

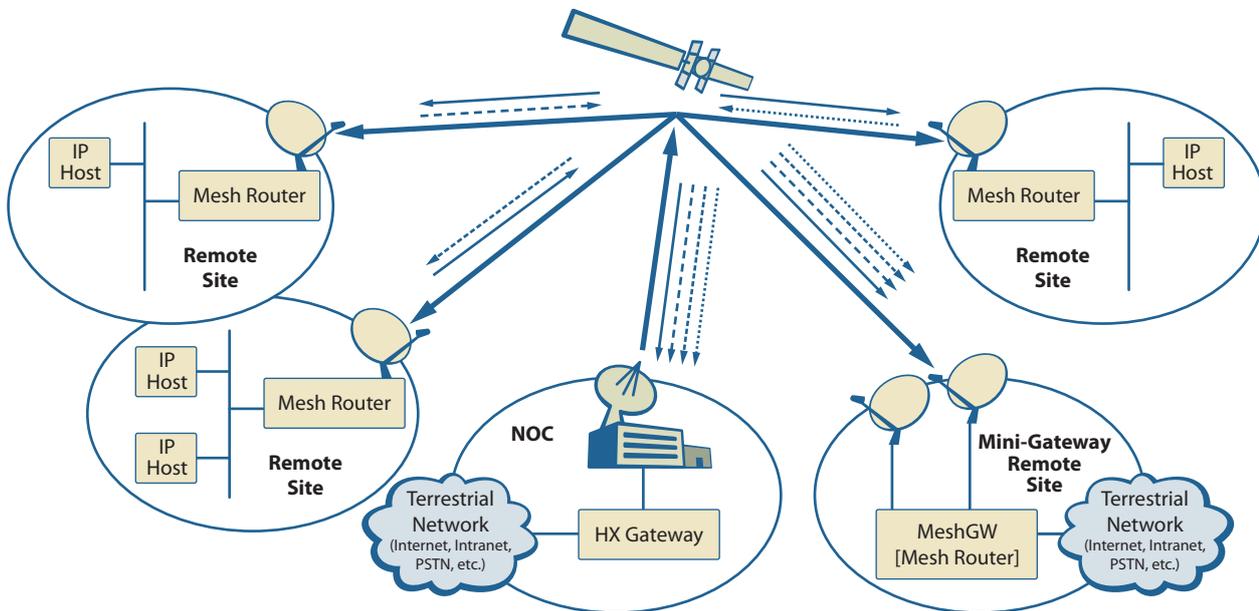
## Simultaneous mesh, star, and multi-star broadband satellite IP networks for voice, data, and video services

The Hughes HX System Mesh Feature is a powerful capability introduced as part of HX System Release 2.0 that enables simultaneous mesh, star, and multi-star broadband satellite IP networks for cost-effective delivery of voice, data, and video services.

As illustrated, the Mesh Feature extends the star topology of the advanced HX System architecture to simultaneously support direct, router-to-router connectivity in a single satellite hop, such as between HX260 mesh broadband routers. It also encompasses a “mini-gateway” or MeshGW, which is a low-cost solution for concentrating high volumes of mesh traffic at a regional site, acting as a subsystem to a central HX Gateway. Ideal for telephony applications, the MeshGW provides hub-like interconnection to terrestrial infrastructure, and supports least-cost routing of traffic into the PSTN at multiple entry points. The result is a highly flexible and cost-effective broadband platform for delivering any combination of high-quality voice, data, and video services.

### Key Benefits

- Enables single-hop, router-to-router connectivity for VoIP, video, or other latency-sensitive applications
- Encompasses a MeshGW “mini-gateway” for cost-effective concentration of high-volume traffic at regional centers
- Supports TCP, UDP, and RTP connectivity for a wide range of applications
- Satellite routers can simultaneously demodulate multiple TDMA channels for flexible connectivity and performance
- Utilizes the advanced bandwidth management, IP routing, and network management features of the HX System



HX System Architecture for Mesh Connectivity

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. To date, Hughes has shipped more than 1.9 million satellite terminals to customers in over 100 countries.

### HX Gateway

The HX System Mesh Feature is part of Release 2.0 and is backward compatible with all prior versions of the HX System software. It includes the mesh controller software that performs the bandwidth management for mesh connections. The addition of mesh functionality extends and does not impact the star topology capabilities of the HX System.

### HX260 Broadband Satellite Router

Key to implementing the HX System Mesh Feature is the HX260 mesh/star broadband satellite router with its integrated, multi-channel TDMA receiver. Among the benefits of this flexible and high-performance router is the ability to simultaneously receive TDMA channels of varying symbol rates, and to process different FEC coding rates within each TDMA channel. Bandwidth assignment and QoS (Quality of Service) for mesh connections are done on a per router basis and can be implemented using any of the HX System bandwidth assignment schemes. For added flexibility, the HX260 supports independent QoS schemes for mesh and star traffic.

### MeshGW

The MeshGW is scalable and able to dynamically support a large number of simultaneous mesh connections. The MeshGW utilizes a single IP address which can be used to access the entire gateway. The MeshGW intelligently distributes sessions and load across the multiple HX260 servant routers. This design avoids the complexity and overhead of inverse multiplexing solutions and enables the HX260 routers to dynamically route traffic to various “gateways” into the Internet or PSTN. In the case of telephony, this feature enables least-cost routing where the VoIP session is routed into the PSTN terrestrial fabric at the point closest to the destination. Alternatively, the MeshGW design can be used to support small private data networks. The MeshGW includes key features such as a “master” terminal by which a single IP address can be used to access the entire gateway. In addition, the MeshGW is available in a fully redundant configuration for the highest performance and availability.

### HX Mesh—Industry’s Leading Solution for Mesh

- HX mesh satellite routers simultaneously receive multiple TDMA channels using different symbol rates and coding rates
- HX mesh satellite routers operate simultaneously in star and mesh modes
- MeshGW enables cost-effective multi-gateway or multi-star operation
- Common TDMA channels used for mesh and star eliminate the need for separate mesh-only channels
- Mesh connectivity is supported for TCP, UDP, and RTP traffic
- Existing HX networks are easily upgraded to support mesh

### Applications

- Cellular backhaul connectivity from BTS to BSC
- Telephony with multi-gateway connectivity
- Videoconferencing
- Private enterprise data networking
- WiFi Internet backhaul

### System Requirements

- HX System Software Release 2.0
- HX260 broadband satellite routers
- HX MeshGW (optional for multi-gateway operation)

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