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A Novel Routing Topology Inference for Peer To Peer Data Communication in Wireless Network

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ABSTRACT: Inferring the routing topology and link performance from a node to a set of other nodes is an important component in network monitoring and application design. In this paper we propose a general framework for designing topology inference algorithms based on additive metrics. The framework can flexibly fuse information from multiple measurements to achieve better estimation accuracy. We develop computationally efficient (polynomial-time) topology inference algorithms based on the framework. We prove that the probability of correct topology inference of our algorithms converges to one exponentially fast in the number of probing packets. In particular, for applications where nodes may join or leave frequently such as overlay network construction, application-layer multicast, peer-to-peer file sharing/streaming, we propose a novel sequential topology inference algorithm which significantly reduces the probing overhead and can efficiently handle node dynamics. We demonstrate the effectiveness of the proposed inference algorithms via Internet experiments. This tool can help a network operator obtain routing information and network internal characteristics (e.g., loss rate, delay, utilization) from its network to a set of other collaborating networks that are separated by non-participating autonomous networks. In application design, this tool can be particularly useful for peer-to-peer (P2P) style applications where a node communicates with a set of other nodes (called peers) for file sharing and multimedia streaming. A streaming node using multi-path may want to know both the routing topology and link loss rates so the selected paths have low loss correlation. There are two primary approaches to infer the routing topology and link performance in a communication network.

KEYWORD: Network Measurement, Network Monitoring, Packet probing.

I. INTRODUCTION

Developing the efficient tools to check the network topology and link performance of the node to group of other nodes is an important approach. Network monitoring describes the use of a system that constantly monitors a computer network for slow or failing components and that notifies the network administrator (via email, pager or other alarms) in case of outages. It is a subset of the functions involved in network management. It also helps the network operator to obtain routing information and network internal characteristics from network and from node to node within the individual networks. While an intrusion detection system monitors a network for threats from the outside, a network monitoring system monitors the network for problems caused by overloaded and/or crashed servers, network connections or other devices. For example, to determine the status of a web server, monitoring software may periodically send an HTTP request to fetch a page. For email servers, a test message might be sent through SMTP and retrieved by IMAP or POP3.Commonly measured metrics are response time, availability and uptime, although both consistency and reliability metrics are starting to gain popularity. The widespread addition of WAN optimization devices is having an adverse effect on most network monitoring tools especially when it comes to measuring accurate end-to-end response time because they limit round trip visibility. Status request failures - such as when a connection cannot be established, it times-out, or the document or message cannot be retrieved - usually produce an action from the monitoring system. These actions vary -- an alarm may be sent (via SMS, email, etc.) to the resident system admin, automatic failover systems may be activated to remove the troubled server from duty until it can be repaired, etc. Monitoring the performance of a network uplink is also known as network traffic measurement, and more software is

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listed there. Here, two approaches are used to infer the network topology and link performance. Routing topology is the process of selecting paths in a network along which to send network traffic. Routing is performed for many kinds of networks, including the telephone network (Circuit switching), electronic data networks (such as the Internet), and transportation networks. In packet switching networks, routing directs packet forwarding, the transit of logically addressed packets from their source toward their ultimate destination through intermediate nodes, typically hardware devices called routers, bridges, gateways, firewalls, or switches.

II. RELATED WORKS

Grouping algorithm to infer the tree topology is based on shared losses identified at the destination node which was proposed by the Multicast routing tree topology. In computer networking, multicast routing tree is the delivery of a message or information to a group of destination computers simultaneously in a single transmission from the source creating copies automatically in other network elements, such as routers, only when the topology of the network requires it. Multicast is most commonly implemented in IP multicast, which is often employed in Internet Protocol (IP) applications of streaming media and Internet television. In IP multicast the implementation of the multicast concept occurs at the IP routing level, where routers create optimal distribution paths for datagram's sent to a multicast destination address. At the Data Link Layer, the multicast describes one-to-many distribution functions such as Ethernet multicast addressing, Asynchronous Transfer Mode(ATM) point-tomultipoint virtual circuits (P2MP) or Infiniband multicast. After verifying all the algorithms, with best of our knowledge, the sequential topology inference algorithm proposed in this paper is a first effort to address the issues of dynamic node and probing scalability for network for network routing topology inference. The rooted neighbor-joining (RNJ) algorithm proposed in this paper is also a grouping type algorithm that recovers the tree topology by recursively joining the neighbors on the tree. This agglomerative joining/grouping idea has been used in clustering for building cluster trees and in evolutionary biology for building phylogenetic trees. Unicast routing tree topology inference was studied in Coates et al. introduced a sandwich probing technique to conduct delay measurements and proposed a Markov chain Monte Carlo procedure to search the most likely tree topologies.

