

## High-throughput router for Ku- and Ka-band

The HX90 is a high-throughput capable and highly scalable satellite router that enables operators to provide cost-effective satellite broadband services over Ku- and Ka-band networks. Supporting up to 60 Mbps of multicast traffic throughput, 45 Mbps of UDP throughput or 15 Mbps of TCP throughput, the HX90 delivers exceptional performance. The HX90 includes the full suite of HX System Quality of Service (QoS) features which enable operators to tailor service plans to meet the needs of the most rigorous end users. High-throughput satellite operators can use the HX90 to deliver enterprise and carrier-grade services to users in a cost-effective manner.

### Target Markets

- Ku- and Ka-band network
- High-throughput satellite operators
- Internet services
- SCPC/MCPC replacement links
- MPLS extension services
- Embassy and government networks
- Private leased-line services
- Education services

### HX System Architecture

The HX System provides true IP broadband connectivity via satellite. The HX System is based on a “star” network topology where the outbound channel is DVB-S2 with Adaptive Coding and Modulation (ACM). The return channel of the HX System is multi-frequency FDMA/TDMA using the IPoS standard for broadband over satellite. With a DVB-S/DVB-S2 outbound carrier and transmit rates up to 3.6 Mbps, the HX90 provides a cost-effective and highly scalable solution for satellite broadband networks.



Efficiency and flexibility in utilizing satellite bandwidth are at the core of the HX90 design. Each link can be configured to provide a QoS tailored to the requirements of the remote site. This includes adaptive Committed Information Rate (CIR) and Constant Bit Rate (CBR) services that provide guaranteed bandwidth through optimizing use of the bandwidth during periods of idle or light traffic. Remote sites with less stringent bandwidth requirements or service level agreements can be configured for best-effort service, thereby allowing service providers to develop a service tailored to their customers' specific requirements. In addition, the HX System bandwidth allocation scheme uses Aloha channels for initial bandwidth assignment which results in very efficient use of space segment. This frees up unused bandwidth and allows an operator to make more efficient use of space segment resources.

### Optimizing the Return Channel with LDPC

OQPSK with LDPC coding provides exceptional performance:

- Spectral efficiency is similar when comparing Rate 9/10 versus 8PSK Rate 2/3;
- OQPSK is less susceptible to noise;
- Lower power BUC requirements;
- 8PSK requires larger burst size for coding gain.

Overall, LDPC provides superior performance.

### Hughes Outdoor Unit

The HX90 is supplied with the Hughes manufactured outdoor unit. Available in either Ku-band or Ka-band, the Hughes ODU utilizes a constant envelope modulated carrier output that results in exceptional performance and reliability and offers a wide range of dynamic range for uplink power control. The ODU utilizes a highly integrated design with the LNB an integral part of the ODU thereby increasing reliability.

The HX System from Hughes, the world leader in broadband satellite networks and services, is designed and optimized for smaller and mobile networks, including maritime and airborne applications, where the provision of high-quality and high-bandwidth links is paramount. Capable of simultaneous mesh, star, and multi-star configurations, the HX System builds upon the capabilities and global success of the high-performance HN System, incorporating many advanced features pioneered by Hughes, including integrated TCP acceleration and advanced IP networking. Its broadband satellite products are based on global standards approved by TIA, ETSI, and ITU, including IPoS/DVB-S2, RSM-A, and GMR-1.

## Features

- Quality of Service features include:
  - Constant Bit Rate (CBR) services
  - Adaptive CBR. Minimum and maximum rates are configurable, as is step size.
  - Committed Information Rate (CIR) with minimum, guaranteed, and maximum rates
  - Best effort with weighted fair queuing
  - Class-based weighted prioritization
  - Multicast data delivery
  - Four levels of IP traffic prioritization
- Bandwidth management
  - Supports both preassigned (static) traffic assignment and dynamic traffic assignment
  - Idle remotes can be configured to release all network resources
- Acts as a local router providing:
  - Static and dynamic addressing
  - DHCP server or relay
  - DNS caching
  - RIPV1, RIPV2, BGP routing support
  - Multicasts to and from the LAN by using IGMP
  - NAT/PAT
  - VRRP
  - VLAN tagging
  - Firewall capability with integrated access control lists
- Supports unicast and multicast IP traffic
- Software and configuration updates via download from the HX Gateway
- Implements dynamic, self-tuning Performance Enhancement Proxy (PEP) software to accelerate the throughput performance by optimizing the TCP transmission over the satellite, delivering superior user experience and link efficiency
- Bidirectional data compression
- IPSec encryption (optional)
- Configuration, status monitoring, and commissioning via the HX ExpertNMS™
- Embedded Web interface for local status and troubleshooting
- User-friendly LED display indicating terminal operational status
- Closed loop control between hub and remote
- Dynamic outbound coding and modulation changes based on received signal
- Dynamic inbound coding changes based on received signal
- Dynamic remote uplink power control
- IPV6 ready

## Technical Specifications

### Physical Interfaces

Two 10/100BaseT Ethernet LAN RJ45 ports

### Satellite Specifications

Frequency:	Ku-, Ka-band
DVB-S2 ACM Channel:	DVB-S2 with Adaptive Coding and Modulation or DVB-S
DVB-S2 ACM Rate:	1–45 Msps (in 0.5 Msps steps)
DVB-S2 ACM Modulation:	QPSK, 8PSK, 16APSK (Adaptive Modulation)
DVB-S2 ACM Coding:	BCH with LDPC 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (Adaptive Coding)
FDMA/TDMA (IPoS) Channel Rate:	256 to 2048 kbps (256 kbps to 3.6 Mbps)
FDMA/TDMA (IPoS) Modulation:	OQPSK
FDMA/TDMA (IPoS) Channel Coding Rate:	Adaptive Coding 1/2, 2/3, 4/5 with TurboCode 1/2, 2/3, 4/5 and 9/10 with LDPC
Error Rate (Receive):	Quasi Error Free
Error Rate (Transmit):	10 <sup>-5</sup> PLR (equivalent to 10 <sup>-7</sup> or better)
Interface to ODU:	Hughes Saturated Carrier BUC

### Performance

Packets per second	5,000
UDP throughput	45 Mbps
TCP throughput	15 Mbps
Multicast throughput	60 Mbps

### Mechanical & Environmental

Weight (IDU):	1.6 lbs (.726 kg)
Dimensions (IDU):	8.05" W x 1.55" H x 8.95" D (20.4 cm W x 3.9 cm H x 22.7 cm D)
Operating temperature:	
IDU:	+32° F (0° C) to +122° F (+50° C)
ODU:	-22° F (-30° C) to +131° F (+55° C)
Input power:	90 to 264 VAC; 50 to 60 Hz
DC power supply (opt.):	12 to 24 VDC

For additional information, please contact Hughes at [globalsales@hughes.com](mailto:globalsales@hughes.com) or visit [www.hughes.com](http://www.hughes.com).