

# Hanaro Telecom Prepares for the Future with Force10 Networks E-Series Switch/Routers

## Customer PROFILE

**Customer**  
Hanaro Telecom



**Industry**  
Telecommunications  
Service Provider

**Applications**  
Core aggregation routing;  
data center server aggregation

**Highlights**  
Force10 Networks' proven line-rate performance and high-availability features enable Hanaro Telecom to cost-effectively upgrade its core network in preparation for increased traffic and advanced broadband services.

*Telecommunications carriers around the world are racing to offer subscribers faster and faster Internet access. Technologies like very-high-speed DSL (VDSL) — which offers blazing fast speeds over existing copper lines — are spreading rapidly, particularly in Asia. But as VDSL becomes widely adopted, carriers must ensure that their network infrastructures can handle the increased traffic while avoiding expensive upgrades that eat into razor-thin profit margins.*

Faced with the need to upgrade its network capacity, Hanaro deployed Force10 Network's



E-Series switch/routers for 10 Gigabit Ethernet (10 GbE) routing and Gigabit Ethernet (GbE) aggregation services. Force10's E600 systems deliver the resiliency, fault-tolerance and robust 10 GbE routing that Hanaro Telecom required for its network expansion, which included increased high-capacity connectivity for a wide range of broadband services.

"Force10's E-Series greatly enhances our core routing infrastructure, enabling us to extend our IP service offerings to include native GbE and 10 GbE connectivity," says Mr. Park, Chan-Woong, team manager of the Network Planing Team for Hanaro Telecom.

### **Paving the Way for VDSL**

Sixty-five percent of South Korea's 16 million households have broadband connections — the world's highest broadband penetration. According to the International Telecommunications Union, 94 percent of all Internet subscribers in South Korea subscribe to broadband, a rate that is approximately three years ahead of the global average. Today, nearly 30 percent of South Korea's 10 million broadband subscribers are Hanaro customers.

Along with Korea Telecom (KT), Hanaro Telecom is one of the two major providers of high-speed Internet access, local telephony, multimedia, data and Internet data center services in Korea. Through its HanaFOS Internet access service, the company offers its subscribers asymmetrical DSL (ADSL) service at downstream speeds of up to 10 Mbps — two to three times faster than what most subscribers in North America enjoy.

In mid-2002, Hanaro began looking at ways to expand its network in order to increase its market share. The company launched a VDSL service called HanaFOS V, which delivers speeds of 50 Mbps downstream at a cost that's little more than their existing ADSL service. The move created a challenge for Hanaro's existing network infrastructure, which was built using products from another vendor.

"With the addition of the new services, the potential traffic burden was significant enough for Hanaro to begin considering a capacity upgrade plan to the core aggregation routers," says Byron Yu, senior market development manager for CommVerge Solutions, the integrator that Hanaro selected to manage the deployment. "They needed a solution that was more economical than their current one."

Hanaro issued a request for information (RFI) for a high-capacity GbE switch/router. Requirements included:

- Non-blocking switch fabric
- Redundancy with no service interruption during failover
- Support for GbE, 10 GbE LAN PHY, 10 GbE WAN PHY, PoS and 100/1000/Base-T interfaces with full line-rate performance
- A minimum of 48 GbE and four 10 GbE ports per system
- Layer 2 switching: compatibility with 802.1Q VLAN standards, STP support and link aggregation
- Layer 3 routing: support for static, OSPF, BGP and IS-IS protocols, source/destination IP routing and multicasting

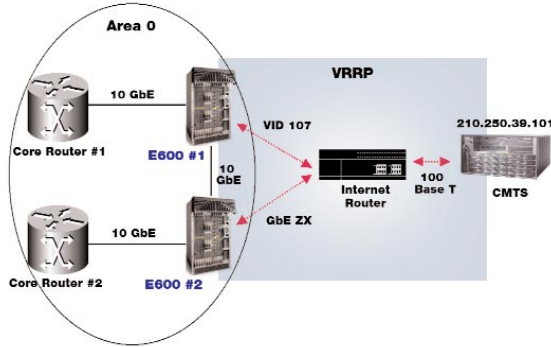


# Hanaro Telecom Prepares for the Future

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“We selected Force10’s E-Series because it clearly demonstrated the capacity to meet our customers’ current and future demands. It was also the obvious choice from an economic point of view, making it the best overall fit for our business objectives.”

**Mr. Park, Chan-Woong**  
Team Manager  
Network Planning Team  
Hanaro Telecom



E-Series ability to integrate with legacy Broadband Remote Access Servers while allowing for a high capacity future.

