

## Tohoku Electric Power Co., Inc. Juniper Networks M-series™ Routing Platforms Provide Fault-Tolerant Nonstop Network to Major Japanese Utility

**Customer:**

Tohoku Electric Power Co., Inc.

**Challenge:**

Implement fault-tolerant, mission-critical IP Infrastructure for a major Japanese utility provider.

**Action:**

Deploy Juniper Networks M40e™ routing platforms to create a stable, high-performance MPLS network.

**Advantages:**

- Robust M40e routing platforms provide fault-tolerance through Graceful RE Switchover and Graceful Restart.
- MPLS network provides reliable throughput for mission-critical services.
- Traffic engineering function enables logically partitioned Virtual Private Networks between departments.

**Customer Profile**

Tohoku Electric Power Co., Inc. (Tohoku EPCO) provides nuclear and LNG-derived electric power to the Tohoku district of Japan, which is home to more than 12 million people. Tohoku EPCO is responsible for providing power to the six prefectures of the Tohoku region (Miyagi, Aomori, Iwate, Akita, Yamagata, and Fukushima), as well as to the Niigata prefecture. The company utilizes a WDM-based optical backbone, with an additional microwave-based data network. It needed to ensure complete fault-tolerance for its corporate infrastructure.

Tohoku EPCO's "Vision 2010" lays out the company's long-term strategy, up to the year 2010. Key concepts in this vision are "co-prosperity with local communities" and the "creation of new business values." These guiding principles encourage business groups to constantly strive for improvement in processes and business tools. Toward this end, a next-generation IT infrastructure was deemed important for advanced communications and collaborative business applications, and would also support innovative initiatives within and between departments and points of presence.

**Legacy ATM Encounters Scalability Limits**

"Our business is to provide electric power to millions of people," says Takashi Konno, Manager, Information Systems & Communications Department, Tohoku Electric Power Co., Inc. "We must ensure 100 percent uptime for our data network, because any disruption to the communications links between our equipment, business groups, and points of presence would be disastrous. Our corporate network is mission-critical."

Before the construction of the new MPLS network, Tohoku EPCO relied on leased lines for servicing an ATM-based backbone. The ATM network connected the head office, branch offices, and computing centres. As traffic demands grew, Tohoku EPCO increased leased-line capacities from 50 Mbps to 135 Mbps to cope. But the limitations of this solution were clear. "We knew there was a limit to this ATM solution. We had to make the network adaptable for future large-volume IP traffic. And so we constructed FINES (Flexible IP Network System)," says Satoru Ohnami of the Information Systems & Communications Department.

### A Fine Design

FINES is an MPLS-based network created with Juniper Networks M40e routing platforms. NEC was an implementation partner on the FINES project, and its advanced network management system, iNetWorX, provides administration functionality.

To determine the appropriate components for its network, Tohoku EPCO thoroughly researched the options. "We were very careful in our selection process," says Takashi Konno. "Our network had to be completely fault-tolerant. It must never stop. Reliability was absolutely essential."

Takashi Konno and his team reviewed MPLS-compliant routers from several vendors, but finally chose the Juniper Networks M40e router. It came highly recommended by both NEC and Tsuken Electric Industry Co. Ltd., the system integrator and designer of the implementation project. "Our router review was so extensive that 16 Juniper Networks M40e routers were brought in and configured in exactly the environment in which they would be deployed," says Takashi Konno. "The Juniper Networks M40e routers worked flawlessly, and we especially liked their support for Graceful RE Switchover and Graceful Restart. No other vendor supported both these features."

Graceful RE Switchover and Graceful Restart are high-availability features built into the M40e router. Graceful RE Switchover allows a secondary router to immediately take over a failed router, with near-zero loss of packet forwarding; Graceful Restart allows a router to continue forwarding packets even in the event of a control plane failure, virtually eliminating packet loss.

The M40e router, like all Juniper Networks routing platforms, runs the modular JUNOS™ operating system. Although Graceful Restart is an Internet Engineering Task Force (IETF) specification, the implementation of this industry standard via JUNOS provides additional fault tolerance. JUNOS is built on a modular architecture, with inherent clear independence between the routing control and packet-forwarding mechanisms. Both Graceful RE Switchover and Graceful Restart take full advantage of this pioneering design. Juniper Networks M-series platform also features extensive support for current and emerging Layer 2 and Layer 3 services over IP/MPLS Virtual Private Networks (VPNs).

