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Review of protocols used in Multicasting Communication

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Abstract –

In the age of multimedia and high speed network. Multicast is one of the mechanism by which the power of the internet can be further harnessed in an efficient manner. Multicast services have been increasingly used by various continues media application. Multicasting is the ability of communication network to accept a single message from an application and deliver copies of the message to multiple recipients of different location. This paper provides the role of protocols in multicast communication.

Keyword-application,protocols of multicasting

Introduction

Data communication or transfer in the internet is many ways. Unicast, Broadcast, Anycast and Multicast. Unicast is point to point communication, Broadcast is one to all communication, Anycast is the when data is transmitted to only a group of hosts on a network and multicast is one to many communication. a basic features of the computer network consist of sending information to a selected, usually a large group for some specific data.video-confrenceing software delivery, group-ware are some important example of feature of network. Multicasting is a technique used for this type of features or this type of information exchange. Multicasting is transmission of packets from one sender to many receivers. It is like a one to many type of communications. Multicasting is intended to a group oriented computing where the member of the group is dynamic (a new host can join or leave from the group any time).a host may be a member of more than one group. a single send operation that results in copies of the sent data being delivered to many receivers –can be implemented in many ways.in multicasting a single datagram is transmitted from the sending host This datagram (or a copy of this datagram) is then replicated at a network router whenever it must be forwarded on multiple outgoing links in order to reach the receivers.the basic definition is a multicast group is a set of nodes in a network that need to share the same piece of information .a multicast group can have one or more source nodes,and more than one destination .even there is more than one source,the same information is shared between all nodes in the group. A multicast can be static or dynamic,static group cannot be changed after its creation.on the other hand the dynamic group can be changed any time,any host can join or leave the group anytime.

Multicast Communications

The data transfer associated with a multicast group needs to be handled differently by the intermediate nodes, namely the routers involved in the routing of the multicast packets from the sender(s) to the receivers. The need to handle multicast data differently coupled with the different types of applications using multicast and their varied requirements has led to the development of various routing algorithms and protocols. An ideal multicast routing algorithm will have the following features:

- The load on network should be minimal. This essentially involves avoiding loops and avoiding traffic concentration on a link or a sub-network.
- It should support reliable transmission.
- The routing algorithm should be able to select optimal routes, taking into consideration different cost functions, including available resource, bandwidth, number of links, node connectivity, price to be paid and end-to-end delay. It should further maintain optimality of the routes after any changes occur in the group or the network.
- It should minimize the amount of state that is stored in the routers, so that more groups can be supported in a network without any scalability issues.
- The data transmitted should reach only the members of the group.

Multicast routers4 communicate among themselves using the standard routing protocols and deliver the multicast datagram from the sender(s) to the receivers. The host which wants to send data to a multicast group transmits the datagram using the local network multicast. capability. The multicast router on receiving the datagram looks up its routing table and forwards it to the appropriate outgoing interface. When a host decides to join a particular multicast group, it sends the request to the local multicast router. The local multicast router makes an entry for this group (if it does not exist already) and propagates the information to other multicast routers to establish the multicast routes. Multicast routers use Internet Group Multicast Protocol (IGMP) to gather member information for the multicast groups [2].

However, all routers in the Internet are not multicast capable. Solution is to use IPencapsulation tunnels such hosts, as used in the MBONE. The multicast router at the source end of the tunnel encapsulates the datagram and forwards it. By encapsulation, it means that the router prepends another IP header with the destination address as the unicast address of the multicast router at the other end of the IP tunnel. Intermediate routers view it as a unicast datagram and forward it as per the unicast routing table. Destination router removes the outer encapsulated IP header and forwards the packet as a multicast datagram. Once the data is delivered to the end-host by the network, the end-host must deliver a copy of the message to all the processes that belong to that group. Multiple processes on a given endhost can belong to the same multicast group.

Applications

Applications of multicast routing have a wide spectrum, from business to gov-ernment and entertainment. One of the ¯rst applications of multicast routing was in audio broadcasting. In fact, the ¯rst real use of the Internet MBONE

(Multimedia Backbone, created in 1992) was to broadcast audio from IETF (Internet Engineering Task Force) meetings over the Internet [2]. Another important application of multicast routing is video conference [33], since this is a resource-intensive kind of application, where a group of users is targeted. It has requirements, such as real-time image exchanging, and al- lowing interaction between geographically separated users, also found in other

types of multimedia applications. Being closely related to the area of remote collaboration, video conferencing has received great attention during the last decade. Among others, Pasquale et al. [1] give a detailed discussion about uti- lization of multicast routing to deliver multimedia content over large networks, such as the Internet. Also, Jia et al. [34,35] proposed algorithms for multicast routing applied to real-time video distribution and video-conferencing prob-lems.Many other interesting uses of multicast routing have been done during the last decade, with examples such as video on demand, software distribution, Internet radio and TV stations, etc.

