

# Satellite Cellular Backhaul Solutions



Global Reach—Land, Air, and Sea

**HUGHES**<sup>®</sup>  
An EchoStar Company



## Discover new opportunities and expand your coverage area with Hughes Satellite Cellular Backhaul

The growing demand for connectivity anytime/anywhere holds the potential for cellular operators to expand beyond urban and higher density markets—which to date have primarily fueled the success of wireless communications globally. But increasing coverage in rural and hard-to-reach areas is difficult to cost-justify employing terrestrial backhaul technologies, whether fiber, cable, or microwave. Hughes Satellite Cellular Backhaul is the answer.

- Hughes Satellite Cellular Backhaul Solutions are specifically designed for mobile operators to rapidly and cost-effectively expand service into rural and hard-to-reach markets.

### A Proven Solution

Supporting a wide range of different vendor radio access network (RAN) systems, Hughes Satellite Cellular Backhaul Solutions are specifically designed for mobile operators to rapidly and cost-effectively expand service into rural or hard-to-reach markets. These solutions provide high quality and scalable links tailored to cell coverage and traffic parameters, and with optimized space segment utilization to yield the lowest possible cost.

Additionally, Hughes Satellite Solutions can be readily configured as backup links for high-availability requirements, such as in urban cell sites serving critical locations, or in rural sites with multiple microwave hops.

## Global Reach—Land, Air, and Sea

Ideal not only for rural and difficult-to-reach locations, Hughes Satellite Cellular Backhaul Solutions also serve transportation platforms in the air and at sea.

- Rural and remote areas
- Islands
- Oil rigs
- Airplanes
- Cruise ships
- High-speed trains
- Disaster recovery
- Vacation resorts
- Special events with Cell on Wheels (COWS) coverage

Hughes solutions facilitate the implementation of government-mandated Universal Service Obligations (USO) coverage and social responsibility programs by mobile operators.

## Interoperability

Hughes has successfully deployed its solutions and completed interoperability testing with a wide range of cellular equipment providers and technologies:

### Radio Access Network Equipment Manufacturers

- Ericsson
- Nokia Siemens Networks
- Huawei
- Alcatel-Lucent
- ZTE
- Cisco
- AltoBridge
- Lemko

### Bandwidth Optimizer Equipment Manufacturers

- Sevis
- Memotec
- Xiplink

### Certified for Backhaul of Wireless Technologies and Cell Types

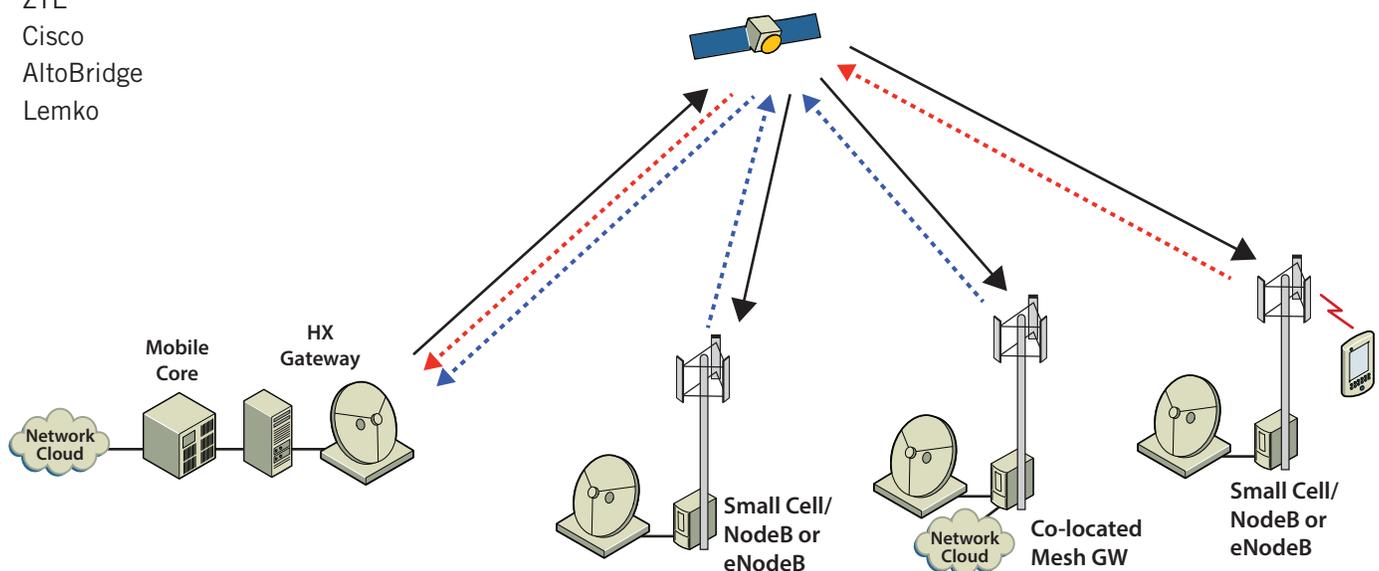
- 2G, 3G and 4G/LTE (based on GSM, CDMA, WiMax, and OFDMA technologies)
- Femto, Pico, Micro, Metro & Macro base stations (dedicated or shared backhaul)