III. EXISTING SYSTEM

Efficient file query is important to the overall performance of peer-to-peer (P2P) file sharing systems. Clustering peers by their common interests can significantly enhance the efficiency of file query. Clustering peers by their physical proximity can also improve file query performance. However, few current works are able to cluster peers based on both peer interest and physical proximity. Although structured P2Ps provide higher file query efficiency than unstructured P2Ps, it is difficult to realize it due to their strictly defined topologies. In this work, we introduce a Proximity-Aware and Interest-clustered P2P file sharing System (PAIS) based on a structured P2P, which forms physically-close nodes into a cluster and further groups physically-close and common-interest nodes into a sub-cluster based on a hierarchical topology. PAIS uses an intelligent file replication algorithm to further enhance file query efficiency. It creates replicas of files that are frequently requested by a group of physically close nodes in their location. Moreover, PAIS enhances the intra-sub-cluster file searching through several approaches. First, it further classifies the interest of a sub-cluster to a number of sub-interests, and clusters common-sub-interest nodes into a group for file sharing. Second, PAIS builds an overlay for each group that connects lower capacity nodes to higher capacity nodes for distributed file querying while avoiding node overload. Third, to reduce file searching delay, PAIS uses proactive file information collection so that a file requester can know if its requested file is in its nearby nodes. Fourth, to reduce the overhead of the file information collection, PAIS uses bloomfilter based file information collection and corresponding distributed file searching. Fifth, to improve the file sharing efficiency, PAIS ranks the bloom filter results in order. Sixth, considering that a recently visited file tends to be visited again, the bloom filter based approach is enhanced by only checking the newly added bloom filter information to reduce file searching delay. Trace-driven experimental results from the real-world PlanetLab testbed demonstrate that PAIS dramatically reduces overhead and enhances the efficiency of file sharing with and without churn.

Disadvantages

- Although numerous proximity-based and interest-based super-peer topologies have been proposed with different features, few methods are able to cluster peers according to both proximity and interest.
- In addition, most of these methods are on unstructured P2P systems that have no strict policy for topology construction.

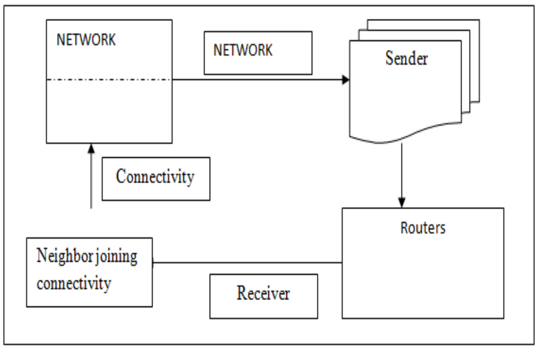
IV.PROPOSED SYSTEM

Inferring the routing topology and link performance from a node to a set of other nodes is an important component in network monitoring and application design. In this paper we propose a general framework for designing topology inference algorithms based on additive metrics. The framework can flexibly fuse information from multiple measurements to achieve better estimation accuracy. BitTorrent is a P2P file sharing system that allows its users to distribute large amounts of data (especially large files) over IP networks. BitTorrent is distinguished from other similar file-transfer applications in that instead of downloading a resource (one or more files) from a single source (e.g. a central server), users download fragmented files from other users at the same time. We propose Conditional Shortest Path Routing (CSPR) protocol that routes the messages over conditional shortest paths in which the cost of links between nodes is defined by conditional intermeeting times rather than the conventional intermeeting times. Through trace-driven simulations, we demonstrate that CSPR achieves higher delivery rate and lower end-to-end delay compared to the shortest path based routing protocols

ADVANTAGES

- Message delivery ration is high.
- Find the best route through the CSPR.
- Links with nodes are stable not disconnected frequently.
- Lower end to end delay

System Architecture



Network Model And Tree Topology Inference By Probing

When dealing with networking, the terms "network model" and "network layer" used often, Network models define a set of network layers and how they interact. We assume that during the measurement period, the underlying routing algorithm determines a unique path from a node to another node that is reachable from it. Hence, the physical routing topology from a source node to a set of (reachable) destination nodes is a (directed) tree. From the physical routing topology, we can derive a logical routing tree, which consists of the source node, the destination nodes, and the branching nodes (internal nodes with at least two outgoing links) of the physical routing tree. A logical link may comprise more than one consecutive physical links, and the degree of an internal node on the logical routing tree is at least three. In this paper, we consider topology inference of logical routing trees and use the routing tree to express the logical routing tree.