Proposed multicast protocols

The routing protocols are deployed at the intermediate nodes, namely the routers that make up the path from the sender(s) to the receivers. The routing protocols have two main responsibilities: to collect and maintain state information that can be used by the routing algorithms in selecting the best path to the receivers and to select the most appropriate path among the various paths available using a path selection procedure.

1. Distance Vector Multicast Routing Protocol (DVMRP)
2. Multicast Open Shortest Path First (MOSPF)
3. Core Based Tree (CBT)
4. Protocol Independent Multicast (PIM)
5. Border Gateway Multicast Protocol (BGMP)

1. Distance Vector Multicast Routing Protocol (DVMRP)

DVMRP [1] is a distance vector style algorithm that builds source based multicast trees.When a DVMRP router receives a multicast packet, it sends the packet to all attached routers and waits for a response. Routers with no group members return a .prune. message, which eventually prevents further multicast messages for that group from reaching the router. The prune state is soft, that is, it will time-out within a set time interval. If after sending a prune and before the state can time-out, the host wants to join the group, it has to send a .graft. message upstream. DVMRP is inefficient when the number of receivers in the group is sparsely distributed. DVMRP builds its own routing table instead of reusing the existing unicast routing table for RPF checking of incoming packets. A packet is assumed to have arrived on the RPF interface
if a router receives it on an interface that it uses to send unicast packets to the source. If the packet arrives on the RPF interface, then router forwards it out the interfaces that are present in the outgoing interface list of a multicast routing table entry. If it does not arrive on RPF interface, it is silently discarded to avoid loop-backs. The advantage of RPF is that it does not require the router to know about spanning trees. This way, multicast adapts automatically and only is sent where it is wanted. RPF checking cannot be used to check the validity of a path
in case of asymmetric paths. [1] proposes a hierarchical distance-vector multicast routing protocol. This approach involves partitioning the MBone into non-overlapping regions, while using DVMRP as the inter-region routing protocol. Intra-region routing protocol may be accomplished by any of the multicast routing protocols.

2. Multicast Open Shortest Path First (MOSPF)

MOSPF is a link state routing protocol that builds the map of the network topology, including location of domains and tunnels. It selects the best path to the required receivers using Djikstra.s shortest path algorithm. It is meant to be in use within an Autonomous System (AS). When there are multiple sources or many groups, it is CPU intensive. It is best used when relatively few sources or groups are active at any given time. It does not work well in presence of unstable links, as it leads to frequent state update and the associated computations. MOSPF does not support tunneling. The path is calculated only .on-demand. and cached for later use. It constructs source based multicast trees. It can also be considered as a QoS routing algorithm that minimizes delay. It is one of the dense mode protocols that requires explicit join from the receivers [8].

3. Core Based Tree (CBT)

CBT [6] builds a single bidirectional shared tree for the data transmission from the source(s) in the group to the receivers. When an intermediate node receives a packet meant for the group, it forwards it to the remaining members of the group that are downstream to the node. It does not need to forward it to the core. Core selection is one of the major issues in CBT and can be handled by the various heuristics proposed for core selection.

4. Protocol Independent Multicast (PIM)

PIM operates in two modes . Dense mode (PIM-DM) and Sparse Mode (PIM-SM). PIMDM operates similar to DVMRP. Sparse mode protocols use explicit join messages to set up uni-directional shared distribution trees. Dense mode protocols use only source distribution trees and uses RPF checking to determine if a packet is to be forwarded.
In PIM-SM [3], a node is selected as the Rendezvous Point (RP) and all group communication takes places by sending the packets to it. It is not dependent on any particular unicast routing method. However, it uses existing unicast routing table for the routing decisions. Each of the sources in a PIM-SM multicast group send their packets to the RP. Since it builds unidirectional shared tree, only the RP can forward data to the members. Intermediate nodes should forward the data only to the RP. Any site interested in joining requests one of the RPs to set up a tunnel to the RP. All PIM-SM traffic is transported by unicast instead of multicast.

5. Border Gateway Multicast Protocol (BGMP)

Border-Gateway Multicast Protocol (BGMP) is implemented at the border routers of a domain. It constructs inter-domain bi-directional shared trees using a single root, while allowing any multicast routing protocol to be used within the domains. The root is located at the domain whose address range covers the group address; which is typically the group initiators domain. BGMP requires strict address allocation [34].

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