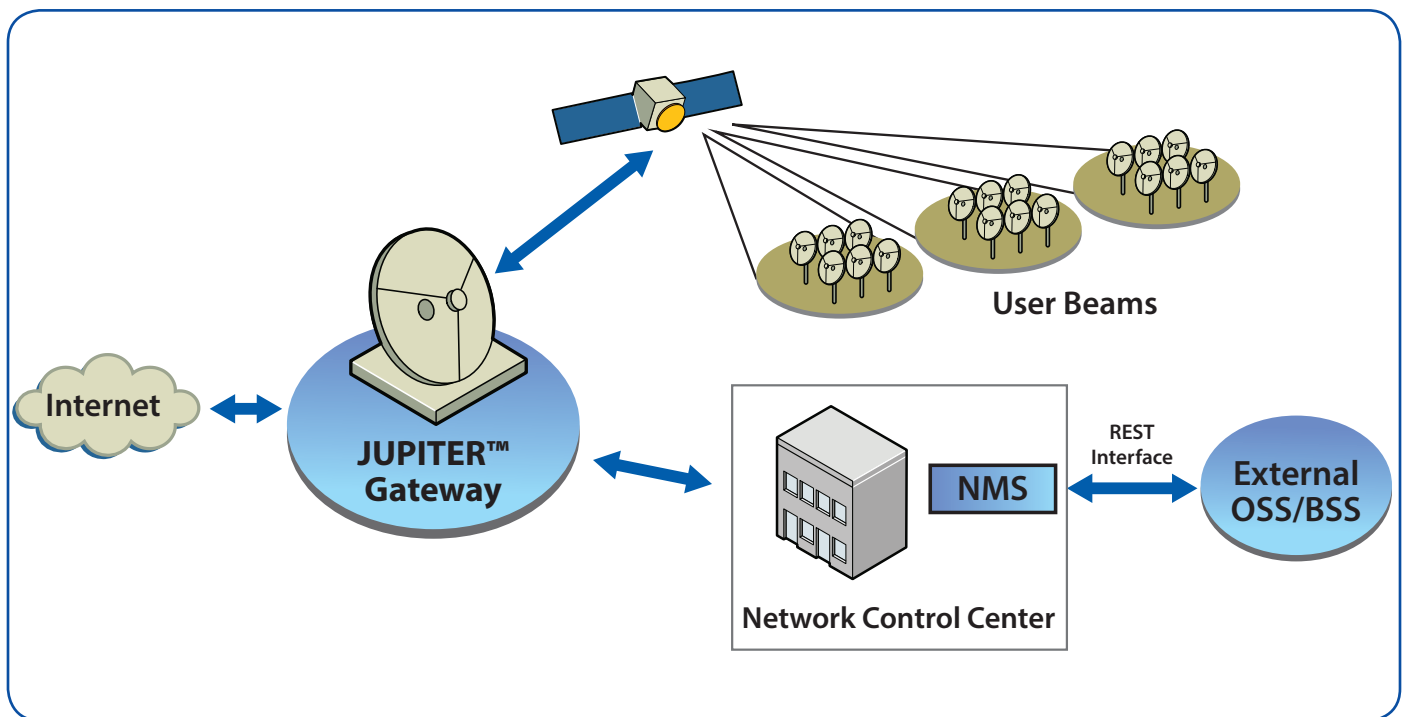


## Next-generation, high-throughput platform for satellite broadband networks

The Hughes JUPITER System is a high performance and high efficiency satellite broadband platform designed to support a wide range of applications across all market sectors, from consumer to enterprise, government, and mobility. Powering the world's largest satellite broadband service—HughesNet®—in North America, the JUPITER System has been deployed by leading operators around the world, on both High-Throughput Satellites (HTSs) and conventional satellites, making it the preferred technology choice for delivering advanced broadband services.



The High-level JUPITER System Architecture

### Industry-Leading Performance

Powered by the JUPITER System on a Chip (SoC), a powerful multicore ASIC, every HT terminal is able to achieve more than 100 Mbps of throughput. This throughput enables the JUPITER System to be effectively used for a wide variety of applications and markets including:

Traffic management and QoS are achieved through integrated traffic classification with five traffic priorities (based on the 3GPP standard): intelligent, protocol-sensitive bandwidth assignment for optimum performance using a variety of bandwidth assignment schemes including

- Broadband Internet access
- Enterprise networking
- Cellular backhaul
- MPLS extension
- Videoconferencing
- Mobility

Committed Information Rate (CIR), on-demand Committed Bit Rate (CBR), Adaptive CBR (outbound and Inbound), and backlog-based assignment.

