

IDG4400 6WIND: A Flexible IPv4/6 Ethernet Router and IPsec Gateway Appliance

Intelligent Appliance Powered by Mellanox Indigo Network Processor and 6WIND Network Software Acceleration. Delivers Unparalleled IPsec & Routing Performance for LTE 4G and 5G Wireless Networks as well as Data Center Deployments.

POWERFUL SOLUTION SUSTAINING 180GbE IPsec ENCRYPTION/DECRYPTION FOR DATA IN MOTION

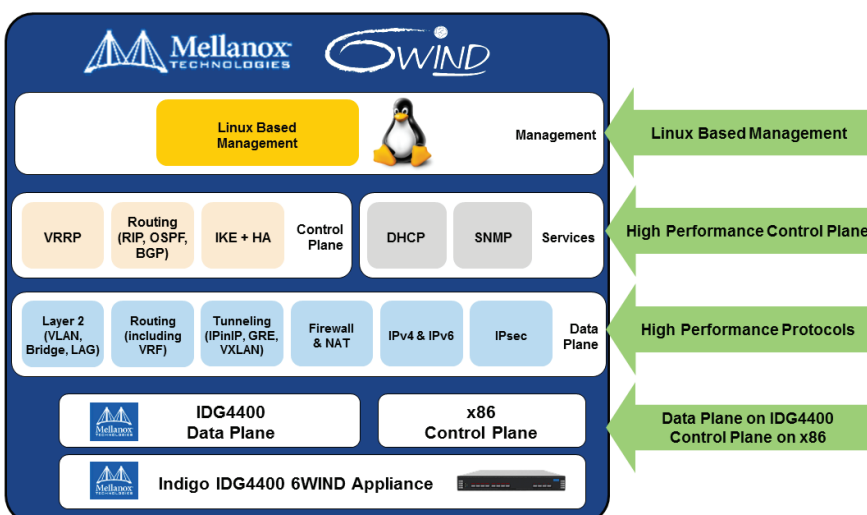
The Mellanox IDG4400 6WIND 1U appliance is a high-performance and cost-effective IP router and IPsec gateway solution powered by the Mellanox Indigo™ NPS-400 network processor combined with 6WIND software technology. Delivering 400GbE bandwidth and 180GbE IPsec performance in a dense 1U platform, the appliance is ideally suited for carrier, data center, cloud and Web2.0 applications requiring high-performance cryptographic capabilities alongside IP routing capabilities.

The 6WINDGate™ software suite optimized for the Mellanox Indigo™ NPS-400 network processor provides fully-featured, data plane and control plane packet-processing software delivering IPsec capabilities on top of IPv4 and IPv6 routing (Figure 1). By accelerating the routing and IPsec features, the IDG4400 appliance achieves a tremendous boost in routing and security application performance while offering a competitive and cost effective solution.

The Linux-based IDG4400 6WIND allows users to manage and administer the entire system using standard Linux tools, ensuring ease of use for data center operators.

IDG4400 6WIND is suited for a wide variety of applications and use cases. This paper presents the appliance as a security gateway in mobile provider networks and in data center deployments. For more information see the [IDG4400 6WIND Product Brief](#).

Figure 1. IDG4400 6WIND Software Package



MOBILE SECURITY GATEWAY FEATURES

HIGHLIGHTS

- Packet filtering (ACL)
- Stateful packet filtering
- Encapsulation/tunneling protocols: IPsec, GRE, VxLAN, 6in4/4in6
- uRPF
- IPsec

THROUGHPUT

- Up to 180Gb/s aggregated simultaneous encryption/decryption

TUNNEL ESTABLISHMENT

- Up to 20,000 established tunnels
- Up to 1,000 IPsec tunnels negotiated per second

PROTOCOLS AND MODES

- Authentication header (AH) for authentication and integrity
- Encapsulating security protocol (ESP) for confidentiality, authentication and integrity
- Tunnel or transport mode

KEY MANAGEMENT

- Static key configuration
- IKEv1 and IKEv2 for automatic key negotiation with automatic re-keying, dead peer detection
- VPN monitoring

AUTHENTICATION METHODS

- IKEv1/v2 pre-shared keys or X509 certificates
- Relaying to external AAA server via EAP Radius