Tohoku EPCO's Wide Area Network was based on a 2.4-Gbps OC-48 WDM optical ring. With Juniper Networks M40e routing platforms delivering an MPLS network, management of this infrastructure was handled by NEC's advanced network management system iNetWorX. The iNetWorX system allows users to fully leverage the traffic engineering aspect of MPLS. Together with the Juniper Networks M40e router, iNetWorX lets network operators and end users monitor critical network status reports, and rapidly troubleshoot problem areas when faults occur. iNetWorX also enables simple provisioning of VPNs and configuration of Quality of Service (QoS), via a user-friendly Graphical User Interface (GUI).

### A Route to the Future

Once FINES was in place, Tohoku EPCO enjoyed the confidence that comes with a reliable infrastructure. "Our network runs flawlessly," says Takashi Konno. "We've experienced no downtime since the implementation. We are ready to expand with more services, now that we have a foundation upon which we can build."

Due to its prominence among Japanese utility companies, Tohoku EPCO often serves as an example to other Japanese electricity providers. Now that Tohoku EPCO has demonstrated success in the implementation of its next-generation network, other utilities have a high-profile model for the design and use of fault-tolerant MPLS technologies in their own networks.



**CORPORATE HEADQUARTERS  
AND SALES HEADQUARTERS  
FOR NORTH AND SOUTH AMERICA**  
Juniper Networks, Inc.  
1194 North Mathilda Avenue  
Sunnyvale, CA 94089 USA  
Phone: 888-JUNIPER (888-586-4737)  
or 408-745-2000  
Fax: 408-745-2100

**EAST COAST OFFICE**  
Juniper Networks, Inc.  
10 Technology Park Drive  
Westford, MA 01886-3146 USA  
Phone: 978-589-5800  
Fax: 978-589-0800

**ASIA PACIFIC REGIONAL  
SALES HEADQUARTERS**  
Juniper Networks (Hong Kong) Ltd.  
Suite 2507-11, Asia Pacific Finance Tower  
Citibank Plaza, 3 Garden Road  
Central, Hong Kong  
Phone: 852-2332-3636  
Fax: 852-2574-7803

**EUROPE, MIDDLE EAST, AFRICA  
REGIONAL SALES HEADQUARTERS**  
Juniper Networks (UK) Limited  
Juniper House  
Guildford Road  
Leatherhead  
Surrey, KT22 9JH, U. K.  
Phone: 44(0)-1372-385500  
Fax: 44(0)-1372-385501

[www.juniper.net](http://www.juniper.net)

Copyright 2004, Juniper Networks, Inc. All rights reserved. Juniper Networks, the Juniper Networks logo, NetScreen, NetScreen Technologies, the NetScreen logo, NetScreen-Global Pro, ScreenOS, and GigaScreen are registered trademarks of Juniper Networks, Inc. in the United States and other countries.

The following are trademarks of Juniper Networks, Inc.: ERX, ESP E-series, Instant Virtual Extranet, Internet Processor, J2300, J4300, J6300, J-Protect, J-series, J-Web, JUNOS, JUNOScope, JUNOScript, JUNOSe, M5, M7i, M10, M10i, M20, M40, M40e, M160, M320, M-series, MMD, NetScreen-5GT, NetScreen-5XP, NetScreen-5XT, NetScreen-25, NetScreen-50, NetScreen-204, NetScreen-208, NetScreen-500, NetScreen-5200, NetScreen-5400, NetScreen-IDP 10, NetScreen-IDP 100, NetScreen-IDP 500, NetScreen-Remote Security Client, NetScreen-Remote VPN Client, NetScreen-SA 1000 Series, NetScreen-SA 3000 Series, NetScreen-SA 5000 Series, NetScreen-SA Central Manager, NetScreen Secure Access, NetScreen-SM 3000, NetScreen-Security Manager, NMC-RX, SDX, Stateful Signature, T320, T640, and T-series. All other trademarks, service marks, registered trademarks, or registered service marks are the property of their respective owners. All specifications are subject to change without notice.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without .  
352072-001 Dec 2004