



The SurfBeam® 2 satellite networking system enables fast and cost-effective satellite broadband services. The system is designed to simultaneously deliver a wide range of residential, enterprise, and mobile broadband services. By exploiting the full potential of Ka-band high-capacity satellites, the SurfBeam 2 system can deliver more than ten times the speed and capacity of current systems at a much lower cost per subscriber.

## SURFBEAM 2 SYSTEM ADVANTAGES

### An Integrated Ground System for High-Capacity Satellites

ViaSat is the innovator of the world's highest capacity satellite, ViaSat-1, and we're helping our partners maximize the potential of their own next-generation satellites. With the power of the SurfBeam 2 system, these high-capacity satellites can deliver more than ten times the speed and capacity of current systems at a much lower cost per subscriber.

Achieving the full potential of these satellites requires a sophisticated ground infrastructure. With our innovative and tightly integrated SurfBeam 2 system, operators can achieve the best user performance, lowest cost of ownership, and economic scale. In combination with the SurfBeam 2 system, ViaSat-1 and our partner satellites will deliver more than 250 Gbps of capacity to support more than 5 million subscribers around the globe.<sup>1</sup> Our systems and expertise also help you optimize network operations and subscriber services.

### Delivering Media-Rich Internet Services

The demand for network bandwidth consumption continues to grow without limit. Consumer traffic now represents more than 80 percent of global IP traffic and is driven by real-time video, downloaded video, and video-enabled social networking. Enterprise traffic is driven by increases in network-connected devices, video conferencing, and online collaboration.<sup>2</sup>

The SurfBeam 2 system enables high-speed, media-rich Internet and multimedia communication services to residential and business customers. The system delivers a quantum leap in affordable broadband Internet access via satellite and builds on the success of SurfBeam, the first satellite networking system designed from the ground up for economical mass market broadband networking. SurfBeam is the leading choice for residential broadband, with over 800,000 units shipped.

“The inter-connection of SurfBeam 2 ground systems can connect us into a worldwide network, creating new market opportunities.”

ARDUINO PATACCHINI,  
CEO, SKYLOGIC, S.P.A.

<sup>1</sup> Capacity and subscriber count represent partnerships as of February, 2011

<sup>2</sup> Cisco Visual Networking Index IP Traffic Forecast, 2011

## Excellent Customer Experience for a Range of Market Applications

Media-rich websites, Internet video, large file transfers and media downloads, content distribution and contribution, and quality VoIP are now mainstream. Perhaps the most important benefit of the advanced SurfBeam 2 system is the ability to deliver an excellent customer experience for these high-bandwidth residential and business applications.

The SurfBeam 2 system optimizes the use of satellite bandwidth, embeds web acceleration with optional application acceleration, and provides for a range of selectable service rates. A unique advantage of the SurfBeam 2 system is that satellite capacity is assigned on a system-wide class-of-service basis, rather than to each user terminal. This feature gives more bandwidth to higher priority services, such as real-time voice or video, without impacting lower priority traffic like email and web surfing. The approach also helps ensure end-user satisfaction since most users run several applications concurrently and system throughput can have a significant influence on application performance.

These powerful features allow you to deliver an excellent user experience for web and email services and also enable premium service levels with higher user subscription rates.

## A System Designed for Service Providers

Our Integrated Management Framework simplifies large network operations. The framework is comprised of three key components: Network Management System (NMS), Operations Support System (OSS), and Business Support System (BSS).

Its primary function is the management of subscriber services, including:

- » definition of usage-based, volume-based, pre-paid time, and pre-paid data service plans
- » customer subscription and billing
- » automated, zero-touch provisioning
- » assurance that services are provided per end user service level agreements
- » central control of networks spanning multiple remote gateways and satellites

Additional functions such as payment processing, email services, web hosting services, and more can easily be integrated if needed. External access can be made available for operators, resellers, and installers via web portals or a web services API for custom management interfaces.