CRYPTOGRAPHIC ALGORITHMS

- Encryption: DES CBC, 3DES CBC, AES (128, 192, 256) in CBC, GCM or NULL_GMAC modes
- Hash: MD-5, SHA-1, SHA-2 (256, 384, 512), AES XCBC

DIFFIE HELLMAN SECURITY LEVEL

- Modp groups 1 (768 bits), 2 (1024 bits) and 5 (1536 bits)
- Support of PFCS (perfect forward secrecy)

SECURITY ENHANCEMENT FEATURES

- Extended sequence numbers
- Large anti-replay windows

CERTIFICATE MANAGEMENT

- CRL retrieval from HTTP or LDAP distribution points
- Local CRL caching

IDG4400 6WIND AS A SECURITY GATEWAY IN MOBILE PROVIDER NETWORKS

Providing IPsec & Routing Capabilities for LTE 4G and 5G Wireless Networks

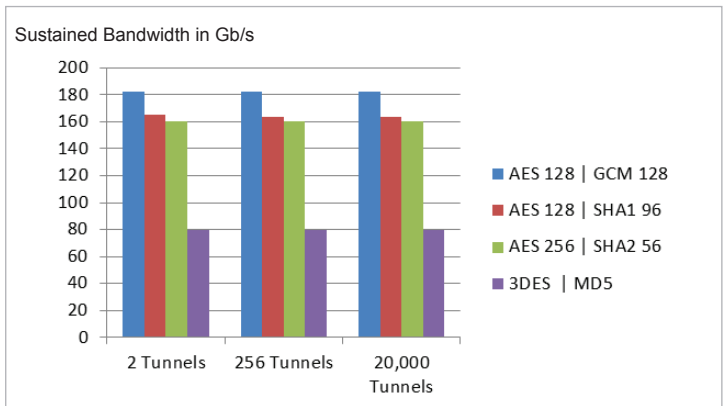
Smartphone adoption is constantly growing with nearly a 60% penetration of the mobile phone market and this trend will continue as more and more services are launching networks based on Long Term Evolution (LTE). Mobile service providers' (MSPs) addressable market is growing at an accelerated rate. To maintain their competitive edge, many MSPs are rolling out LTE to scale up their network to 4G and improve user experience. Securing the network has become a baseline requirement for MSPs to ensure successful LTE deployment. As mobile devices become increasingly important in peoples lives and private services such as mobile banking are commonly used on smartphones, end customers are expecting the services to be fully reliable and safe. Any security incident can greatly affect customer trust and could adversely impact MSP customer loyalty for many years.

Unlike universal mobile telecommunications systems (UTMS), LTE architecture is based on a flat all-IP network architecture. The advantage of this architecture is that it offers lower costs, lower latency and greater flexibility. However, the nature of flat all-IP networks also creates security concerns. The LTE standards body, 3GPP, has recommended various guidelines for the LTE security gateway and has defined the functions of the security gateway in this new architecture.

One of the main functions of an LTE security gateway is to set up an IPsec tunnel with an evolved node base station (see eNodeB in [Figure 2](#)) to encrypt all the traffic in between the eNodeBs and the Evolved Packet Core. The security gateway needs to handle a significant amount of traffic (above 100GbE) while performing encryption/decryption at line rate. Unfortunately, the equipment capable of processing such large amounts of IPsec traffic is typically very expensive and MSPs are often reluctant to deploy security gateways, which puts their networks and their customers at risk.