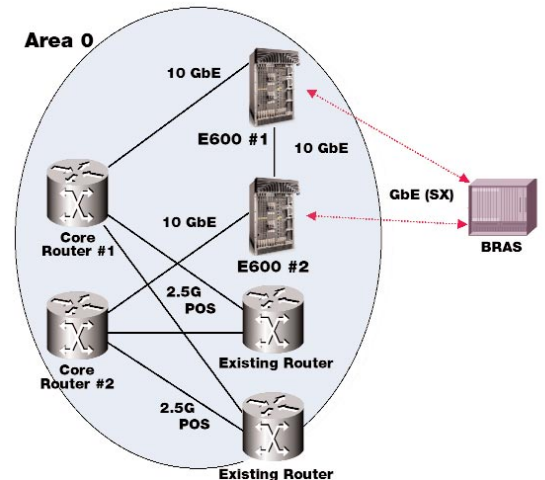
Force10 Networks was one of ten vendors who met Hanaro’s RFI specifications — in fact, the E-Series exceeded Hanaro’s requirements — and qualified for intense benchmark testing (BMT), which measured products for performance based on their stated specifications as well as in more extreme environments. In this case, Hanaro tested vendors’ performance with 140 Gbps of backplane traffic running for 48 hours and 250,000 Internet routes. As it turned out, thanks to a 900-Gbps non-blocking switch fabric and other features, Force10’s E600 switch/routers were the only products to pass Hanaro’s strict BMT, making them the clear choice for the network upgrade.

"In our tests, the Force10 E-Series was the most stable product, performing as promised to deliver true line-rate 10 GbE," said Mr. Park, Chan-Woong. "We selected Force10’s E-Series because it clearly demonstrated the capacity to meet our customers’ current and future demands. It was also the obvious choice from an economic point of view, making it the best overall fit for our business objectives."

## Proven Line Rate Performance and High-Availability

Hanaro has installed four E600 systems. Two are used for core services such as aggregating broadband remote access (BRAS) devices used to authenticate xDSL subscribers, and as the collection point for all of Hanaro’s hybrid fiber coaxial (HFC) cable modem termination service (CMTS) devices. The other two E600s provide server aggregation in the company’s Internet Data Center (IDC), where the Force10 system enables Hanaro to reduce the layers of aggregation from three to one. Each of the Hanaro’s E600 systems is configured with four ports of 10 GbE and 120 ports of GbE.

With their unmatched GbE and 10 GbE port densities, Force10’s E600 switch/routers provide the added capacity that will enable Hanaro to expand its customer base throughout South Korea and provide services such as IP-VDSL, video services and metro Ethernet. The E600 supports up to 48 GbE ports or four 10 GbE ports per line slot, and up to seven line card slots per chassis, for a total of 336 GbE or 28 10 GbE ports in each E600 chassis — much more capacity than Hanaro’s RFI specified.



E-Series switch/routers will enable Hanaro to provide services such as IP-VDSL, video services and metro Ethernet throughout South Korea.



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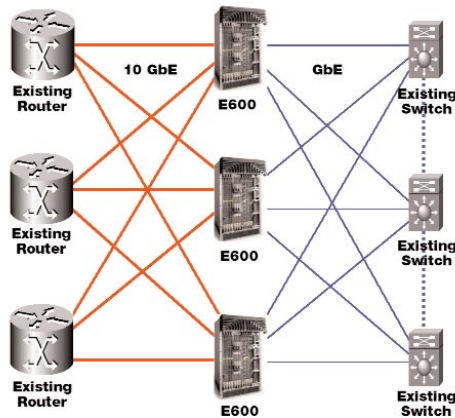
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“The E600’s many high-availability features qualify it as a core partitioning device that can be reliably used throughout Hanaro’s entire backbone.”

**Byron Yu**  
Senior Market Development Manager  
CommVerge Solutions

"The high density and high capacity allows Hanaro to reduce the number of physical nodes it needs for aggregation while increasing overall port densities by more than 30%, all at one-third the cost of existing equipment," says Yu. "And it gives Hanaro headroom for future growth."

Force10's E-Series architecture and Force10 ASICs deliver innovations in switch fabric, backplane, ASIC and system control plane design that ensure resilient Layer 2 switching and BGP/OSPF routing at line rate GbE and 10 GbE speeds. Unlike the architecture of Hanaro's existing equipment, the E-Series architecture performs value-added services simultaneously at line-rate without performance degradation. Implementing all services directly in the hardware in the forwarding path ensures that for any combination of services, or even with all services enabled at the same time, users will not experience any variation in system performance, latency or jitter.



The E-Series scaleable configuration in the Hanaro network will allow traffic of greater than 90 Gbps.

Given the size and scale of Hanaro's new network deployment, the E-Series' ability to enable access control lists (ACLs) with hundreds of entries, use techniques for congestion avoidance, employ Quality of Service (QoS) for traffic prioritization and deliver fair bandwidth access and policy enforcement gives Hanaro engineers the capacity to control the environment and ensure a higher level of service than their competitors. As a result, Hanaro can reliably deliver "always-on," multi-megabit connectivity to its current and future subscribers.

To maximize network uptime, Force10's E-Series architecture and Force10's operating system (FTOS™) support multiple levels of hardware and software redundancy. For example, the E-Series distributes processing functionality among three CPUs: one CPU handles routing, one handles switching and the third takes care of overall system management. This increases overall system stability, provides higher availability and protects the system and network against malicious traffic generated by denial of service (DoS) or other attacks.

In addition, FTOS is customized for high availability and fault tolerance. It supports graceful RPM failover capabilities to minimize recovery times in case of an RPM failure. Hitless forwarding for both Layer 2 switching and BGP/OSPF routing allows the E-Series to continue forwarding traffic even during an RPM failover.

"The E600's many high-availability features qualify it as a core partitioning device that can be reliably used throughout Hanaro's entire backbone," says Yu.



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