A Distributed Infrastructure for Internet Broadcasting System

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SUMMARY

A system with a primarily distributed media stream server and a control node consists of multiple storage nodes to accommodate files for multimedia data transmission service. As a matter of principle, each client, depending on the nature of the service, will provide uniform load distribution. Distributed media streaming technology will invite a better operating price, stability, and better performance than existing products offering similar services for concurrent users. Nevertheless, too much wait time still induces delay. This limitation must be addressed. This research proposes implementing an environment offering distributed media stream servers by applying an algorithm based on overlay multicast services. The algorithm is vital, because it limits the users based on the flexibility and scalability. This could greatly improve system performance. If the proposed technique is applied for the service of multimedia files, and analyzed for optimal sizes of data, storage nodes, and number of concurrent system users, we can derive an optimization formula for the delay, and the limits of verification can be observed.

Keywords: Distributed Media Stream Server; Storage Node; Overlay Multicast; Data Size; Stream

1. INTRODUCTION

The initial wait time can be very long to provide services to Internet users to access content they intend to watch. As a result, they may move to other content broadcasting systems. Therefore, researchers put in a lot of effort to reduce the wait time to ensure users can comfortably access the media. In today’s multimedia world offering broadcasted content, using the Internet to communicate has been the mainstream of everyday service.
To be practical, multimedia video should be a real-time service. However, most existing communication protocols cannot satisfy this criterion. Therefore, production of a system with less sensitivity to quality service, with minimum initial delay time for Internet broadcasts must be achieved for a superior multimedia system. However, in using a network to provide simultaneous services the server performance to handle many users has difficulties to resolve these issues. The idea seems to be more cost-driven.

Recent developments of networks suitable for the previously mentioned services must support high-speed media delivery systems to enjoy their full effect and capability. The media delivery system of data in the storage device is directly dependent on the access speed. RAID, SAN, and many other technologies, have been introduced to resolve these problems. Research is still underway to provide seamless multimedia broadcasting stream for many users, whilst alleviating some of the cost-effective parameters for load balancing [1]. Above all, a new technology system, using uniform load balancing, and the organic combination of storage devices to enable simultaneous events to develop new data transfer techniques must be applied.

In this paper, distributed multimedia data stored at the nodes, and the media, are each incorporated as a storage server node in distributed to send data to the clients. The server and the system scalabilities maximize the availability of the user system. A distributed media stream server environment, without the establishment of the system hardware resource infrastructure and without an efficient use of network bandwidth techniques, has been a focus of research. Overlay multicast-based algorithms were applied. In particular, this research addresses solving the problems of delays caused by waiting for concurrent users. Emphasis has been placed on the system’s flexible scalability.

2. RELATED WORK

2.1. Overlay Multicast-based Technology

Important issues related to QoS and multicasting include the provision of multimedia services and network efficiency. The existing IP Multicast, serving IP Multicast packets, should be implemented in each router. From this, arise the
differences in terms of IP Multicast and Overlay Multicast. An overlay multicast allows a network, to forward packets to the next and subsequent nodes by only installing application software, without the need to change the structure of their end nodes.

Overlay multicasting of data from a node, as well as reception and transmission functions, performed by the existing IP Multicast router in the multicast tree for data transmission are configured and managed to be capable of performing within a given group. Therefore, in IP Multicast, the different configurations of the installed network, as well as the expansion of the network, are not affected or changed. The top of the hierarchy is provided with the network layer error control, congestion control, and flow control features. This makes management easier compared to that of IP Multicasting [2]. However, when the overlay multicast transfers data, each node cannot determine the configuration of the physical network. IP multicasting uses network redundancy and transmission lines. These are responsible for the overhead and performance degradation factors that inevitably exist in the system.

Mathy, Canonico, and Hutchison established the basis for the traditional TBCP and Tree-First based specificity of distributed algorithms. These can be classified as early as possible in the creation of the best tree. The focus was on reducing convergence time [3]. Traditional TBCP was used to configure the overlay tree for the multicast routing distributed algorithm [4]. The research program investigates the factors limiting the users from obtaining acceptable services; the flexible scalability and reliability for multimedia data transmission service is inappropriate in the multi-casting that was otherwise acceptable.

2.2. Stream Server Technology

The introduction of a wide range of stream server addresses the biggest barrier to real-time sound and image transmission and traditional e-mail and file transfer applications. These operate on both sides, with local networks or intranets. A dedicated server is required to take advantage of multimedia broadcast content that can handle multiple concurrent flows.

Recently, broadcasts on the Internet, Internet movie theaters, and the growing stream of service-oriented Internet services have increased. The bottleneck created to enhance network performance to meet the needs of service users has also
increased, while accommodating the needs of the system for the performance of multimedia server capacity cannot meet the server specifications. A relay system, introduced through the cache server, has been the only measure to resolve the said limitations.

