Topography Discovery and Bandwidth Measurement Tools For Overlay Networks
Final Year Project (2002-2003) Group TD1-02

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Project Overview:

Deploying application-level multicast is an alternative of network-layer multicast. The ideal software will be able to automatically create an overlay distribution tree spanning all the participants of a multicast group and deliver application traffic efficiently.

In our project efficient software was developed to help upper level applications form a good logical topology. Our topology discovery algorithm is based on two important metrics, bandwidth and latency. We also designed the tailor-make algorithm for available bandwidth measurement and implemented them.

Our software is called BOT, namely Bandwidth measurement & Overlay topology Tool. The core is a topology management protocol that allows a group of hosts to dynamically auto configure into an overlay distribution tree and a mechanism for measuring link cost in terms of bandwidth and latency. This topology management protocol maintains a tree structure when new nodes want to join or old nodes want to leave the group.

BOT provides an API (application programming interface) to upper level software to multicast their content to other hosts within the multicast group. Two conferencing tools were also developed to demonstrate the usefulness of our tree topology.

The first aim was characterize the link bandwidth without affecting existing network data traffic. The second aim of the project was to help overlay nodes form an efficient overlay network topology metrics based tree that allows application runs over it.
System Block diagram:

Bottleneck Link Capacity  ———— Available Bandwidth  ———— Latency

Overlay Topology Discovery by three Metrics above

Visual Display of Topology by NS

Application of Overlay Network (Draw Board & Audio Conferencing)

Link Cost
Measurement

Topology
Forming and Visualization
Results:

In this project, we designed and implemented an algorithm for Bottleneck link capacity, Available bandwidth, and Latency. We integrated and implemented these measurement metrics with our topology algorithm. The overlay topology basing on above three metrics was formed successfully. Finally, in order to apply our tool into real life, two network applications were implemented on this overlay topology.

A six nodes form an overlay topology using our BOT software.

Sample output of the Draw Board application
The participants can draw different pictures on the board. They can also import some text files onto the board.

Sample output of the Audio Conferencing tool
All participants can talk with each other. The names of all participants are displayed.