



Full Mesh Network Solution The Ultimate in Performance & Flexibility

The VSATPlus II satellite communications terminal is **PolarSat's** cost-effective, multiservice time division multiple access (TDMA) system with full mesh network connectivity. With more standard features than ever before, the field-proven VSATPlus II surpasses price and performance levels of competing DAMA systems.

With its ability to support data, video, voice and facsimile, the VSATPlus II terminal is the ideal low-cost modular system. It supports a full complement of information transport applications, including Frame Relay, IP packets, low-and high-speed serial data, multichannel high-quality voice, two-way videoconferencing, and facsimile - all in a single, integrated, fully digital network.

PolarSat's VSATPlus II operates in a full mesh network for single-hop terminal-to-terminal connectivity. Serial data, video, voice, and facsimile connections can be made directly from one remote site to another, eliminating the need for a central hub. The NMS controls Frame Relay Bandwidth on Demand (BoD) connections to provide intelligent space segment management. BoD management provides the network operator full bandwidth control to meet users' connectivity requirements.

Every new VSATPlus II is backed by over 20 years of experience in manufacturing, installing, and maintaining mesh TDMA networks worldwide. Through constant quality improvement, the VSATPlus II reaches new levels of reliability, flexibility, operating efficiency, and growth capability. The result is a network solution that meets your most demanding communications requirements now, and well into the future.

Features

- ▶ Toll-quality voice, data, video, and facsimile services combined on a single, low-cost platform
- ▶ Standards-based Frame Relay interface to support a variety of user applications
- ▶ Hubless, full mesh Demand Assigned Multiple Access (DAMA) operation with single satellite hop
- ▶ Maximum use of satellite bandwidth by combining Time Divisional Multiple Access (TDMA) and frequency hopping (FHOP) techniques
- ▶ Fractional, split, and DAMA E1 services
- ▶ Network Management System (NMS) offers sophisticated network control for dynamic Bandwidth-on-Demand (BoD) services
- ▶ Easily installed and expandable terminals for low-cost network growth



Markets Served

PTTs & telcos

Private carriers

Government agencies

Corporations including:

Banking and financial institutions

Petroleum and oil exploration

Mining and natural resources

Manufacturing

Construction

Aerospace

Retail

Service industries

Services Supported

Data

Frame Relay packet services

Local area networks

Batch file transfer

Client server

High-speed computer data transfer

High-resolution image transfer

Telephony (packet services)

VoIP, VoFR

Telephony (switched services)

Voice

Facsimile

In-band-data

Compressed digital videoconferencing

Applications

Corporate Private Networks

Public Switched Telephone
Networks (PSTN)

Backbone telephony, data, and
videoconferencing networks

Telephony service

Extended or supplemental services

Temporary, emergency, or backup
communication services

Distance learning

Telemedicine

Internet Access



Network Features

Fully integrated services in a single platform

The VSATPlus II terminal is based on TDMA with frequency hopping (FHOP). Taking advantage of both time domain and frequency domain access methods, the VSATPlus II allows users to support multiple services such as data, voice, and videoconferencing in one simple, integrated platform.

The single VSATPlus II platform eliminates the need to overlay a multiplicity of equipment allowing for a more reliable, flexible, and economical solution.

Hubless, full mesh operation with single satellite hop

The VSATPlus II is based on a distributed architecture that supports various network topologies including star, full mesh, hybrid, or any combination of these.

The VSATPlus II architecture eliminates the need for costly central hub equipment and improves call quality by transferring information over single satellite hops. Transponder bandwidth and power requirements are greatly reduced.

Frame Relay Packet Services

PolarSat's Frame Relay support provides a powerful and cost-effective solution to corporations, governments, and service providers who need to interconnect locations via a satellite-based backbone. The Frame Relay Interface is



The VSAT*Plus II* with Frame Relay is the ideal solution for data, voice and video connectivity. Private and public network applications can take advantage of the inherent easy and low-cost growth features of the VSAT*Plus II* system. Network traffic capacity can be increased and service mix changed simply by software control or by adding more interface cards as required.

based on industry-standard Frame Relay and adds powerful packet-switched data capability to the VSAT*Plus II*. Corporate users are provided a single transport mechanism that can encapsulate other user traffic such as TCP/IP, UDP/IP, IP, and X.25 while providing mesh communications among all sites within the network.

Satellite bandwidth is allocated through committed information rate (CIR), excess information rate (EIR), and Quality of Service (QoS) definitions, and optimized using dynamic bandwidth allocation (BoD) techniques, thereby minimizing recurring communications network costs. This approach provides user circuits with guaranteed bandwidth and the ability to request additional bandwidth from the network. VSAT*Plus II* provides the virtual LAN in the sky with the satellite bandwidth resource shared among all users.

