** | |
| Week 1 |  |
| Week 2 |  |
| Week 3 |  |
| Week 4 |  |
| **February 2014** | |
| Week 1 |  |
| Week 2 |  |
| Week 3 |  |
| Week 4 |  |

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