Streaming technology, which allows the download of files, can be played at the same time whilst receiving. These technologies allow real-time applications and maximize system effectiveness. It is also available for live applications. That is, this technology, like FTP, can be used to download all the data over the network. What is missing is how to run it continuously through the network while data transmission can be run directly from the client. This came about since the technology was developed around Internet broadcasting. A quality of minimum bandwidth can be guaranteed between a server and the users, but the network must be secured to view a video at the performance level desired by the client with minimum requirements.

In addition, the server for a large number of users larger desiring video content from the client, will have offer a certain rate. Therefore, the streaming technology network bandwidth and the provision for the server’s performance will determine the success or failure of the system. We consider the information when the stability, storage media access speed, the administrator’s convenience, the capacity of a single system, and the price per concurrent user to introduce a stream server [5].

3. THE PROPOSED SCHEME

3.1. The Stream Server Service Model in the Distributed Media Server Environment

This paper proposed a server in the environment is a file striping on each system is a distributed storage system, each divided as a cluster of storage servers, on each of which, files are stored in sequential order. Each storage server is reconfigured as a single piece of striped system with the same name stored.

The advantage of a distributed media stream server is that one file is striping on different systems. Thus, it is being treated as distributed storage. Therefore, when you ask to transfer data of each system’s I/O bus, each account transfers files, and the file access speed is superior to RAID configuration speed. In
addition, for each system, the same access requirements works simultaneously, a
uniform system without a separate load balancing feature can be used to achieve
load balancing.

Overlay multicast is implemented in this environment based on the limits of
personal Internet services and the personal interests of many users of the server
from unstable multimedia broadcasting to provide a smooth stream.

A system between the storage device, coupled with the organic load balancing
providing uniformity, the stream server can be directly connected to the server for
overlay multicast, based on the user node that offers better and guaranteed service
reliability and stability than do existing services.

Figure 1 shows distributed media streams, received from the server as a
whole, applied in service.

**Figure 1.** Distributed Media Stream based Service Structure

This research proposes a distributed media stream server environment, by
application of the algorithm of overlay multicast based services to limit the user
based on a flexible, scalable configuration that could greatly improve
performance.
3.2. Distributed Media Server Environment in Overlay-based Multicast Model

Building a distributed media stream server, with the same performance as the system constructed by a number of clustering nodes’ groups, comprises a single system with one unit of functionality. The system behavior is characterized by a system with distributed multimedia data stored in each node, with each server node later acting in distributed to the client to send the media data.

Users should use the web and distributed media streams connected to the server needed to request a service for the Internet Broadcast content. The management node, operating through the login process to authenticate the authorized users, determines if the user can select the best potential parent among the parent nodes. The nodes list request, with response messages containing information of the data, after the transfer of the metafile access correspond to the basic services for the users.

Broadcasting service content that is stored in the storage servers are distributed media streamed via the servers connected directly Overlay Multicast based to the user node. The content is pre-stripped before the multimedia stream transmit data are stored.

The server’s availability and system scalability, which maximize the delay in waiting for services and limit system performance, have been improved by the distributed media stream server environment. The proposed scheme that applies the overlay multicast algorithm based on concurrent users, maximizes the service to the users. This was not possible in the past.

Figure 2 shows the distributed media server environment with the structure of the overlay multicast-based broadcast service model.

At this point, it is desired that the storage directly connected on the service to the user node applies the overlay multicast based algorithm mOBCP content in the Internet broadcasting content services.

In the case with no direct connection to the server Internet broadcasting service, the storage node rather than the user node will apply an overlay-based approach to the P2P multicast mOBCP service algorithm.
4. Control Storage Nodes’ Performance Analysis of the Proposed Model

This paper evaluates the performance of the proposed model using network simulator ns2 [7] and MatLab 7.0 tools.

In a distributed streams-based server environment, the Internet broadcasting services to the users enable reading files when times are rolling. There is an increase of the hard disk seek time and an increase of about 8.5 msec in the speed of the hard disk during the disk access for each file. Therefore, at a unit time, it is impossible to serve many clients.

Therefore, this study concentrates on a system between the storage devices that seamlessly combine to provide uniform load balancing. Distributed streams are directly connected to the server node for overlay multicast-based usage to concurrent users. The waiting delays are based on flexibility and scalability that could improve performance. Specifically, this research technically evaluates the performance of the maximum number of users, the optimal striping size, the optimal storage nodes, and the analysis and correlation of the maximum delay.
The foundations of HDD-based technique are needed to evaluate performance. The variables and the constants, as provided in the formula listed in Fig. 3, were used.

