NEWS RELEASE

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New software framework that allows Internet appliances to cooperate dynamically with networks and far-end appliances

- Communication Service Concierge (CSC) for enhanced end-to-end Internet performance evolution -

Nippon Telegraph and Telephone Corporation (hereafter NTT, Headquarters: Chiyodaku Tokyo Prefecture, President: Junichirou Miyazu) has developed the innovative software framework 'CSC' (Communication Service Concierge) that will play a significant role in the future cooperation of Internet appliances(1) and networks.

'CSC', developed in NTT Network Innovation Laboratories, is an unique software framework that assists any Internet appliance, such as a PDA (Personal Digital assistant) or home AV server, to access the Internet by controlling intermediate network facilities such as home gateway(2), router, and far-end contents server. 'CSC' is realized as a small core module program that is installed in each appliance together with various function-specific programs (hereafter Plug-in Modules) as shown in Figure 1. Each Plug-in Module provides a different communication function. These Plug-in Modules are delivered dynamically via the network; this allows each device to install fresh and optimized communication functions as needed at run-time.
Figure 2 shows an example; an application program running on a Personal Computer (PC) displays a video stream being output by a network-attached video server. The 'CSC' will automatically download the necessary Plug-in Modules into the PC, router, and video server. These modules cooperate with each other to provide an optimized video streaming service. The cooperation may include monitoring stream quality in the PC, video coding method/quality optimization in the PC and server, and packet flow prioritization in the router.
The 'CSC' software framework allows the end user to communicate more comfortably via the Internet without any expertise in networking or the appliance. Furthermore, its flexible component structure will allow various kinds of service providers to develop attractive communication services in short time frames.
NTT Network Innovation Laboratories have a plan to disclose the 'CSC' software framework specifications to the public to encourage its adoption and widespread use in Internet appliances.

<Background>
The Communication Service Concierge, 'CSC' , has been developed as a common software framework that can handle the extreme diversification expected in communication infrastructures.
Communication services have become more and more chaotic due to the rapid growth

in Internet user population, in broadband access capability, and in the variety of Internet appliance technologies. The two extremes in bandwidth requirements are super high-quality video streaming and low bit-rate telemetry for temperature sensing. Also the reliability required varies from mission critical transactions between banks to personal Web browsing. Soon we will be faced with a wide variety of Internet appliances, access technologies, and home networking facilities.

Legacy application software[3] has two issues; difficulty in matching the diverse communication environments expected, and poor software development productivity. Today's packaged applications include many communication functions such as encryption and video stream coding. An increase in the variety of communication environments demands that packaged software be rewritten to encompass the new mechanisms, which will greatly increase application cost. Rewriting each application individually is obviously inefficient.

'CSC' is a common software framework and so is independent of the application software. Its uniqueness lies in its end-to-end total coverage since it offers intermediate quality-of-service control within the networks used. Consider browsing today's Internet; even with broadband access we are often plagued by delays and corrupted pages. The Internet depends on the cooperation of multiple networks (i.e. home, access, regional, and long-distance), and it is difficult to localize and eliminate the service bottleneck, especially from the appliance side.

'CSC' can be categorized as innovative middleware[4] that focuses on end-to-end communication services as a whole; it allows the end user to get the communication quality desired. Its scope far exceeds that of Jini[5] and existing or planned Operating Systems (OS), since they focus on communications within the device/appliance itself.

<Key Features>

1) Plug-in Modules and its circulation via network

'CSC' adopts the modular architecture in that most communication service functions are supplied as small component programs: the Plug-in Modules. Various kinds of mechanisms and devices will be useful for improving end-to-end communications, and hence are best prepared as separate Plug-in Modules. These Plug-in Modules are dynamically downloaded to each device via the network as needed (Figure 2).

This architecture has two advantages. a) Fresh, optimum sets of communication functions can be installed instantaneously as needed which allows a wide variety of application/network configurations to be supported as well as solving a wide range of communication problems. b) Applications can share the Plug-in Modules, which will reduce development cost. Moreover, reliability will be enhanced since the modules will be so well tested. The creation of a Plug-in Module for encryption/decryption is a good example. Device setup programs written in Jini could be re-used as Plug-in Modules.

Plug-in Modules may be provided by a) ASPs (Application Service Providers), b) Application Software or Internet Appliance Developers, c) ISPs (Internet Service Providers), and d) end users. Various Plug-in Modules could be developed and circulated via the network based specific business models or individual interest.

2) Internet appliances that cooperate with the network

The 'CSC' framework will harmonize end-to-end facilities for more comfortable communications. The Plug-in Modules will be written for routers and servers as well as Internet appliances. These modules will communicate with each other to improve the overall performance; e.g. a) the appliance will automatically negotiate with the server to set the video screen frame size , b) the appliance can ask the router for network congestion status, and c) the appliance can request the server to grant higher processing priority.

3) Handy portability
The 'CSC' software framework is applicable to almost all Internet appliances, PCs, network facilities, and servers. The 'CSC 'architecture employs Java(6) technologies and hence is independent of hardware and operating system (OS).
The 'CSC' core program will provide a new set of application interfaces (APIs) that allow application software to fully utilize the 'CSC' features. Even legacy application software can use some of the 'CSC' functions to achieve improved communication performance.
Another important feature of the 'CSC' framework is its compactness. Each Plug-in Module uses the host's resources, such as CPU power and memory, only while it is runs for improving communication quality. This allows us to use 'CSC' even in small Internet appliances such as cellular phones and light weight PDAs.

<Future Plan>
NTT has a plan to release this 'CSC' software framework as an open specification. One of the key features of 'CSC' is its Internet delivery of various Plug-in Modules to Internet appliances running different applications. This framework will be applicable to many areas of the Internet, such as home networks, Internet access, and application service providers.
As test users of CSC technology, researchers in the Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago are designing Plug-in Modules adapting to CSC and developing relevant communication application software for network-wide virtual reality environments.

Note

1) Internet appliance: Personal digital assistant (PDA) as well as domestic appliances that offer Internet access capability. Examples include phone handsets, television sets, AV players, washing machines, refrigerators, and microwaves; anything which offers access to the Internet.
2) Home Gateway: Gateway in home that allows appliances to access the Internet. Most popular implementations are provided within DSL modems or Dial-up routers.
3) Application software: software that provides applications based on communications; e.g. Web browser, Audio/Video player, IP phone, TV conference, etc.
4) Middleware: Intermediate software between operating system (OS) and application software. OS hides the hardware dependence, whereas application software provides specific services to the user. The middleware eases the cooperation of multiple applications or for providing common basic functions to application software.
5) Jini: Software framework that realizes networked services and that provides communications between application software of such network services. Currently Jini is seen as middleware for the network-wide plug-and-play operation of devices. Jini is based on Java technology. Jini and Java are trademarks of Sun Microsystems, Inc.
6) Java: Generic programming language that is independent of hardware and operating system (OS). It was originally designed for network-wide usage and

hence has a secure option that prevents downloaded programs from erasing local files. Java is a registered trademark of Sun Microsystems, Inc.

- Fig.1 Communication Service Concierge (CSC) Mechanism
- Fig.2 Communication Service Concierge (CSC) Architecture

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