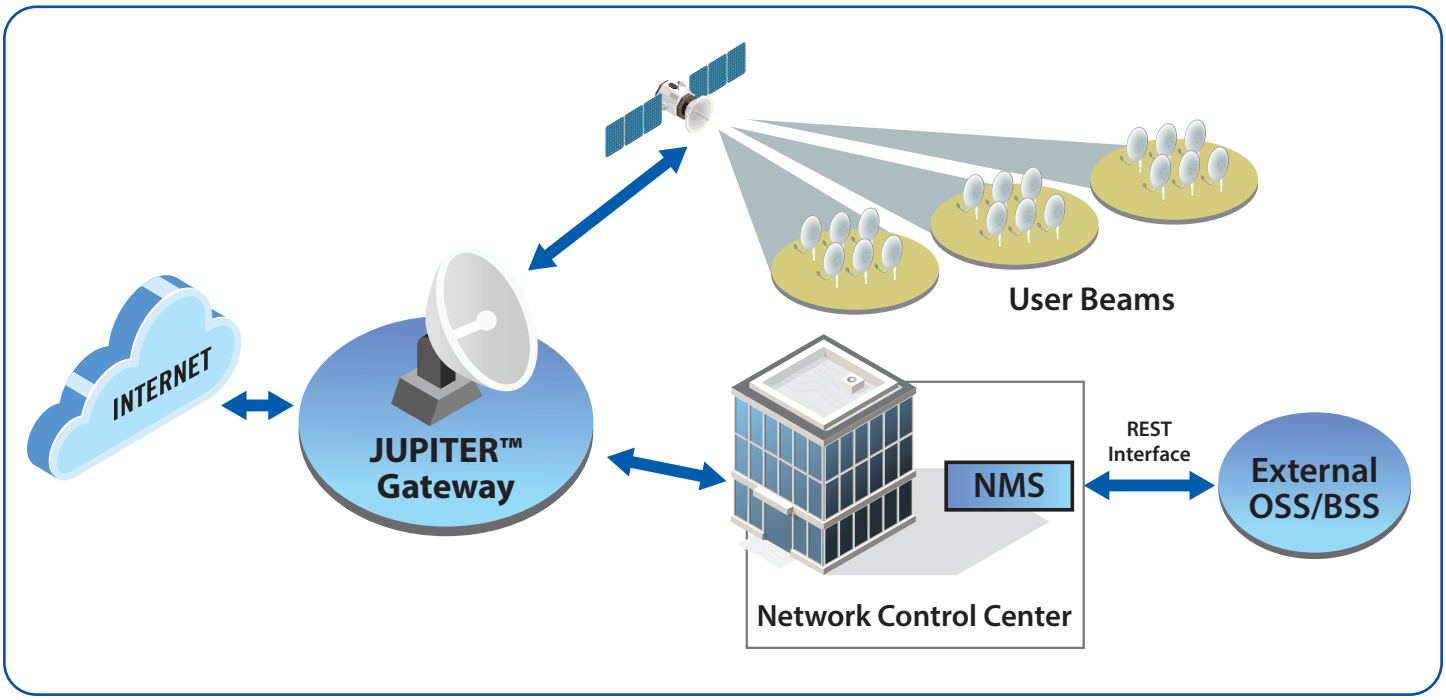
HUGHES®
An EchoStar Company

DATASHEET

JUPITER™ System with DVB-S2X

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 segments, from consumer to enterprise, government, aero/IFC/maritime, 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 with all types of applications, making it the preferred technology choice for delivering advanced broadband services over C-, Ku-, and Ka-bands.