## Scalability to Operate in the Largest Networks

The design and architecture of the SurfBeam 2 system supports millions of subscribers. System capacity expands easily with compact and highly modular gateway equipment. The bandwidth processing density of the SurfBeam 2 Satellite Modem Termination System, or SMTS, reduces the footprint and power requirements at the hub.

Satellite bandwidth consumption and system licenses are modular and scalable so expenses and operational costs are proportional to your customer growth and business needs.

## Unmatched Expertise in Satellite Broadband

ViaSat extends fast, efficient, and secure communications to people at the far reaches of information networks. Our extensive project management experience, global installed base of satellite terminals, and status as the premier Ka-band Internet service provider make us the leading technology provider for large-scale satellite broadband. ViaSat-1 and the SurfBeam 2 system transform two-way satellite communications with the ability to provision more bandwidth per customer and boost the satellite broadband experience to new levels.

Our technical staff can optimize your network in a number of other ways. Data processing and acceleration techniques, more efficient antenna technologies, creative waveforms, adapting open standards, and software-driven products all give you the ability to get the most out of your network and bandwidth, creating new opportunities for your business.

Complementing our technical expertise, our strong business organization can plan, develop, and execute programs on a large scale. We bring you an unmatched combination of technical and business innovation, award-winning schedule/quality performance, and a commitment to the overall success of your venture.



RESIDENTIAL USER TERMINAL



PROFESSIONAL TERMINAL



PRO PORTABLE TERMINAL



KA BAND GATEWAY ANTENNA



SMTS-5000

## SYSTEM COMPONENTS

### Satellite User Terminal — At the Customer Premises

Supporting large-scale networks, the SurfBeam 2 system equipment resides in multiple locations: the customer premises (user site), the gateway earth station(s), and the network operations center (NOC).

### Satellite User Terminal — At the Customer Premises

Each residential subscriber location has a SurfBeam 2 user terminal, consisting of a compact indoor unit (IDU) similar to a cable or DSL modem, and an unobtrusive Ka-band outdoor unit (ODU) similar to a dish for satellite television reception. The SurfBeam 2 terminal enables fast web browsing plus video streaming, file sharing, and other bandwidth-intensive Internet applications at downstream rates up to 40 Mbps and upstream rates up to 10 Mbps.<sup>3</sup> The indoor unit integrates seamlessly into any home-based network via a standard Ethernet connection; a single coaxial cable connects the indoor and outdoor units. A professional IDU and larger ODU support enterprise applications requiring higher speeds and availability. A portable terminal integrates the IDU and ODU into the smallest and lightest ruggedized terminal for use on high-throughput satellites and is ideal for satellite news gathering, tactical military operations or wherever you need fast, temporary connectivity.

The IDU has an embedded acceleration client that works transparently with acceleration servers in the gateway to provide a faster, more responsive user experience. The fully integrated ODU includes a satellite reflector, TRIA (transmit and receive integrated assembly), and mounting kit available in both pole-mount and structure-mount configurations.

The family of highly integrated SurfBeam 2 user terminals sets a new standard for performance and reliability. High-volume production ensures flexible product delivery schedules and the lowest possible volume pricing.

### Satellite Gateway Earth Station — At the Hub

The system of gateways comprising the satellite ground system provides all network services for satellite connectivity and terrestrial network access. Several gateway elements are available in a redundant configuration, removing any single points of failure.