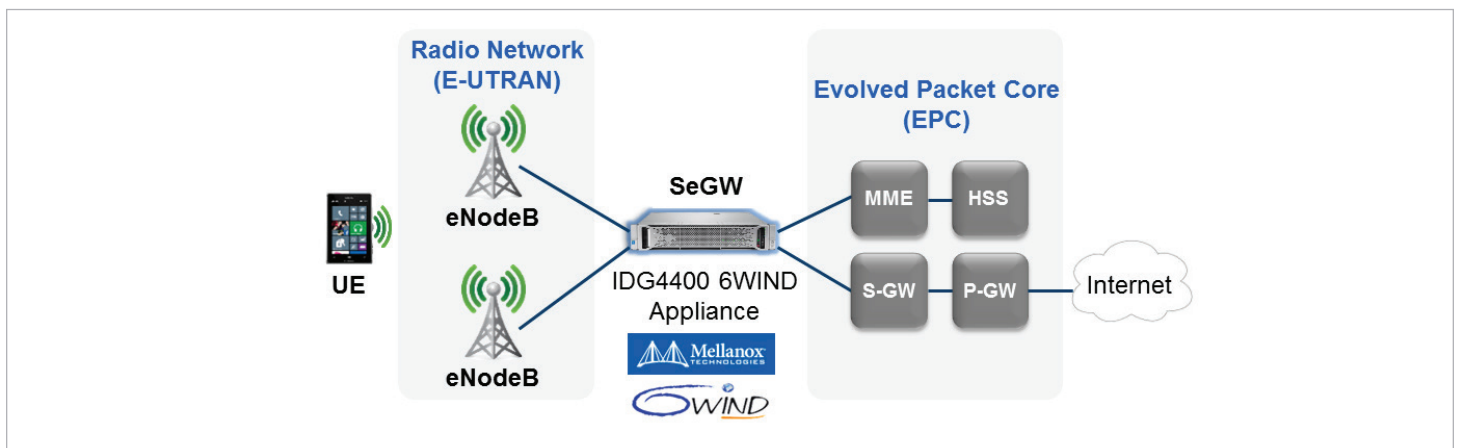
IDG4400 6WIND high-performance IPsec appliance is an ideal solution for a security gateway, as it answers the need for high bandwidth crypto with up to 180GbE of encryption/decryption capacity for tens of thousands of IPsec tunnels ([Figure 3](#)) at a fraction of the cost of the equivalent systems offered by standard OEMs. In addition, IDG4400 6WIND can provide up to 400GbE of packet processing with Internet-scale IPv4/IPv6 forwarding tables of up to 1 million routes and more. These capabilities packaged in a compact 1U form factor combined with the ease of management of a standard Linux server offer an outstanding security gateway solution.

Figure 3. IDG4400 6WIND IPsec Benchmark Results
Results Obtained on Testing an IPsec Reference Application Using the Indigo Crypto Libraries



Over 180Gb/s of encryption/decryption for AES128 mode, mid-size packet, independent of the number of tunnels

Figure 2. Use Case: IDG4400 6WIND Security Gateway Implementation

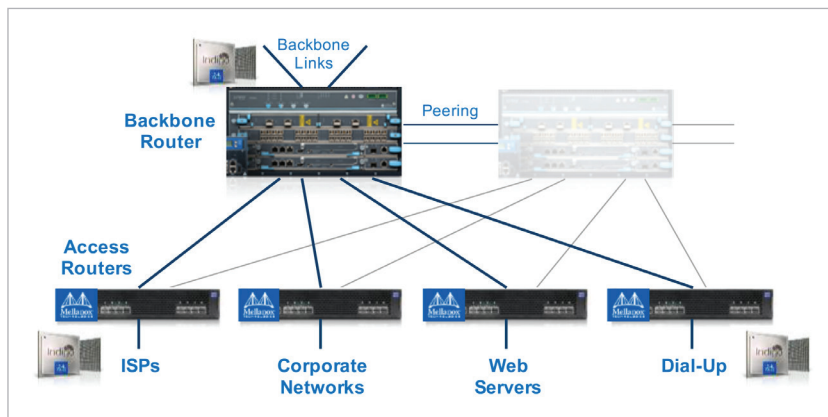


FOR DATA CENTER DEPLOYMENTS

Historically, routers are seen as flexible and feature-rich expensive machines to use with care. This has pushed standard OEM vendors into a feature race in routers whereas in practice only a few key features are really being put to use.

An ISP point-of-presence (PoP) is the point of intersection between an ISP backbone and its external customer connections (Figure 4). As such, the router equipment facing the backbone needs to have the scalability, performance and reliability to face the Internet backbone.

Figure 4. ISP Point-Of-Presence (PoP) Architecture



The basic Internet edge/peering router requirements include:

- Large forwarding tables with headroom for future growth for both IPv4 and IPv6
- Multi-protocol data plane: Layer 2, IPv4, IPV6, MPLS underlay with a large number of tunnels and overlays including GRE and VxLAN
- Flexible packet parsing and updating to handle future overlay and tunneling protocols
- Flexible Access Control Lists to help define packet filtering rules
- Traffic management capabilities for providing large packet buffers to handle traffic burstiness and traffic shaping when needed.