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 300 Mbps of throughput. This throughput enables the JUPITER System to be effectively used for a wide variety of applications and markets, including:

- Broadband Internet access
- Enterprise networking
- Cellular backhaul
- MPLS extension
- Videoconferencing
- Mobility
- Aero/IFC and maritime

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

The JUPITER System return channel scheme delivers the industry's best efficiency thanks to the combination of MF-TDMA (multi-frequency Time Division Multiple Access) with ACM (adaptive coding and modulation) and optional DVB-S2X return channel. The MF-TDMA channels employ LDPC coding and a variety of access schemes designed to ensure maximum link efficiency. With support for up to 12 Msps and QPSK, 8PSK or 16APSK modulation, remotes are able to transmit with the optimal bits per Hz based on the outdoor unit configuration. The MF-TDMA ACM feature is available for any terminal which operates in linear mode supporting QPSK, 8PSK or 16APSK modulation. The DVB-S2X option, available as an option on certain of the HT2500 and HT2600 platforms, enables up to 50 Msps of return traffic.

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. The JUPITER System also support layer 2 transport with protocol acceleration including GTP acceleration for 4G/LTE backhaul.

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 as well. The HG220 gateway comes with a single chassis that can support up to six 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.

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

HG220

HG240

HG242

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.

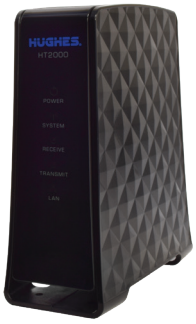
JUPITER System HT Remote Terminals

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 300 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



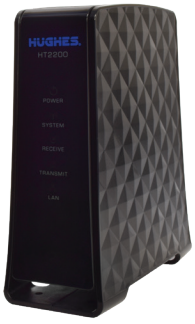
HT2000

HT2000W

- This terminal is equipped with 4GigE LAN ports and an integrated
- Wi-Fi 802.11 ac/n access point, in addition to the capabilities of the HT2000

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
- Supports QPSK, 8PSK and 16APSK modulation with adaptive coding and modulation (ACM)
- 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
- Layer 2 transport with acceleration and compression

HT2300

HT2500 Series

- Operates in C-, Ku-, or Ka-band with a variety of power amplifiers
- Capable of QPSK, 8PSK and 16APSK modulation with adaptive coding and modulation (ACM) when using linear radio
- Equipped with four GigE LAN ports
- Supports a dual-cable IFL for interface to industry-standard L-band radios
- Layer 2 transport with acceleration and compression
- Optional LTE acceleration
- Packaged in an industry-standard 19-inch rack mount chassis
- Suitable for data centers or enterprise environments
- Capable of 50 Msps DVB-S2X (TDM) transmission for high throughput
- Available with optional DC power supply
  - +24 VDC Power*
  - -48 VDC Power*

HT2500

HT2600 Series

- The HT2600 series unit is packaged in an IP67 outdoor enclosure
- Capable of QPSK, 8PSK and 16APSK modulation with adaptive coding and modulation (ACM) when using linear radio
- Capable of 50 Msps DVB-S2X (TDM) transmission for high throughput
- Requires +24 VDC or -48 VDC DC power
- Equipped with two GigE LAN ports
- Offers functionality is similar to the HT2500 series

HT2600

Technical Specifications

Forward Channel

DVB-S2X with Adaptive Coding and Modulation (ACM)

Modulation: QPSK, 8PSK, 16APSK, 32APSK, 64APSK

Code blocks: Normal and short frames

Encapsulation: GSE

Symbol rates: Up to 235 Msps

Frequency: C-, Ku-, and Ka-band

Return Channel

MF-TDMA

- LDPC FEC with efficient burst size encapsulation
- With Hughes linear ODU
  - QPSK, 8PSK, and 16APSK modulation
  - ACM
  - Symbol rates from 256 ksps to 12 Msps
- With Hughes saturated carrier ODU
  - QPSK modulation
  - AIS
  - Symbol rates from 256 ksps to 4 Msps

DVB-S2X

- QPSK, 8PSK, 16APSK, 32APSK and 64APSK modulation with LDPC coding
- Symbol rates from 1 to 100 Msps

Gateway Architecture

Hardware platform: Blade servers with virtualization

Aggregate inroute capacity per SMC: Up to 96 Msps

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 (optional; subject to local government approval) (bidirectional)

Remote Terminals Supported

HT2000, HT2000W, HT2010, HT2010W, HT2200, HT2210W, HT2300, HT2500 Series, HT2600 Series

For more information, please visit www.hughes.com or email globalsales@hughes.com.

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