## Industry-Leading Efficiency

First in the industry with the DVB-S2X wideband forward channel, the JUPITER System can operate a single carrier in a 250 MHz channel. DVB-S2X brings more MOD/COD points, which enable operation closer to the theoretical Shannon curve as compared to DVB-S2. A 5% channel roll-off further improves efficiency. Higher order modulation (16APSK and 32APSK) is available at the highest symbol rates.

The JUPITER System TDMA return channels deliver the industry's best efficiency thanks to the LDPC return channel coding and the Aloha-based contention scheme, which enables idle remote terminals to deallocate all return channel capacity. With support for return channels up to 12 Msps and either QPSK or 8PSK modulation, the JUPITER System can deliver well more than 20 Mbps of return channel throughput.

## Powerful IP Features

Designed to support demanding enterprise applications, the JUPITER System supports a full range of IP routing protocols including BGP IPv4, BGP IPv6, and RIP v2. Dual stack IPv4 and IPv6 means that both of these protocols can be supported simultaneously. VLAN with DSCP-based prioritization enables effective portioning of traffic off the remote site. Support for Virtual Router Redundancy Protocol (VRRP) along with policy-based routing enables remotes to effectively and seamlessly interface with terrestrial routers to provide alternate path selection as well as load balancing over satellite and terrestrial links.

## Advanced Acceleration Features

Integrated into the JUPITER System is a comprehensive set of acceleration and compression algorithms that drive performance and efficiency. The Hughes proprietary Performance Enhancement Proxy (PEP) provides for TCP spoofing, ACK reduction, and flow control to accelerate TCP traffic over the satellite link. In addition, Web acceleration where HTTP objects are pre-fetched by a proxy server at the gateway, pushed over the satellite link, and cached in the remote terminal, delivers near terrestrial-like screen paints for an industry-best surfing experience. The Web acceleration incorporates an advanced grammar-based compression algorithm that is able to significantly reduce overall HTTP traffic. Integrated DNS caching in the remote terminals eliminates satellite latency introduced by DNS lookup queries.

## JUPITER System Gateways

The JUPITER System gateways are architected on powerful and scalable data center technologies including blade chassis and blade servers. The power of these devices enables a Satellite Modem Cluster (SMC) to be configured as a single blade server mated with a modulator and demodulator. One SMC, occupying two slots in a blade chassis, is able to support all of the traffic—both forward and return—for a 250 MHz forward channel. There is no need for multiple devices to scale to the largest possible network.

Recognizing that networks operating over conventional satellites using 36 or 72 MHz transponders are different from HTS networks, the JUPITER System has a gateway configuration that is designed and optimized for conventional satellite operations. The HG220 gateway comes with a single chassis that can support up to four SMCs. An integrated L-band matrix switch enables a redundant SMC to come online to take the place of the primary SMC, allowing the HG220 to support 1:N redundancy. The Hughes-developed L-band matrix can connect the SMCs to different transponders or satellites. The HG220 also comes equipped with integrated IF distribution, timing system, NMS with firewall, Gigabit LAN switch, and intelligent power distribution. All components are 1:N redundant with automatic fault detection and switchover.

For multigateway, multibeam HTS applications, a high-density JUPITER System Gateway can be configured to support a virtually limitless amount of capacity. Typically included with the high-density gateway are deep packet inspection and traffic shaping devices.



HG220



HG240

HG242

The advanced JUPITER System Gateway architecture features autonomous design and “lights out” operation where the gateways can be operated independent of other network elements.

## JUPITER System Network Management System (NMS)

The JUPITER System Gateway is integrated with the powerful and full-featured NMS. The NMS platform provides a single, intuitive, easy-to-use Graphical User Interface (GUI) and advanced diagnostic capabilities through which operators can easily manage and monitor multiple networks on multiple satellites. The NMS GUI provides detailed graphical views of both real-time status and historical performance of all gateway components and managed terminals. The NMS is available in different configurations including a single gateway NMS configuration as well as a large-scale multigateway configuration with a manager of managers.