## Backhaul of 2G, 3G, 4G/ LTE, WiMax and Tetra Solutions

Hughes Satellite Cellular Backhaul Solutions support the full range of industry standard interfaces, including T1, E1 and IP (Abis, Iub, Iuh etc), along with end-to-end encryption, traffic prioritization and various synchronization methodologies. Backhaul capacities are readily configured per cell site in both downlink and uplink directions based on traffic engineering requirements.

## Cost-Effective and Dynamic

Hughes Satellite Cellular Backhaul Solutions employ sophisticated traffic management techniques to minimize bandwidth cost in reaching difficult locations, including dynamic channel assignment and sharing on an as-needed basis among multiple sites.



## Highly Efficient

Hughes Satellite Cellular Backhaul Solutions are based on TDM/TDMA statistical multiplexing on the outroute, compliant with the DVB-S2 standard for sharing information among multiple RAN base stations. Inroutes use a demand-assigned, multi-frequency TDMA scheme for transmissions from RAN base stations to the Core.

With the Hughes TDM/TDMA approach, capacity is dynamically assigned as needed to each base station, or to Node B in the case of a 3G system, resulting in the most efficient use of space segment.

## Flexible and Easy to Use

Available in Ku-, C-, and Ka-bands, Hughes Satellite Cellular Backhaul Solutions support both star and mesh configurations, utilizing conventional and the latest generations of high-throughput satellites (HTS). Easily installed by one person, Hughes solutions boast low power requirements and can be powered easily by solar or wind sources.

Hughes Satellite Cellular Backhaul Solutions are available to mobile operators globally, either as a stand-alone private network or a managed service offering. An integrated and packaged Small Cell version ensures the minimum total cost of ownership for even the lowest density market entry opportunities.

## Innovation is Why We Lead

Since inventing the very small aperture terminal (VSAT) over three decades ago, Hughes has an unmatched heritage of sustained innovation in satellite networking technologies, products and services. As the world leader in broadband satellite for home and office, our culture drives us to bring the most advanced and cost-effective solutions to the market, employing the best-of-breed terrestrial fixed and wireless access technologies.

### A Snapshot of Hughes

- Worldwide market leader in broadband satellite and managed network services
- Over 30 years of experience managing large-scale enterprise networks
- Global service delivery with sales offices and operations worldwide
- Over 4 million satellite terminals shipped worldwide
- More than 225,000 network sites for Fortune 500 enterprises
- VSAT 2013 Service Provider of the Year
- HughesNet®: World's Largest Consumer Satellite Internet Service, Winner of 2013 Consumer World Award.

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