Software control of adjustable modem transmission (burst) rate

The VSAT*Plus II* terminal offers a satellite modem with software-configured, adjustable transmission (burst) rates at speeds from 512 kbps to 10 Mbps per carrier. This equates to an information rate range of 256 kbps to 8.75 Mbps, depending on forward error correction (FEC) rate.

These software-controlled, adjustable rates allow for extremely flexible network growth planning. Thin route networks can be started with a relatively inexpensive bandwidth configuration. Then, as growth in traffic dictates, bandwidth capacity can be expanded gradually, without modifying or adding hardware.

Carrier (frequency) hopping on up to 32 carriers

The VSAT*Plus II* allows network operators to increase transmission capacity up to 32 times, without costly RF and antenna upgrades.

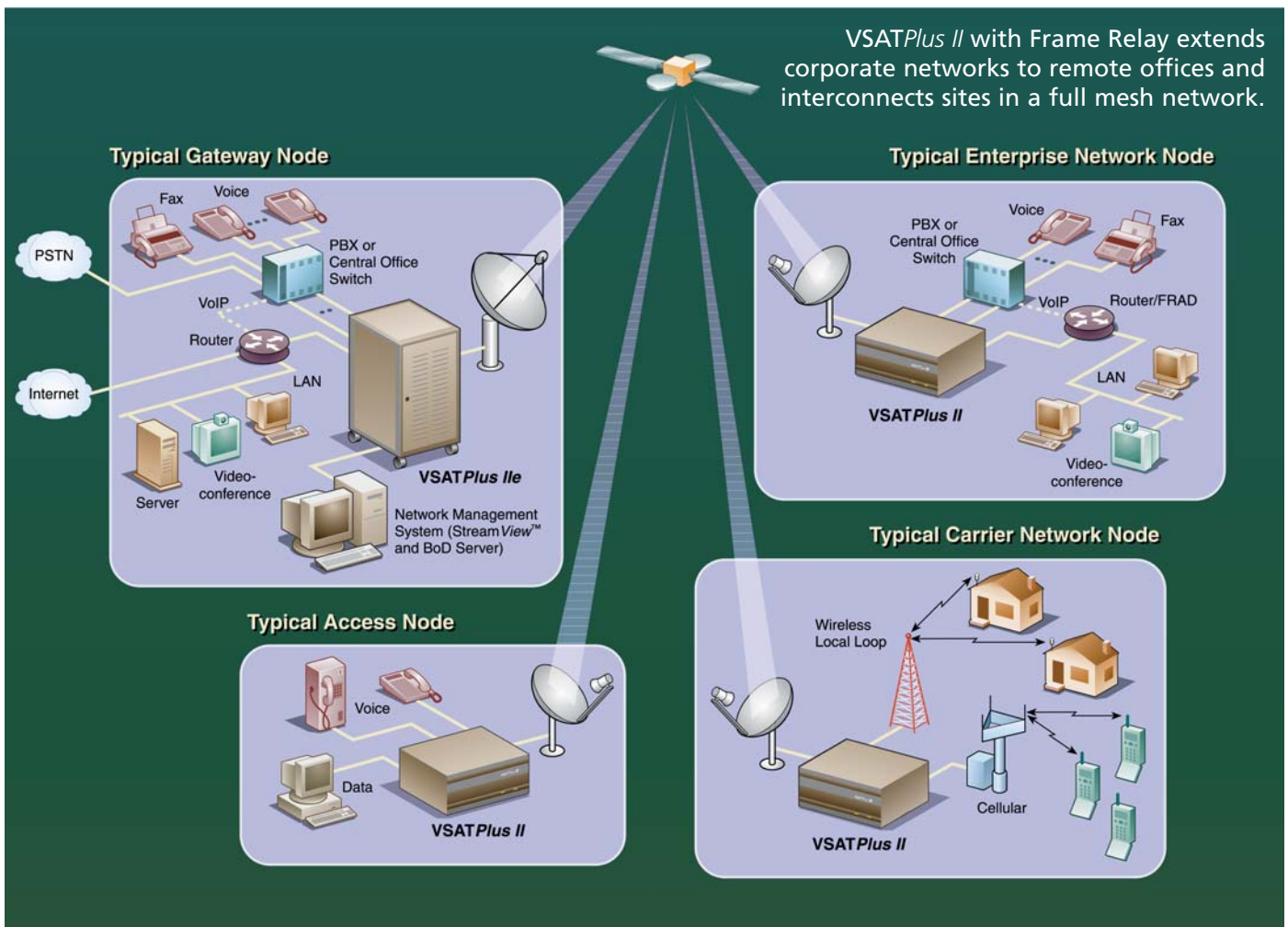


Figure 2. Typical Configurations using VSATPlus II

Dynamic bandwidth management via StreamView

The StreamView Network Manager can maximize the use of network resources including equipment hardware and software, network operation, and satellite space segment. StreamView's "Service On Demand" feature allows network operators to optimize capacity in many ways:

