World's first automatic protocol selection technology for any environment

March 7 2013

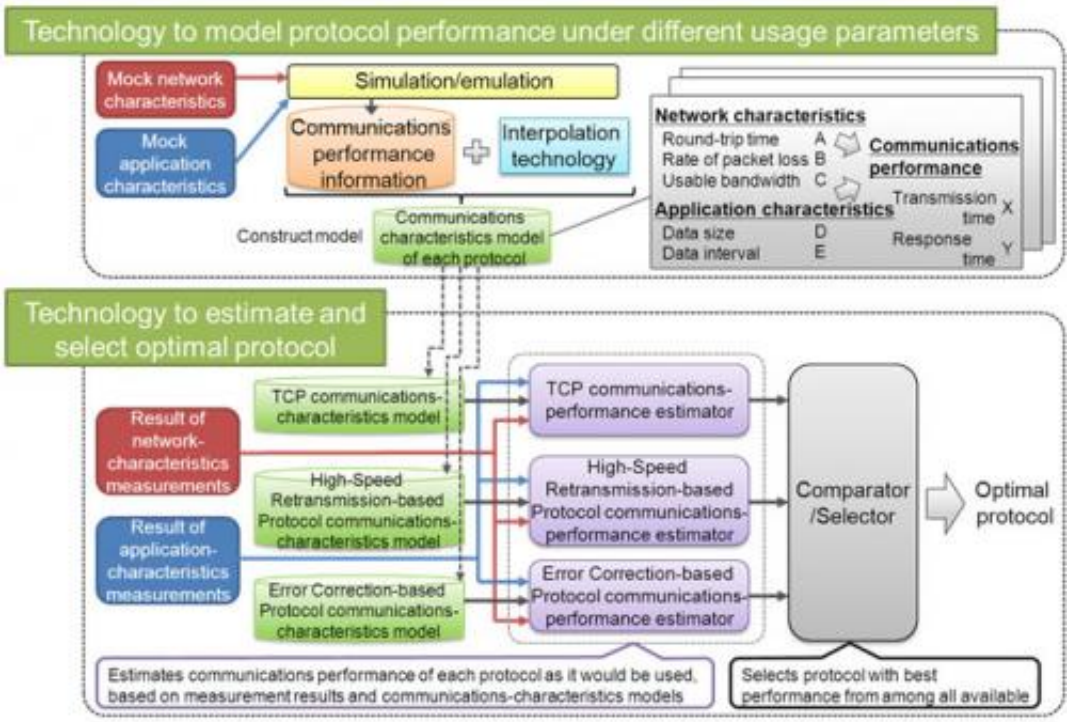

Figure 1: Overview of the new technology.

Fujitsu Laboratories announced the development of the world's first technology that speeds communications by automatically selecting the communications protocol best suited to its environment. This is used for applications being carried over such varied mediums as international lines or wireless channels.

A number of high-speed communications protocols have previously been developed that will maintain high speeds even in degraded communications environments, such as in wireless channels or international lines. But these do not solve the problem of obtaining sufficient communications performance (transmission time and latency) under all usage parameters, which include the communications environment and applications. What Fujitsu Laboratories has done is to develop a technology that is based on previously modeled protocol performance under all usage parameters to quickly estimate the communications performance of each protocol and automatically select the one that will yield the best communications performance given the current actual usage parameters.

This technology has been confirmed to enable smoother use of remote-desktop applications in a variety of communications environments than with TCP, the communications protocol used as a standard in many applications. For the variety of cloud-based, network-delivered services, this will allow users to enjoy a smooth service without having to worry about signal strength in their location.

Details of this technology are being presented at the Joint Meeting of the IEICE Technical Committees on Network Systems and Information Networks, March 7-8 in Okinawa, Japan.

With the increased popularity of mobile devices and cloud services in recent years, applications are being used over networks in a variety of communications environments. In many applications, such as file transfer, virtual desktop, and other communications applications, TCP is employed as a standard communications protocol. One issue with TCP is that data loss (packet loss) can occur in low-quality communications environments, resulting in significant drops in transmission performance (reduced throughput and higher latency) due to increased latency from having to retransmit data. In the future, it is expected that international

communications lines and wireless networks will be used more and more, deeming it necessary to ensure good communications performance regardless of the communications environment being used.

As one high-speed communications protocol, the High-Speed Retransmission-based Protocol improves on TCP's communications performance with a re-engineered approach to retransmissions when packet loss occurs. This is effective for speeding up the transfer of large files, but retransmission processing cannot be entirely eliminated, meaning operational delays occur in interactive communications, such as for virtual desktops. Another high-speed protocol is the Error Correction-based Protocol, which recovers data without retransmission by taking advantage of data redundancy in the lost packets, but as this redundancy and error correction increases the burden on the CPU rises. The strengths of each communications protocol are different and no single one manages to provide an optimum level of communications performance in every type of communication environment or application usage. In the complex communications environment that already exists today, which include a mix of LANs, wireless networks, Internet and dedicated lines, understanding the communications environment in real time and determining which protocol is best is a difficult task. In addition, it has also been difficult make such determinations on the user's end.