The IDG4400 6WIND powered by the Indigo processor combined with the feature rich software from 6WIND is ideally suited to provide Internet edge/peering router functionality. The solution supports millions of IPv4/IPv6 routes and MPLS labels. ECMP and Virtual Extended VLANs (VxLAN) leverage Layer 3 for scaling cloud networks. VxLAN is a tunneling mechanism that runs between virtual or physical switches and enables applications to be deployed and moved between any server within the data center regardless of IP subnet or physical host location. The appliance also provides industry-leading traffic management capabilities and can adapt to new protocols through code customization. The high performance appliance packaged in a compact 1U pizza box, as opposed to a large chassis-based system, makes an outstanding and competitive solution for point-of-presence data center deployments.



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DATA CENTER DEPLOYMENT FEATURES

HIGHLIGHTS

- IPv4/IPv6 support
- NAT, NAT-T
- IKE virtual routing
- IPsec 6in4/4in6 tunnel support
- Secure Virtual Tunnel Interfaces (SVTI)

ROUTING PROTOCOLS (IPv4 & IPv6)

- BGP4, MP-BGPv4
- OSPFv2, v3
- RIPv1, v2, ng LAYER 2
- QinQ (802.1ad)
- Jumbo frame (9K)
- 802.1q (VLAN Tagging - 4095)
- Ethernet bridge

LAYER 2 HIGH AVAILABILITY, RESILIENCE

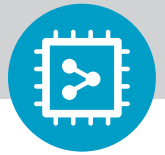
- LAG 802.3ad (Static/LACP)

LAYER 3

- IP Forwarding Table (1M routes)
- VRF
- Static routes

LAYER 3 HIGH AVAILABILITY, RESILIENCE

- VRRP
- ECMP
- BFD



Mellanox IDG4400 6WIND Appliance

IPv4 and IPv6 Ethernet Router and IPsec Gateway Appliance
Based on the High Performance Indigo NPS-400™ Network
Processor and 6WIND Accelerated Software

The IDG4400 6WIND 1U appliance provides a high-performance and cost-effective IP router and IPsec gateway turnkey solution, leveraging the Mellanox Indigo™ NPS-400 network processor. Delivering 400Gb/s bandwidth and 180Gb/s IPsec performance, the IDG4400 6WIND appliance is the ideal solution for Carrier, Data Center, Cloud and Web2.0 applications requiring high-performance cryptographic capabilities alongside IP routing capabilities.

IDG4400 6WIND Network Appliance – Boosting Your IPsec Performance

The Mellanox IDG4400 appliance provides an unprecedented 400Gb/s of bandwidth in flexible network port options of 10, 40 and 100Gb/s in a dense 1U platform. Powered by the Indigo NPS-400 network processor and 6WIND technology, the game-changing IDG4400 6WIND appliance offers processing performance with CPU flexibility and ease of use.

6WIND provides a high performance, fully featured data plane and control plane packet processing software delivering IPsec capabilities on top of IPv4 and IPv6 routing. By accelerating the routing and IPsec features, the IDG4400 appliance achieves a tremendous boost in routing and security application performance while sustaining a very dense, competitive and cost effective solution.

IDG4400 Router

6WIND software provides a scalable, cost-effective routing solution, including a flexible and rich feature set, making it ideal for medium-to-very-large enterprises and network operators/carriers and data centers.

The Linux-style management interface enables customers to take advantage of all the hardware accelerations of the Indigo NPS-400 without requiring dedicated CLI knowledge and provides ease of use for the standard Linux configuration users.

IPsec for Secure Connectivity

The escalation of security concerns fuels the need for scalable security solutions. As such, IPsec VPN security technology has gained popularity, as it is used to create secure communication tunnels between trusted endpoints across the inherently insecure internet and even WAN links.

Whether terminating a number of high-speed tunnels to connect data centers or enterprise campuses or connecting with remote users across hundreds or thousands of low speed tunnels, IDG4400 6WIND appliance scales to meet the application/use case demand.

The IDG4400 6WIND appliance can be deployed to provide high-performance IPsec connectivity between geographically dispersed data centers, or providing IPsec gateway capabilities in LTE networks.