- ▶ DAMA, the sharing of satellite bandwidth to support dynamic assignment of data or voice channels
- ▶ Quick reconfiguration of any system element - network connectivity, bandwidth, and service mix
- ▶ Maximized available space segment by providing nearly 100% utilization of bandwidth by dynamic reallocation of capacity to other services

The StreamView Network Manager workstation can be connected to any VSATPlus II network node.

Centralized network management

The StreamView Network Manager is a key component of the overall NMS and also allows monitoring and controlling of network elements from one central location. This function provides:

- ▶ Remote node management including diagnostics, control, and configuration
- ▶ Addition and deletion of nodes without service interruption
- ▶ Management of network connectivity and service mix
- ▶ Collection of network status and alarm information

Additional StreamView options:

- ▶ Traffic management, including traffic statistics
- ▶ Call detail records (CDR) for billing
- ▶ Remote StreamView, allowing additional Network Manager platforms to operate in a Client/Server environment

Uplink power control

Uplink power control (UPC) is built into every VSATPlus II terminal. VSATPlus II's unique closed-loop architecture allows for true automatic setting of IF signal strength to compensate for uplink fade.

The VSATPlus II's UPC function consistently monitors and compensates rain fade to maintain optimum link margin. This provides increased link availability while minimizing the satellite power utilization.

Terminal Features

Flexible user interfaces

VSAT*Plus II* hardware architecture allows a variety of interface cards to be used, accommodating any combination of data, voice, video, and facsimile services in a single terminal unit.

This flexibility allows custom service tailoring at each network terminal. The use of the same type of terminal equipment in each location simplifies installation, operation, and network maintenance.

Modular architecture for easily expandable terminals and low-cost network growth

Terminal configuration and expansion is accomplished by choosing among different interface cards:

- ▶ Frame Relay Card
- ▶ Four-channel analog Voice Card
- ▶ Two-channel Data Card
- ▶ Thirty-channel digital E1 Card

These cards are interchangeable in any VSAT*Plus II* (three-slot interface card capacity), and any VSAT*Plus IIe* (ten-slot user interface card capacity).

Simply adding more cards as demands outgrow capabilities substantially reduces the costs of terminal upgrades. These interchangeable cards minimize incompatibility issues, allow common network sparing, and assure the greatest return on investment as communication needs change.

Multidestination (split channel) operation

All multiple-channel digital interface cards, whether voice or data, support service routing to and from multiple destinations. Fractional, split, and DAMA E1 services are supported where only the active channels are transmitted over the satellite network.

Multidestination operation reduces the number of E1 interface ports required. It also eliminates the need for inefficient point-to-point circuits, and reduces the space segment bandwidth required to meet traffic demand.

Operation with lower power RF and smaller antenna sizes

The VSAT*Plus II* reduces costly RF equipment investment in two ways. First, VSAT*Plus II*'s lower bit rate modem allows for significantly reduced antenna sizes and RF power requirements. Second, because of **PolarSat**'s unique implementation of time and frequency domain access methods, the VSAT*Plus II*

does not require additional RF hardware for FHOP operation. Typical outdoor unit sizes are 1.8 meter antenna with 2 watt RF for Ku-band, or a 2.4 meter antenna with 5 watt RF for C-band.

Online redundancy

Available as an option on the VSAT*Plus IIe*, the standby Modem Card can automatically come online as needed, without loss of service. Integrity is enhanced by periodic self-check diagnostics performed by the standby Modem Card and monitored by the StreamView Network Manager. This allows the redundant equipment to assume service, if needed, without operator intervention.