The gateway contains several important subsystems:

- » RF earth station and equipment
- » Satellite modem termination system (SMTS)
- » Access service network (ASN)
- » Acceleration system
- » Element management system (EMS)
- » Network routing and security

**RF Earth Station Equipment** »»» For each gateway location, ViaSat provides a Ka-band antenna ranging in size from 4.5 meters to 13.5 meters. The 7.3 meter configuration satisfies the requirements of most of today's Ka-band spot beam satellite designs. The antennas have several unique features including a spacious hub area that integrates all of the high frequency RF electronics close to the antenna feed. The high-strength reflector and motorized mount with optional monopulse autotrack system can operate in a wide range of environmental conditions and the environmentally-controlled hub provides a protective enclosure for sensitive electronics. An optional hot-air de-icing system enables high availability in cold climates. The mount is equipped with a large work platform with integral ladder for accessing the RF electronics in the hub and the mount drive components. Redundancy options allow critical components to be taken offline for maintenance or repair without interrupting signal traffic. Management and control is provided by the dedicated RF Element Management Subsystem.

<sup>3</sup> Up to 20 Mbps for premium user terminals. Actual downstream and upstream speeds offered to subscribers are configurable by the network operator via included provisioning tools.

**SMTS-5000 Satellite Modem Termination System »»»** The SMTS is based on the Advanced Telecommunications Computing Architecture (ATCA) standard, developed to enable high availability systems that include redundant management, board to board communications, power, and cooling. The system manages and controls traffic between end users and the gateway routers and servers. It performs all power and frequency management for both the forward and return links, plus satellite network bandwidth management. Fitting in only 13 standard rack units, a single SMTS can process up to 1 GHz of satellite bandwidth.<sup>4</sup> The SMTS-5000 is fully redundant for maximum availability.

**Access Service Network (ASN) »»»** The ASN is responsible for authenticating and authorizing user access, managing and accounting for individual service flows, and enforcing quality of service (QoS). QoS is implemented by assigning a class of service to different data service flows and is enforced system-wide. This unique approach ensures that all high-priority traffic receives the bandwidth it requires with less impact on lower-priority traffic. The end result is better performance for all users.

**Acceleration System »»»** The SurfBeam 2 system uses our award-winning AcceleNet™ software to significantly improve throughput and end-user performance for HTTP- and TCP-based applications. The acceleration server is located at the gateway and the client software is embedded into the user terminal. Improve performance for a wider range of business applications, including Outlook/Exchange, remote file shares, and private network applications, with an upgrade to the AcceleNet Enterprise Edition software.

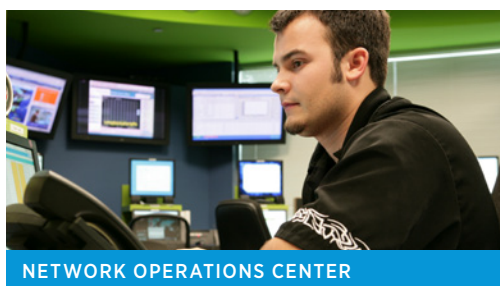
**Element Management System (EMS) »»»** The gateway element management system facilitates detection, isolation, notification, and correction of faults in the satellite network elements. The EMS also manages configurations and software updates for the managed elements and is capable of collecting and sending usage information to the NOC.

**Network Routing and Security »»»** This subsystem enforces traffic security and QoS policy, and routes all management and data traffic to target network destinations. It comprises a router, L2/L3 switch, firewall, traffic shaper, and AAA, DHCP, TFTP, and NTP servers.

## Network Operations Center

The Network Operations Center (NOC) is typically located remotely from the satellite gateways (though it may be co-located with a single satellite gateway) and is where key components of the SurfBeam 2 Integrated Management Framework (IMF) applications reside. The primary function of the NOC is the management of satellite network and subscriber services through the Network Management (NMS), Operations Support (OSS), and Business Support (BSS) systems.