HIGHLIGHTS

BENEFITS

- High performance, full-featured data plane networking supports an extensive set of L2 to L4 networking protocols, including IP forwarding, IPsec, and more
- Standard Linux management interface

FEATURES

- High-performance, production-ready router and IPsec gateway
 - Compact 1RU, stand-alone or 19" rack-mountable
 - High-availability, hot-swappable power supplies and fans with redundancy
 - High density
 - 8x40GbE downstream ports
Optional 32x10GbE with split cables
 - 4x100GbE upstream ports
- Intel® x86 Ivy Bridge CPU
 - Core™ i7 for control plane functionality
 - 1-lane PCIe Gen 3.0 for Indigo NPS-400 configuration
 - 2x8GB DDR3, 64GB SSD memory
 - 1GbE port RJ-45, RS-232 console port RJ-45, USB
- Knowledge-based processor /TCAM
 - Large flow and ACL tables with millions of entries

FEATURES

Networking Features

- IPv4/IPv6 support
- NAT, NAT-T
- IKE virtual routing; Virtual IP address allocation from static pools
- IPsec 6in4/4in6 tunnel support
- Secure Virtual Tunnel Interfaces (SVTI)

Routing Protocols (IPv4 & IPv6)

- BGP4, MP-BGPv4
- OSPFv2, v3
- RIPv1, v2, ng

Layer 2

- QinQ (802.1ad)
- Jumbo Frame (9K)
- 802.1q (VLAN Tagging - 4095)
- Ethernet bridge

Layer 2 High Availability, Resilience

- LAG 802.3ad (Static/LACP)

Layer 3

- IP Forwarding Table (2M routes)
- VRF
- Static Routes

Layer 3 High Availability, Resilience

- VRRP
- ECMP
- BFD

Security Services

- Packet filtering (ACL)
- Stateful packet filtering
- Encapsulation/tunneling protocols: IPsec, GRE, VXLAN, 6in4/4in6
- uRPF

IPsec Throughput

- Up to 180Gb/s aggregated simultaneous encryption/decryption

Tunnel Establishment

- Up to 100,000 established tunnels
- Up to 1000 tunnels negotiated per second

IPsec Protocols and Modes

- Authentication header (AH) for authentication and integrity
- Encapsulating security protocol (ESP) for confidentiality, authentication and integrity
- Tunnel or transport mode

Key Management

- Static key configuration
- IKEv1 and IKEv2 for automatic key negotiation with automatic re-keying, dead peer detection
- VPN Monitoring

Authentication Methods

- IKEv1/v2 pre-shared keys or X509 certificates
- Relaying to external AAA server via EAP Radius

Cryptographic Algorithms

- Encryption: DES CBC, 3DES CBC, AES (128, 192, 256) in CBC, GCM or NULL_GMAC modes
- Hash: MD-5, SHA-1, SHA-2 (256, 384, 512), AES XCBC

Diffie Hellman Security Level

- Modp groups 1 (768 bits), 2 (1024 bits) and 5 (1536 bits)
- Support of PFCS (perfect forward secrecy)

Security Enhancement Features

- Extended sequence numbers
- Large anti-replay windows

Certificate Management

- CRL retrieval from HTTP or LDAP distribution points
- Local CRL caching

Management Protocols

- NTP (RFC 1305)
- 802.1ab LLDP
- DHCP Server/Client/BootP Relay
- Services
- SNMP v1, v2, v3
- SCP (Secure Copy)
- SSHv2 (Server/Client)
- Linux style management interface

SPECIFICATIONS

- Height: 43.7mm / 1.72" (1U)
- Width: 438mm / 17.2"
- Depth: 595mm / 23.4"
- Mounting: 19" rack or standalone
- Weight: 10.36kg / 22.8lb
- System LEDs: 2 x Power Supply, Fan, Status
- Network LEDs: Link & Activity
- Input Voltage AC: 100-240V AC, 47-63Hz
- Power Consumption: 450W (estimated)
- Power Supply Redundancy: 1+1 hot-swappable
- Operating Temperature: 0-40°C / 32-104°F
- Operating Humidity: 10% to 95% relative non-condensing
- RoHS Compliance: RoHS-6
- High Availability: ECC SECCED ISSU
- Fan Redundancy: 3+1 hot-swappable; front-to-rear airflow

Table 1 - Part Numbers and Descriptions

OPN	Description
MIDG4400-CS2REW	IDG4400 6WIND with crypto capabilities
MIDG4400-CS2RNW	IDG4400 6WIND without crypto capabilities

Support

For information about Mellanox support packages, please contact your Mellanox Technologies sales representative or visit our [Support Index page](#).



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