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SIONet: A New Technology Offering Different Types of Peer-to-peer Service

The Network Innovation Laboratories of Nippon Telegraph and Telephone Corporation (NTT) has developed a new peer-to-peer (P2P) technology called "SIONet", which is expected to support new communication services based on a brokerless model. P2P is a technology that supports various services on the Internet and is attracting attention as a technology which can support new user-initiated communication, and which avoids the sort of load concentration problems which can arise with Web servers. Napster and Gnutella are well known P2P applications for file sharing; however, they are systems dedicated to a single purpose. SIONet, which has been developed by NTT laboratories, is a technology which can be applied to various P2P services for corporation-oriented collaborative work and distributed computing, in addition to a file sharing service, positional information notification service, personal broadcasting station support service, personalized advertising delivery support service, and participation-type community support service. This is the world's leading P2P technology and includes specific functions for making P2P services widely applicable, such as the measures to ensure increased reliability and scalability. The implementation of SIONet promises to widen the applicability of the Internet, especially in encouraging community-type participation services.

(Background to the Development)

Communication applications such as commonly used Web access and email over the Internet are based upon server-client technology. Such conventional systems adopt the mechanism in which the server processes a request from a client terminal and sends the response back to the client; a server-client communication system is characterized by this sort of master-slave relationship. Although a server-client system is suitable for comparatively small networks, such as closed networks within a university or a research organization, on today's Internet, in which a huge number of PCs distributed all over the world are interconnected, it results in the problem of traffic load concentration at the server. P2P is attracting attention as a communication technology that solves the above-mentioned problem. P2P adopts a technology in which computers and terminals communicate literally on an equal basis. Since in P2P there is no server at which traffic load concentrates, not only computers but also many other appliances around us can be connected to the network. As such, it can be regarded as a technology suitable for the next generation Internet, which is expected to expand greatly in the future. The development of information transfer on the Internet can be divided into three generations. The first generation was file transfer by a limited number of researchers. The second is the use of the Web, which is currently central to the use of the Internet. The third will be the new horizon of Internet use opened up by P2P. NTT

Laboratories took advantage of years of experience in distributed-processing technology when it started research and development on brokerless type communication systems in 1998, leading to the prototype of SIONet, which was completed in 1999. Recently, extension of the functions has been carried out to support practical implementation, such as measures to provide increased reliability and scalability.

Key Technical Aspects:

1) Multiple-purpose use: Offer of generic P2P networking technology

In current P2P systems, such as Napster and Gnutella, the application part, which manages the services visible to a user (music file sharing, data file sharing, etc.), and the protocol part supporting P2P communications, such as the Internet search request and notification of the searched result, are integrated. Moreover, since the protocol part for each system is unique, it does not offer interchangeability and compatibility with different application parts. In SIONet, the application part and the protocol part are clearly separated, and the same low-level protocol part is used for different P2P services.

2) Safety and Security: Offering Secure Semantic Information Space

With SIONet, data transfer is based on the semantic information of the data. The semantic information relates to the content and context of the information in the data. It is used to determine the destination and the routes for the data transfer. It is possible to build a logical network called an event place and to restrict data transfer to within the event place. This feature allows information exchange which is restricted to a closed community, thus protecting private information. It is possible to permit data transfer between event places. In such a case, the flow of unauthorized information can be prevented by checking certain information attributes.

3) Extensive scalability and high reliability: Ability for Scalable construction of SIONet

SIONet does not use broadcast-based transfer to random destinations, such as that used in Gnutella. Since data transfer is based on semantic information, unnecessary data does not flow in the network. In addition, it is possible to geographically distribute the nodes (equivalent to routers) that handle data transfer. The ability for load sharing can ensure that high performance is maintained even when the number of SIONet users and volume of traffic increase. Furthermore, even if a certain node fails, other SIONet nodes can carry the traffic in its place, thus enhancing the reliability of the system.

Future plans:

NTT will continue its research and development of SIONet-based services, and will plan the early deployment of a richly varied P2P service.

(Glossary)

Peer to Peer: any relationship in which devices communicate as equals. It is used against server-client technology. P2P is an abbreviation of peer-to-peer and means person to person when communication between individuals are emphasized.

- [Figure 1](#)
[Multiple-purpose use: Offer of generic P2P networking technology.](#)
- [Figure 2](#)
[Safety and Security: Offering Secure Communication of Information](#)
- [Figure 3](#)
[Extensive scalability and high reliability: Ability for Scalable construction of SIONet](#)

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