NEWS RELEASE

大学共同利用機関法人 情報・システム研究機構
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NII Succeeds in Achieving One of World's Fastest Long Distance Transmission Speeds

Records transmission speed of 84 Gbps using new MMCFTP protocol

The National Institute of Informatics (Chiyoda-ku, Tokyo; Director General: Masaru Kitsuregawa; "NII," hereafter) recently conducted demonstration testing of the new protocol called MMCFTP (Massively Multi-Connection File Transfer Protocol) designed to enable long-distance high-speed file transmission over the JGN-X R&D testbed network operated by the National Institute of Information and Communications Technology (Koganei-shi, Tokyo; President: Masao Sakauchi; "NICT," hereafter). During the testing, researchers with MMCFTP successfully achieved the stable transmission of 1PB (Petabyte; 1PB comprises 1,000TB) of data at approximately 84 Gbps, one of the world's fastest transmission speeds[*1].

In fields of cutting-edge science and technology such as particle physics, nuclear fusion and astronomy, the big data obtained from large experimental systems built through international cooperation are transmitted to and analyzed by the participating countries. While progress has been made in the development of super-high-speed networks in the 100Gbps range for this purpose, one of the issues faced has been limited transmission speeds during long-distance communications due to transmission protocol limitations. MMCFTP is characterized in that it uses a large number of TCP connections simultaneously when transferring big data. By dynamically adjusting the number of TCP connections established based on network conditions (round trip time and packet loss rate), stable super-high-speed data transmission has been achieved.

The latest testing was conducted on March 27 and 28 of this year, with round-trip transmissions taking place over the 100Gbps Tokyo – Osaka – Ishikawa segment of the JGN-X network (almost equivalent to communication distances between Tokyo and Asahikawa or between Tokyo and Kumamoto). Researchers succeeded in transmitting an enormous 1PB of data, the equivalent of 40,000 standard 25GB Blu-ray discs, in 26 hours, 31 minutes and 55 seconds.

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This is the equivalent of transferring the contents of a Blu-ray disc about once every 2.4 seconds.

NII is scheduled to start operation of the SINET5 next-generation science information network connecting domestic and overseas locations over a 100Gbps connection in April 2016. To coincide with the launch, along with conducting demonstration testing in international environments, NII will provide the MMCFTP program for the development of cutting-edge science and technology, achieving stability and further increases in speed through actual usage. MMCFTP will be displayed and demonstrated at NII Open House 2015, to be held June 12 and 13.

[Testing Configuration]

For the test, a transmitter and receiver (both general purpose servers) set up to use MMCFTP were installed at NICT Headquarters (Koganei-shi, Tokyo), and round-trip circuits were configured with NICT's Hokuriku StarBED Technology Center (Nomi-shi, Ishikawa Prefecture; round-trip delay time of 25.7 milliseconds), as shown in Figure 1.

The transmitter and receiver were each equipped with five 40GbE (Gigabit Ethernet) ports to connect to a Layer 2 switch, and the Layer 2 switch has twelve 10GbE ports to connect to the JGN-X access node. This connection environment of at least 100Gbps was ensured for transmitting and receiving data using the link aggregation[*2] feature.

The test was performed under conditions referred to as memory-to-memory[*3]. The transmission time for 1PB was 26 hours, 31 minutes and 55 seconds, and transmission occurred at a goodput[*4] rate of 83.7Gbps (Figures 2 and 3).

On average 2,273 TCP connections and a maximum of 6,632 TCP connections were used, and the average communication speed per TCP connection was 37.4Mbps. In this test, it was demonstrated that high-speed transmission is available with MMCFTP, as communications traffic is mostly evenly distributed to each aggregated physical link even when a large number of circuit lines have been combined.

MMCFTP utilizes a patent held by NTT DATA Corporation[*5] as an elemental technology. NII developed an improved version of the transmission program to enable support for super-high-

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speed communications and link aggregation in order to achieve the high-speed data transmission observed in the test.

*1 One of the world's fastest: As data transmission speed from one server to another. Based on NII's research. 80Gbps long-distance transmission at the Super Computing 2014 international conference held in New Orleans, USA in November last year was reported as the "world's fastest." Although aspects such as distance conditions differed, the results of this test surpassed that speed.

*2 Link aggregation: A technology where multiple physical links are logically combined and treated as a single connection.

