R&D Information

OCN Introduces ENCORE Inter-AS Diagnostic System Targeting the Construction of an Internet Environment with Outstanding Stability

In April 2004, NTT and NTT Communications introduced ENCORE[*1], a new inter-AS (autonomous system) diagnostic system developed by NTT Laboratories. The system, which has been incorporated into NTT Com's Internet access network OCN[*2], will automatically monitor and diagnose anomalies in routing information between multiple ISPs (Internet service providers) on the Internet. It makes it possible to quickly discover, analyze, and recover from anomalies in routing information between multiple ISPs—which had been difficult in the past, when individual ISPs performed monitoring and diagnosis manually—and to construct high-quality Internet environments that offer outstanding stability. The technical features of ENCORE are described below.

(1) ENCORE places agents with monitoring and diagnostic capabilities at each ISP, integrates the information they gathered to infer routing information behavior, and analyzes the causes of anomalies. When an abnormality is detected through regular monitoring, the system diagnoses the anomaly and identifies the factors inhibiting communications.

(2) If a route is omitted due to an erroneous filter setting by the network operator or a difference in policies among ISPs, the agents at the two ISPs in question exchange and analyze observation information to automatically detect routes that are missing from a given ISP's routing table, enabling improved stability of IP packet transmission.

(3) ENCORE detects cases in which a given router's routing table has been rewritten due to an erroneous routing information advertisement from another ISP, and identifies whether the source of the error is being operated as a proper punching hole[*3].

In this way, if a given ISP's route has been taken over as a result of an illegal setting by a malicious third party or an erroneous setting resulting from an oversight by a network operator, the situation can be quickly and automatically detected, and the ISP at the root of the problem can be identified.

The Internet is a conglomeration of countless networks, and the stability of connections between networks is dramatically affected by the service quality of individual ISPs. NTT Com has constructed a routing monitoring system using ENCORE as its engine, and has incorporated this system into OCN, a world's first for a commercial Internet service. This implementation is part of NTT Com's efforts to improve connectivity, which is a fundamental element of network quality.

NTT Laboratories will continue to promote research and development in an autonomous network management environment based on intelligent agents as an extension of the ENCORE system. At the same time, NTT Com will continue its efforts to provide the world's highest level of quality and service as a Global IP Solutions Company, aiming for even safer and more secure network applications.

For further information, please contact
NTT Information Sharing Laboratory Group
Musashino-shi, 180-8585 Japan
E-mail: koho@mail.rdc.ntt.co.jp

*1 ENCORE: An inter-AS diagnostic ensemble system using cooperative reflector agents. NTT Network Service Systems Laboratories created an illegal route detection system based on an intelligent diagnostic system developed by NTT Network Innovation Laboratories with additional new functions.
*2 OCN (open computer network): A large-scale domestic Internet connection service provided by NTT Com. Service began in December 1996, and the number of subscribers surpassed four million in November 2003.
*3 Punching hole: A multihomed site connected to multiple ISPs may obtain a small prefix from an ISP and announce it from multiple ISPs to achieve better reachability. This technique is called "punching hole".