The SurfBeam 2 IMF builds on the best of the Internet Engineering Task Force (IETF)<sup>5</sup> management system standards, leveraging mature off-the-shelf products to form the backbone of the front- and back-office functions necessary to deliver a broadband service to millions of customers, including:



NETWORK OPERATIONS CENTER

- » Subscriber information and subscription profiles
- » Service definitions and plans
- » Service activation and device provisioning
- » Subscriber account management and usage collection for billing
- » Optional billing servers and payment processing
- » Optional customer care and trouble-ticketing system
- » Optional web portal to enable subscribers to view service plan and billing information

The NMS supports the following network-wide and element-level functionality:

- » Fault management (i.e., network status and alarms, event correlation, etc.)
- » Configuration management
- » Performance monitoring
- » Network access security and audit

The IMF supports role-based access for operations, sales, marketing, and engineering and can be extended to service provider partners (e.g., VNOs) via web portals and web services APIs.

With the SurfBeam 2 Management Framework, you get a sophisticated suite of tools to allow efficient and effective customer care and service/network management. A web portal using a standard browser or web services API enables external access to these systems by operators, resellers, and installers, facilitating development of custom management interfaces. Our professional services team can conduct thorough testing during system installation and integration to ensure seamless operation.

<sup>4</sup> 500 MHz each on the forward and return links.

<sup>5</sup> The Internet Engineering Task Force (IETF) is a large, open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet.

## SURFBEAM 2 SYSTEM AT-A-GLANCE

### Features and Benefits

- » Next-generation broadband-over-satellite system for high capacity satellites
- » Highly scalable, modular architecture
- » Optimized for bent-pipe Ka-band spot beams with frequency reuse
- » Highly efficient forward-link modulation and coding
- » Adaptive Coding and Modulation
- » Highly efficient return-link modulation, coding, and MAC protocols
- » Return channel modem burst rates of up to 10 Msp/s (up to 20 Msp/s with premium user terminals)
- » High density hub equipment—up to 1 GHz<sup>4</sup> of bandwidth in only 13 rack units
- » Embedded acceleration
- » Easy to use network management system
- » Easy integration with your business systems
- » Multiple remote terminals for residential, enterprise, portable, and mobile user applications

