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Author(s)	大林, 隆之
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Description	Supervisor:丹 康雄, 情報科学研究科, 修士

A Research on the characteristic of the network system for video transmission

Takayuki Ohbayashi

School of Information Science,
Japan Advanced Institute of Science and Technology

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Multimedia data, such as a video and a voice, have a the characteristics different from the continuous and broad bandwidth are required, as compared with conventional data based, and it was very difficult to handle these multimedia data in traditional computer networks. However, availability of high-speed computers are lead to handle these multimedia data on a computer in recent years, and various researches have been performed in order to transmit multimedia data on a network.

Multimedia data requires a broad bandwidth and is very sensitive to delay bound or delay jitter. Therefore, in order to transmit these data on a network, it is necessary to guarantee QoS (Quality of Service).

As a computer network system which guarantees QoS, ATM, which ITU-T proposed, is mainly used for wide area networks. In IETF, the protocols which aim at realization of QoS guarantee on IP network, such as RSVP and DiffServ, are proposed.

On the other hand, Ethernet, which have been widely used as an infrastructure of LAN for a long time, is accomplishing a change to a high-speed switching network along with progress of hardware technology. IEEE 802.1Q/p which introduces the concept of VLAN and CoS (Class of Service) into Ethernet are also specified. In addition to this IEEE 802.1Q/p, there are also some equipments which can offer QoS guarantee to VLAN.

In this paper, concentrated control mechanism called PAAM (PAth Allocation Manager) which allocates the End-to-End paths on Ethernet for video transmission is proposed.

PAAM consists of a interface module, a path selection module, a network setting module, and a database module, which contains three databases, a topology map, device information, and allocated path status.

In order to identify the End-to-End paths, in this paper, VID (VLAN IDentifier) defined by IEEE 802.1Q frame format is used. There are 12 bits for VID and since three are reserved among those, up to 4093 VIDs can use for identifying of a path.

First, an interface module receives a path-allocation-request from the application or the resource management mechanism of a upper layer, and PAAM requests path-selection to a path selection module. By the path-selection-algorithm, the path selection module which received the request chooses the path which can guarantee QoS requirement by End-to-End from a source node to destination node, and requests actual path reservation to a network setting module. A network setting module sets up devices by SNMP or CLI to the devices on the specified path, and if a path is allocated, the success or failure will be notified to an interface module, and an interface module returns the success or failure of path reservation to the modules of upper layer.

A bandwidth, delay bounds, and delay jitter are mentioned as an especially important QoS parameter required to perform video transmission. In order to offer these guarantees, in PAAM, the characteristic of the scheduling algorithm, the number of queues, and buffering capability is used. With a path selection algorithm, on the basis of these characteristics, some modification for PAAM are added to the algorithm of Dijkstra, and a path is chosen from two or more courses based on the policy which is provided by an upper layer requirements. In order to perform comparison between an actual measurement and the worst-cased value as verification of QoS guarantee of this PAAM, some experiments are made with actual network devices.

As the correspondence to a dynamic change of a network, an actual video network that the application to JAIST VideoLAN, and inter-working with the other computer network system which guarantees QoS are left as future works.