Integrated monitor and control

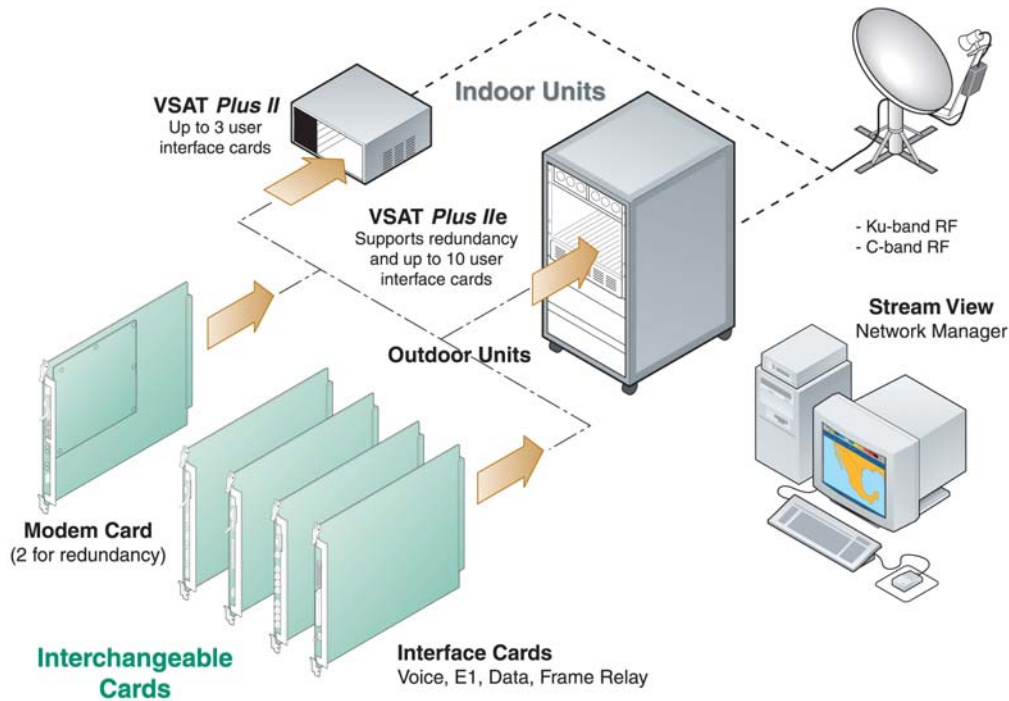
The VSAT*Plus II*'s built-in diagnostic and self-test tools allow network operators to query and activate control or diagnostic functions remotely from the StreamView Network Manager, down to the port level. Optional earth station monitor and control provides real-time monitoring of earth station ancillary equipment/facility parameters, and reports changes and alarm status to StreamView.

The built-in and optional monitor and control features simplify unattended earth station operation by providing central monitoring of all components via StreamView, while minimizing maintenance and troubleshooting costs.

PolarSat for satellite communications equipment and solutions

Contact your **PolarSat** Regional Sales Representative now to find out how the VSAT*Plus II* can be tailored to your specific communication network plans. A VSAT*Plus II* solution, along with **PolarSat**'s worldwide sales, service, and operational facilities, can fulfill your communication network needs now and well into the future.





VSATPlus II™ Summary Of Specifications

BASIC FEATURES

- ▶ Integrated platform for Frame Relay packets, serial data, voice, video, and facsimile applications
- ▶ Full mesh DAMA operation with single satellite hop
- ▶ Software-controlled adjustable rate satellite modem
- ▶ Forward error correction (FEC) code rates of 1/2, 3/4, and 7/8
- ▶ Concatenated Reed-Solomon coding for Frame Relay Traffic
- ▶ Carrier (frequency) hopping on up to 32 carriers
- ▶ Easy terminal installation and low-cost network expansion
- ▶ Fully automatic acquisition and synchronization operation
- ▶ Operates with C- or Ku-band radio frequency (RF) systems (other bands optional)

NETWORK SERVICES

- ▶ Voice
- ▶ Data
- ▶ Videoconferencing
- ▶ Facsimile
- ▶ LAN interconnect
- ▶ High speed imaging
- ▶ E-mail
- ▶ WAN services
- ▶ Backup circuits to terrestrial links

OPERATING MODES

- ▶ Preassigned (full period)
- ▶ Fractional E1 (N x 64)
- ▶ Split channel E1 (multidestination)
- ▶ DAMA
- ▶ Bandwidth on demand
- ▶ Any combination of operating modes

MODEM CHARACTERISTICS

- ▶ Satellite Access Technique: Time division multiple access (TDMA) with frequency hopping
- ▶ IF Interface: BNC connector, 75 Ohm
- ▶ Demodulator Input Level: -38 dBm ±12 dB
- ▶ Modulation Type: Quadrature phase shift keying (QPSK)
- ▶ Information Data Rate Range: 256 kbps to 8.75 Mbps
- ▶ IF Interface Frequency: 52 to 88 MHz
- ▶ L-Band Option: 950 to 1450 MHz
- ▶ Modulator Output Level: -18 dBm ±8 dB