A.Mulicast tree topology inference

Multicast packets flow along a distribution tree rooted at the source. The receivers form the leaves of the tree, and the links from the edges of the tree. The internal nodes in the tree and the links form the edges of the tree. A packet that is dropped along any link of the distribution tree, is lost by all the downstream receivers in the subtree rooted at the

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link. The tree structured delivery model thus introduces correlations in the packet losses seen by the different receivers. This loss correlation between receivers can be exploited to infer the topology of the tree that caused the observed loss patterns. The tree inference algorithm described in this attempts to reconstruct this logical tree in a bottom-up fashion using information regarding the loss patterns of the different receivers. Receivers having similar loss patterns are aggregated together and represented by a single node one level higher in the tree. The aggregated nodes can then be regarded as a single node for further aggregation. The entire tree has been reconstructed when all the receivers have been coalesced in this manner into a single tree In order to rebuild the tree shown in figure 1, the algorithm[8] initially begins with a set of individual receivers A,B and C. Information obtained from the loss patterns of the three receivers indicates that A and B are more closely located than A and C or B and C, thus aggregate A and B into a single macro-node (AB). Next, (AB) and C are aggregated to yield the logical tree ((AB)C).

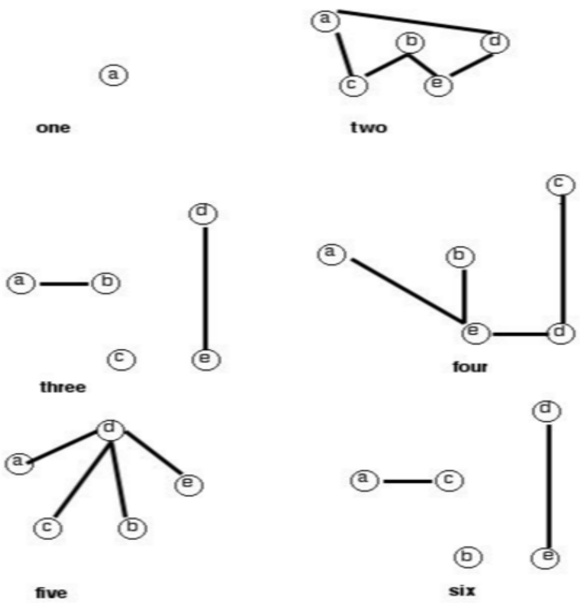

Fig 3.1 Topology Tree

IV. DYNAMIC TREE TOPOLOGY INFERENCE

In practice, the RNJ algorithm (and other existing topology inference algorithms) may have some limitations. First, the focus of previous studies is on a relatively stable set of nodes. In real applications (e.g., P2P applications), the destination nodes that a source node communicates with will often change over time. Hence, the routing tree topology will also change over time. When an existing destination node leaves, it is straightforward to derive the updated routing tree topology. When a new destination node joins, running the RNJ algorithm over the new set of destination nodes to infer the updated routing tree topology is not efficient when the nodes join and leave frequently. The second limitation is the probing scalability problem under unicast probing. The RNJ algorithm requires estimated shared path lengths from the source node to all pairs of the destination nodes as the input. Suppose there are destination nodes. If multicast probing is available, then the source node can use a 1 multicast probing to obtain the required measurements.

V. CONCLUSION

We have proposed different types of tree topologies such as unicast, multicast topologies and traceroute mechanisms in which probing overhead have occurred during the inferring of network topology. To overcome this problem we have proposed fast and scalable algorithms for network routing tree topology inference using a framework

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based on a RNJ algorithm that is a grouping type algorithm that recovers the tree topology by recursively joining the neighbors based on additive metrics, which is considered from the existing algorithms to handle these problems. In particular a sequential topology inference algorithm is proposed from this framework to address the probing scalability problem and handles dynamic node joining and leaving efficiently. These frameworks provide powerful tools for large-scale network inference in communication networks.

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