<table>
<thead>
<tr>
<th>N(Gi):</th>
<th>The number of Storage Nodes</th>
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<tbody>
<tr>
<td>S(Mb/t):</td>
<td>Stripping for the file size</td>
</tr>
<tr>
<td>T(N)(sec):</td>
<td>In the entire system N of the storage nodes connect the user when the maximum for the first time, last access client data stripping services for the maximum time to wait</td>
</tr>
<tr>
<td>Q(Mb/t):</td>
<td>HDD seek time the amount of loss</td>
</tr>
<tr>
<td>R_max(Mbps):</td>
<td>HDD formatted transfer rate(Max)</td>
</tr>
<tr>
<td>C_a(Gb/sec):</td>
<td>A single storage node is a random stripping size delivery service for 1 second as the client’s number</td>
</tr>
<tr>
<td>R_c(Mbps):</td>
<td>A single client to maintain the desired quality required for the average transfer rate</td>
</tr>
<tr>
<td>mOBCP(ms):</td>
<td>Overlay Multicast Environment: Tree-based attributes for data transfer, with the Distributed Protocol (Proposed Algorithm)</td>
</tr>
<tr>
<td>TBCP(ms):</td>
<td>Overlay Multicast based Environment for data transfer that is responsible for the tree configuration protocol</td>
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**Figure 3.** Defined Parameters

Built on a distributed media server environment the GT-ITM model was based on applying the model of the Transit-Stub topology of a network with 1,000 nodes. Then, using ns2, the mOBCP mechanism was randomly applied. Similarly, the process was repeated and measurements taken for the TBCP mechanism.

In the case of a storage node N, if the value of \( R_r \) is 1Mbps, then \( Y_{\text{max}} \) is the change in the value of \( T(N) \) to change the value of the performance of the proposed model. This was analyzed based on the expressions in Fig. 4.

**Figure 4.** The System Formulation when Configuring the Broadcasting Service
In Fig. 4 represent the system formulation when configuring the Internet broadcasting service to allow concurrent users. The system does so by considering the maximum wait time of the last users, where then the best service to the present state can be estimated.

In Fig. 5 and Fig. 6, when storage node N3, N4 signals the maximum number of concurrent users, $Y_{max}$, then the maximum delay $T(N)$ values, as shown in the graph, will change.

Depending on the stripping size, the limits of the maximum number of concurrent users and the maximum delay time can be monitored by comparing the performance of the proposed model with that of the traditional TBCP.

In Fig. 5, we can see that when the data size is small, then the acceptable maximum number of simultaneous users can be reduced proportionally. Fig. 6 shows a larger data size, which leads to increased maximum access latency. Fig. 5 and Fig. 6 illustrate that when the storage node N3’s and N4’s corresponds to the $Y_{max}$ value of the maximum number of concurrent users, then the maximum delay $T(N)$ value shown in the graph will also change.

![Graph](image.png)

**Figure 5.** Maximum Concurrent Users Number
Depending on the data size, the maximum number of concurrent users and the maximum delay time can be monitored by comparing the performance of the proposed model with the other recent systems.

The reduction in the striping size of the reduced initial waiting time can be achieved from the resulting values. A very small striping size will provide a faster response time. Therefore, without waiting for buffering, the user can conveniently receive Internet broadcasting services. Therefore, in the proposed model, the optimal striping size to the maximum number of concurrent users and maximum delay time optimizes the appropriate trade-off.

5. Conclusion and Discussion

The local environment of the network and the system level of the world-view of HD-receiving and processing of multimedia data have been developed as much as possible. Accordingly, broadcast communications and digital home appliance convergence, as the integrated platform environment, have increased the demand for reliable multimedia services. In addition, recent network services encourage users to hold roles that are more active and participative. For this P2P or Internet broadcasting service introduces a requirement for a new environment and appears to determine a user’s characteristics. Nevertheless, in spite of environmental changes to the service, Internet broadcasting has many other challenges.
In this paper, advocacy for Internet broadcasting services to be maintained in a stable environment has been emphasized. A system of distributed servers has been proposed by applying overlay multicast based algorithm. The prediction of limits based on the users’ services and the situation under context could greatly improve system performance, as well as individual reception of the multimedia. In the proposed system model, one of the control nodes is composed of multiple storage nodes. Each storage node has a number of flexible extensions, depending on the performance needs. The storage nodes for each client are kept to provide uniform load distribution through the multimedia service.

As seen in the results, up to a certain number of simultaneous users, storage node numbers, and the maximum delay times, depending on the needs, can provide the best service for the bandwidth trade-off required.

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**References**


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