Bit error rate performance (IF back-to-back modem)

FEC

Bit Error Rate	E_b/N_0 (dB)		
	R 1/2	R 3/4	R 7/8
1×10^{-4}	4.5	5.5	6.9
1×10^{-6}	5.9	7.2	8.3
1×10^{-7}	6.6	8.2	9.7

FEC with R-S

Bit Error Rate	E_b/N_0 (dB)	
	R 1/2 Inner Code	R 3/4 Inner Code
1×10^{-6}	3.7	5.2
1×10^{-8}	4.1	5.7
1×10^{-10}	4.7	6.3

Note: R-S only available for Frame Relay traffic

CUSTOMER (TERRESTRIAL) INTERFACES

(3-card capacity in VSATPlus II and 10-card capacity in VSATPlus IIe)

- ▶ **Frame Relay** (Packet Data):** V.35/EIA-232/EIA-449 user interface, 4.8 kbps to 2.048 Mbps, UNI as per FRF1.1, NNI as per FRF 2.1, Frame Relay packet switching per ITU-T Q.933 and ANSI T1.617 Annex D, DLCI support, CIR/EIR defined per PVC, Reed Solomon error correction provided for Frame Relay packets
- ▶ **Analog Voice*:** 4 channels per card; Voice compression at 8 kbps CS ACELP (ITU-T G.729A), 16, 24, and 32 kbps ADPCM (ITU-T G.726) and 64 kbps PCM (ITU-T G.711); Echo cancellation per ITU-T G.165; Group III fax bypass (up to 14.4 kbps), 2/4-wire E&M Type I-V; 2-wire subscriber (FXS/FXO); V.32bis in-band data
- ▶ **E1*:** 30 channels per card; G.703 CEPT standard; Full/Fractional E1 split-channel operation; Group III Fax (up to 14.4 kbps)+ V.32bis in-band data; Voice compression at 8 kbps CS-ACELP (ITU-T G.729A), 16, 24, and 32 kbps ADPCM (ITU-T G.726) and 64 kbps PCM (ITU-T G.711); Echo cancellation per ITU-T G.165; Signaling Options: DTMF, Decadic, R2, China No. 1, DTMF/TS16 and SS7/C7 support
- ▶ **Data (Circuit Switched):** 2 ports per card; EIA-232, EIA-449, or V.35; Speeds from 2.4 kbps to 512 kbps. 1 port per card; E1 G.703; Speed up to 2.048 Mbps.
*Dial-up: 2 ports per card; EIA-232 port; asynchronous to 57.6 kbps; synchronous to 64 kbps
- ▶ **Videoconferencing:** EIA-449, V.35, or Fractional E1/T1 (G.703), or H.323 (FR interface).

* DAMA available on these interfaces

** With dynamic BoD

NMS

- ▶ StreamView Network Manager
- ▶ NodeView Terminal Manager (PC-based software)
- ▶ Frame Relay BoD Server

OPTIONS

- ▶ Earth station environment monitor and control
- ▶ C- and Ku-band radio frequency (RF) and antenna systems
- ▶ Data line Multiplexer (DLM) - up to 30 data ports
- ▶ VSATPlus IIe (10 interface-card capacity)
- ▶ VSATPlus IIe with redundant common equipment

WEIGHTS/DIMENSIONS/POWER

	VSATPlus II	VSATPlus IIe	VSATPlus IIe Redundant
Weight (kg/lb)	27/60	70/155	81/180
Height (cm/in)	17.5/7	102.5/41	102.5/41
Width (cm/in)	44/17.4	55/22	55/22
Depth (cm/in)	46/18.4	70/28	70/28
Input Power (VAC/Hz)		85 to 265 (autoranging)/47-63	
Power Consumption (Watts)	190	225	375

POWER CONSUMPTION INTERFACE CARDS (Watts)

Voice	Data	E1	Frame Relay
40	40	50	10

ENVIRONMENTAL CONDITIONS

	Operating	Non-operating
Temperature	0 to 40°C	-40 to 70°C
Relative Humidity (noncondensing)	0 to 95%	0 to 95%



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The Canadian north, a land that is vast, rugged, and yet full of awe-inspiring beauty. The Aurora Borealis (shown here) is a light show produced by nature when the gas in the earth's atmosphere becomes charged with electric particles from the sun, and so glows with color. This spectacular show can be seen only in the most northern regions of the world and materializes in many superb color variations.



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