*3 Memory-to-memory: A test condition that measures the performance of data held in a transmitter's memory being written to the memory of a receiver. This is best suited to measuring the performance of a communications protocol because the reading of data from a disk and the writing of data to a disk is not performed and communications are not limited by disk performance.

*4 Goodput: The throughput associated with only the data actually exchanged between applications, with overhead for communications control such as retransmission and protocol headers removed (the volume of data transmitted per unit of time)

*5 NTT DATA Patent: Patent No. 5379892: *File transfer method and the systems and programs thereof*. NII has obtained a license to use the patent for academic purposes. The MMCFTP program with the patent is available free of charge only to SINET users.

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Figure 1: Configuration of the Test System

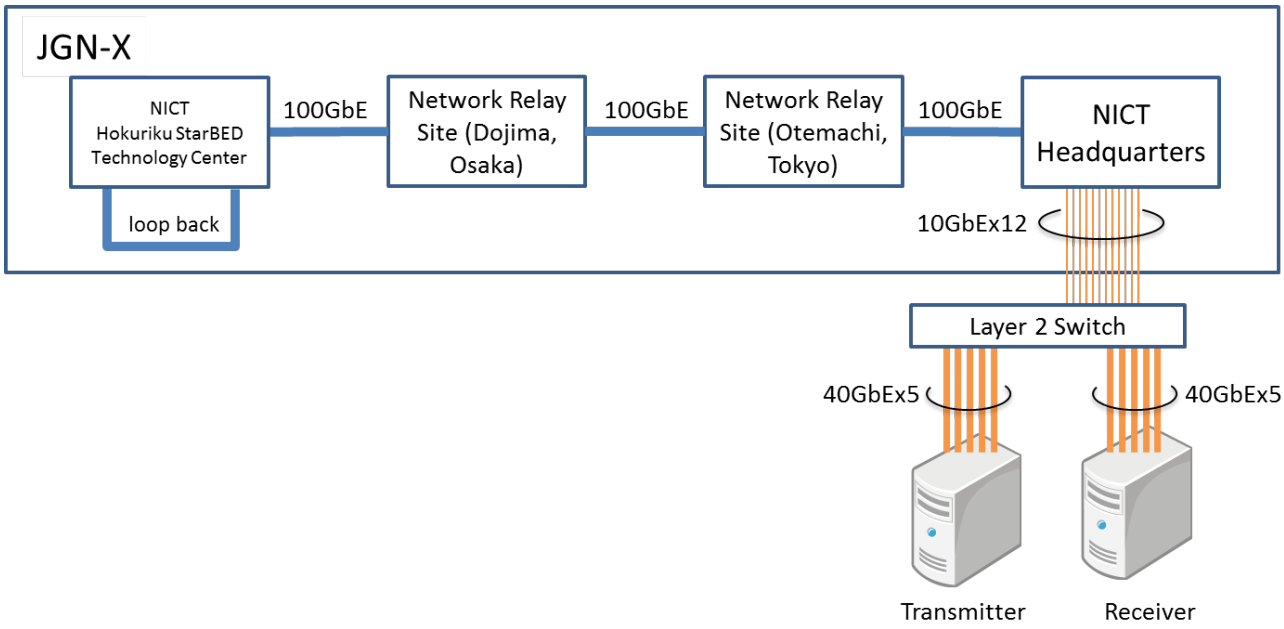

Figure 2: Test Results (State of Bandwidth Utilization)