An extensive and powerful RESTful Application Programming Interface (API) enables easy integration with an existing OSS/BSS. The API enables an external system to perform virtually any operation that can be performed through the NMS GUI.

The NMS includes a fully automated provisioning and remote terminal commissioning system. Remote terminals can be provisioned in bulk electronically or manually via the GUI. The commissioning process is performed without any manual intervention at the gateway or NMS. An optional automatic cross-polarization test process can be used to confirm proper operation of the remote terminal.

The NMS includes an integrated set of Host Network Operator (HNO) and Virtual Network Operator (VNO) capabilities. The HNO/VNO capabilities enable an HNO to establish and operate multiple independent VNOs, each of whom can be provided with a logical partition of network resources including bandwidth. VNOs can be weighed relative to one another so as to enable high-value VNOs to be provided resources at a higher rate relative to lower value VNOs.

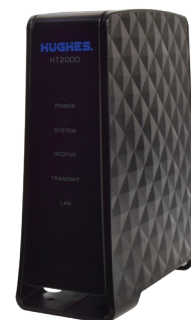
## JUPITER System HT Remote Terminals

At the heart of every JUPITER System HT remote terminal is the advanced JUPITER SoC, a powerful multicore ASIC. The JUPITER SoC enables every HT terminal to achieve up to 200 Mbps of throughput. In addition to sharing the same throughput performance, the family of remote terminals also shares the same powerful IP routing feature set so that any terminal can be used for virtually any application.

The HT2XXX series of remote terminals includes the following:

### HT2000

- Operates in either Ku-band or Ka-band
- Equipped with a single GigE LAN port
- Supports a single cable IFL for interface to the Outdoor Unit (ODU).
- Well suited for home or small-office applications



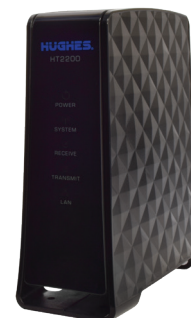
HT2000

### HT2000W\* (Future)

- Equipped with 4GigE LAN ports and an integrated Wi-Fi 802.11 ac/n access point

### HT2200

- Operates in either Ku-band or Ka-band
- Equipped with four GigE LAN ports
- Supports a single cable IFL for interface to the outdoor unit (ODU).
- Well suited for small/medium enterprise (SME) and distributed enterprise applications



HT2200

### HT2300

- Operates in C-, Ku-, or Ka-band with a variety of power amplifiers
- Equipped with four GigE LAN ports
- Well suited for home/small-office and small/medium enterprise (SME) applications.
- Supports a dual-cable IFL that enables use of industry-standard L-band interface radios



HT2300

## HT2500

- Operates in C-, Ku-, or Ka-band with a variety of power amplifiers
- Equipped with four GigE LAN ports
- Supports a dual-cable IFL for interface to industry-standard L-band radios
- Packaged in an industry-standard 19-inch rack mount
- Suitable for data centers or enterprise environments
- Available with optional DC power supply
  - +24 VDC Power\*
  - -48 VDC Power\*



HT2500

## Technical Specifications

### Forward Channel

DVB-S2X with Adaptive Coding and Modulation (ACM)  
Modulation: QPSK, 8PSK, 16APSK, 32APSK  
Code blocks: Normal and short frames  
Encapsulation: GSE  
Symbol rates: Up to 235 Msps  
Frequency: C-, Ku-, and Ka-band

### Return Channel

Modulation: OQPSK and 8PSK  
Symbol rates: 256 kbps – 12 Msps  
Encoding: LDPC FEC with efficient variable block/burst sizes  
Access Scheme: MF-TDMA  
Aggregate inroute capacity per SMC: Up to 96 Msps

### Gateway Architecture

Hardware platform: Blade servers with virtualization  
Redundancy: Fully redundant with 1:N for most subsystems

### Gateway Interface

RFT input/output: L-band  
WAN Interface: 10/100/1000 Ethernet, optical interface optional

### Optional Elements

Deep packet inspection and traffic shaping  
WAN router  
Web Acceleration Server (WAS)

### Security

Hardware-based 256 bit AES encryption (bidirectional)

### Remote Terminals Supported

HT2000  
HT2000W\*  
HT2200  
HT2300  
HT2500

\* Future

**JUPITER™**  
SYSTEM

For more information, please visit [www.hughes.com](http://www.hughes.com) or email [globalsales@hughes.com](mailto:globalsales@hughes.com).

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