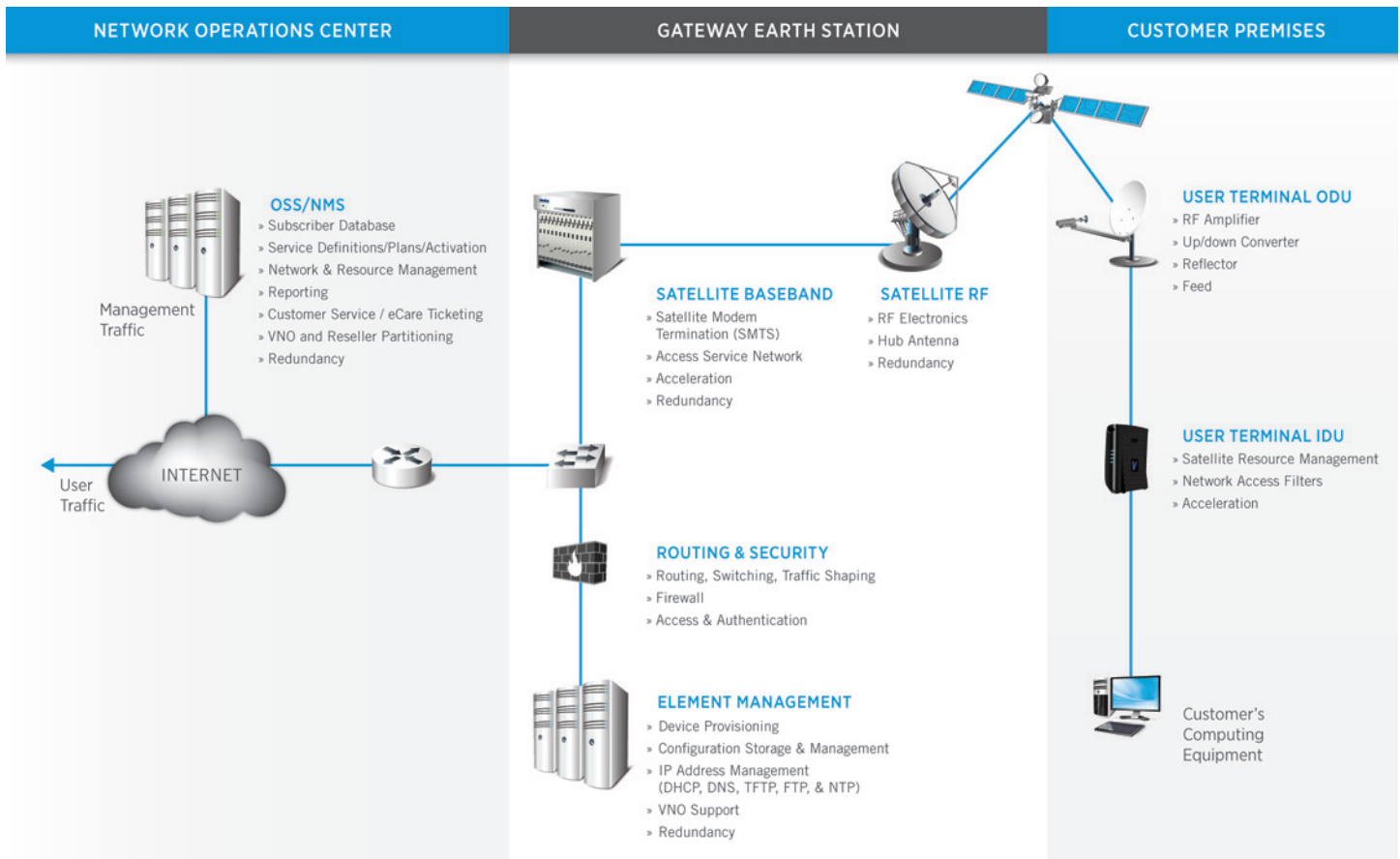
### End User Applications

- » High-speed Internet web browsing
- » Real-time video streaming and video downloads
- » IP-based voice and video (IP-TV, video telepresence)
- » Internet and Outlook/Exchange email
- » SharePoint, CRM/ERP applications
- » Configurable as a Layer 2 or Layer 3 network device for total enterprise networking flexibility
- » Internet multitasking, such as web browsing while talking on an IP soft phone
- » Multicast media and content delivery
- » Remote connectivity, including temporary and nomadic sites
- » Business continuity

### Service Provider Capabilities

- » Central operation of multiple gateways/satellites
- » Wholesale and retail service model support
- » Fixed-rate and metered service plans
- » Web portals for installers and VNOs
- » APIs for development of custom management interfaces

## SURFBEAM 2 NETWORK DIAGRAM



“This new system can change the perception of satellite broadband, to one of superior performance and a great choice for broadband.”

**JOHN MADURI,**  
CEO, XPLORNET COMMUNICATIONS, INC.

## YOUR PARTNER

### You Can be Confident with ViaSat as Your Partner

We are a valuable long term partner for service providers looking to maximize the value of their space segment investment over the coming decades. We are committed to the broadband satellite market and will continue to invest strongly in next-generation technologies to enable this market. Our first-generation SurfBeam system is the ground system of choice for several leading Ka-band satellite service providers around the world, demonstrating its ability to scale and support large networks. The SurfBeam 2 system builds upon that success with significant innovations and scalability. More enhancements are on the way that will further improve the operation of the physical layer while maintaining the scale and performance of the system already deployed around the world. As the leader in Ka-band broadband services worldwide, we stand committed to providing an unmatched level of products and services to the market and our partners.

ViaSat is a satellite network innovator for residential, business, defense, and mobile markets. Our revenues reached \$802 million during the past year, ranking us among the Space News “Top 50 Space Companies.” We have also received national recognition for our long-term record of growth and stability from INC, Red Herring, Business 2.0, Fortune, Business Week, and Forbes. We employ more than 2,100 people, including eighteen regional offices worldwide.



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