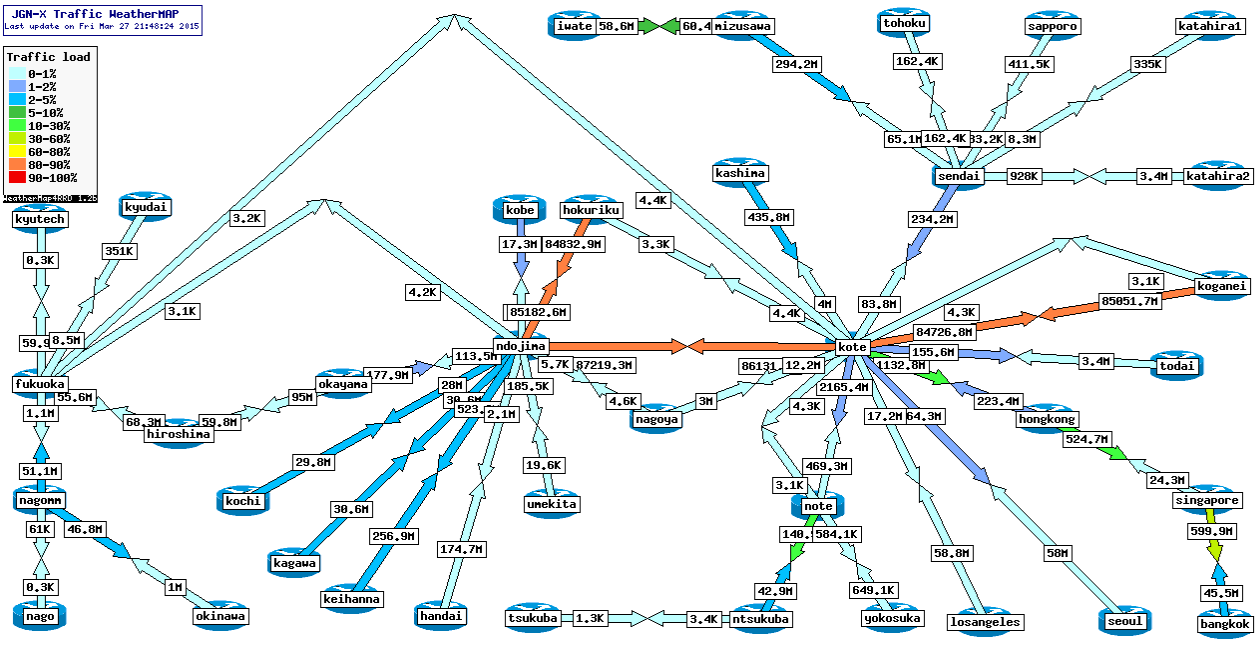

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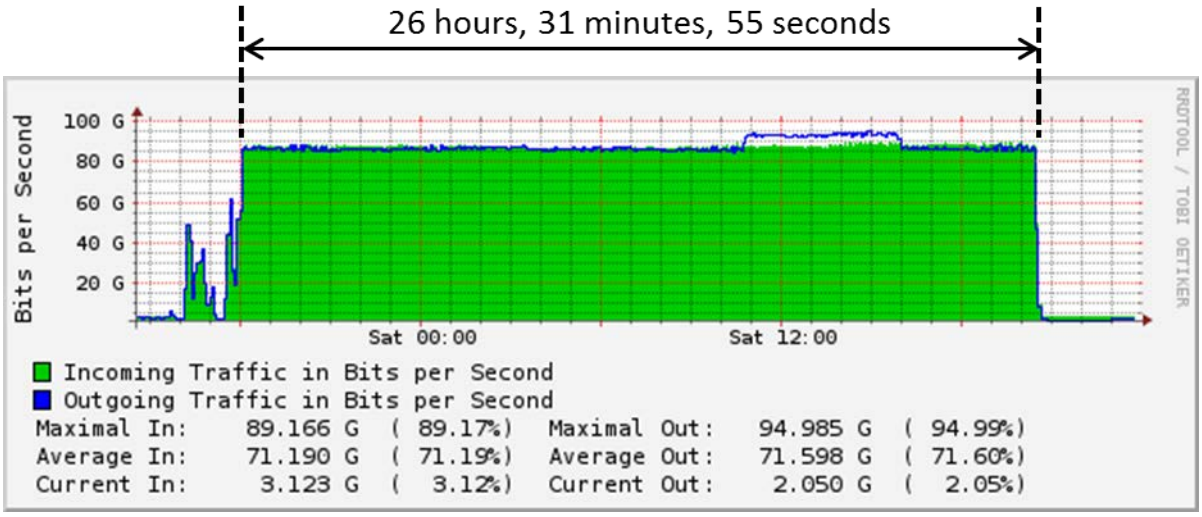
Figure 3: Test Results (Traffic Status between Tokyo and Osaka)



The above figure depicts total volume of traffic between Tokyo and Osaka. In addition to the traffic generated by the test (including overhead such as retransmission and protocol headers), this includes traffic from other applications.

Note – Data source for Figures 2 and 3: JGN-X NOC website (https://www.jgn-x.jp/jp/)

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