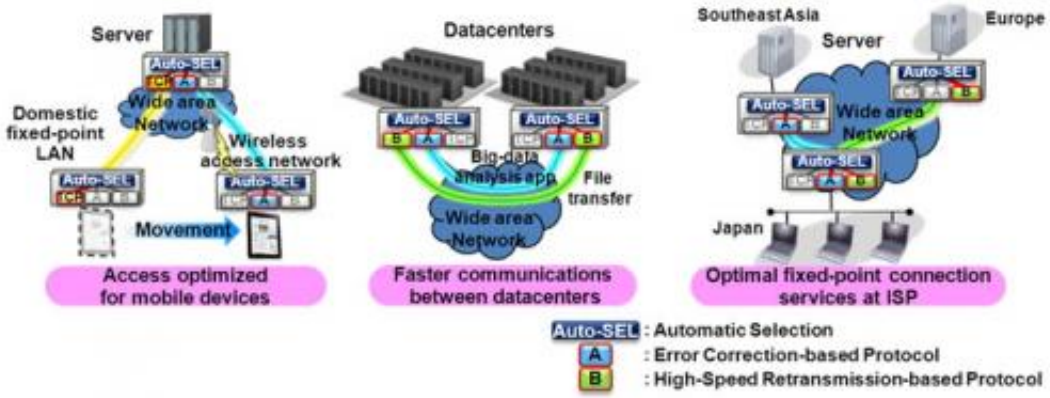

Figure 2: Usage scenarios for these technologies.

Fujitsu Laboratories has developed the world's first technology that automatically selects the protocol best suited to a particular communications environment. Selecting one out of multiple protocols is based on previously modeled protocol performance under all usage parameters, including each communications environment and application type. Then, at the time of actual usage, a high-speed estimate of each protocol's communications performance is conducted, with selection based on the actual usage parameters. Key features of this technology are as follows.

1. Model protocol performance under different usage parameters

To determine which protocols will operate efficiently under complex parameters, Fujitsu Laboratories developed a technology that builds a model of communications characteristics, defining the relationship between network characteristics (round-trip transmission time, rate of packet loss, usable bandwidth), application characteristics (data size, data intervals), and communications performance (transmission time, response time). The communications performance of each protocol where communications characteristics had been defined was determined using simulated and emulated environments with mock network and application characteristics. Due to it being difficult to comprehensively measure all possible parameters, interpolation technology that projects other characteristics based on already measured performance, enables the structuring of a highly precise communication characteristics model.

2. Estimate and select optimal protocol

This technology estimates communications performance based on the communications characteristics model described above, then, selects the protocol that will achieve the best performance. The technology estimates network characteristics using packet information sent and received over the network, and measures the application's characteristics from the data it sends. By fitting the collected network characteristics and application characteristics to the communications characteristics model, this technology can quickly estimate each protocol's communications performance. It then selects the protocol with the best estimated performance and uses it to communicate.

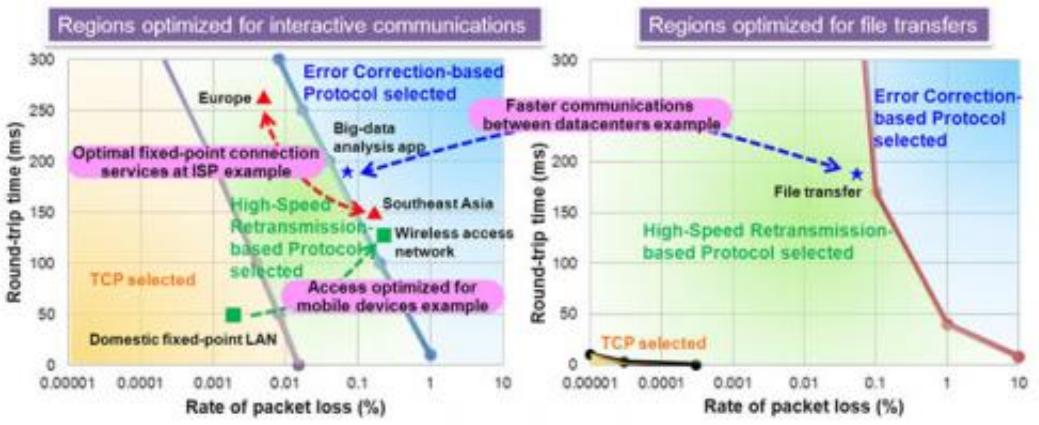

Figure 3: Optimal ranges for protocols in different usage scenarios.

This technology is expected to produce good communications performance under a wide range of situations. For example, with a mobile device, the best protocol is selected in response to changes in the communications environment as the device travels. In communications with a datacenter, depending on the type of application, or in

connections between established points such as ISPs, this can select the protocol that will be best for the distance between those points (Figure 2).

What the best protocol is in these situations depends on whether they are being used interactively or for file transfer, and depending on the communications environment (round-trip time and rate of packet loss). As an example, Figure 3 shows how conventional TCP, Fujitsu Laboratories' own high-Speed Retransmission-based Protocol, and the Error Correction-based Protocol each have their own areas to which they are adapted. With this technology, the best from among them can be selected automatically under a variety of usage parameters, resulting in improved communications performance. This will give users a smoother experience when using cloud-based, network-delivered services under any conditions, without requiring any user intervention.

During fiscal 2013, Fujitsu Laboratories aims to make the new technology practical as a middleware solution for raising communications speeds using multiple protocols.

Provided by Fujitsu

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