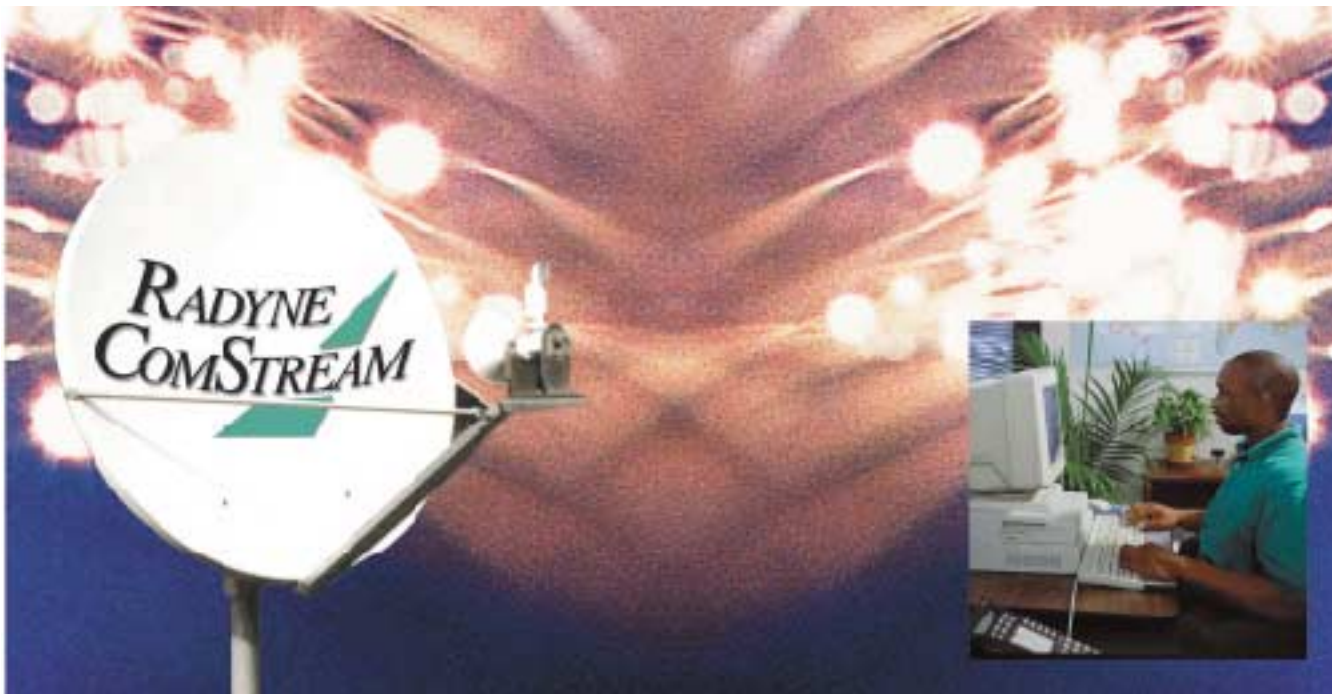




# IPSat Plus

## Bandwidth-On-Demand Internet Over Satellite



### HIGHLIGHTS

- ▶ Specifically designed for Internet traffic allowing low level continuous access
- ▶ TDMA or combination of TDM and SCPC to provide both Dynamic Bandwidth Assignment and High Bandwidth Dynamic Range - Large File Transfers do not congest the TDM Channel
- ▶ High Throughput for File Transfer and Low 'First Click' Response Time
- ▶ L-Band Interfaces allow the system to be deployed as C-, Ku-, S- or Ka-Band with inexpensive LNBS and BUCs.
- ▶ System Controls Bandwidth Assignment and Priorities
- ▶ Satellite Network Protocol Optimization for Fast Throughput of TCP Traffic
- ▶ Remote Power Control

### IPSAT PLUS NETWORK

The Radyne ComStream IPSat Plus Network is a bi-directional Internet Over Satellite System designed for bandwidth-on-demand networks. Ideally suited for Internet POPs, ISPs, corporate intranets and private networks, the IPSat Plus Network is deployable over C-, Ku-, S- or Ka-Band Satellite Systems.

The IPSat Plus Network consists of a Master Hub Station, Remote Site Equipment, Monitor and Control System and Transmission System Controller.

IPSat Plus was engineered for power and flexibility. The IPSat Plus Network can manage and communicate with up to 2000 Remote Sites with connection speeds up to 72 Mbps on the outbound channel and up to 512 kbps (2 Mb optional) return channel. Each Remote Site terminal can support up to 400 simultaneous users. Also, because the IPSat Plus Network was designed for Internet networks exclusively, costly bandwidth is minimized, Internet traffic is optimized and hub cost is reduced.

The IPSat Plus Network has evolved from Radyne ComStream's internationally deployed IPSat suite of satellite communications products. The network is designed for implementation through a point-to-multipoint or 'Star' network topology.



## OVERVIEW

IPSat Plus was specifically designed to offer Internet connectivity at a low ground and space segment cost. Internet specific hub and remote equipment minimizes deployment costs, while the highly-efficient TDMA/SCPC return link maximizes bandwidth efficiency greatly reducing recurring costs.

IPSat Plus is an IP packet-based transmission system. All traffic passes through the Hub System. The Hub System manages all traffic into, within and out of the IPSat Plus Network. All traffic moving from the hub site to remote sites is broadcast to all remote sites simultaneously through a high-speed (up to 72 Mbps) outbound link. Remote sites process all incoming data and pass only the packets destined for its network. Remote site traffic intended for the Internet or other remote sites returns through either an SCPC or TDMA circuit depending upon traffic volume and demand.

## HOW DOES IT WORK?

The outbound channel from the hub is a high-speed TDM link that can address each ISP/POP individual or downlink caching information such as movies, games and music to all sites.

At the remote sites, the Internet packets are buffered and sent on each remote's burst time along with buffer status information. The remote sites are 'dumb' terminals taking all instructions from the master on the outbound channel. The burst length, frequency, power and timing are all controlled by the master.

In addition to the TDM channel, each remote is capable of being switched to an SCPC channel to transmit large files or if the buffer is filling up. By switching to an SCPC channel, the TDM channel remains open.

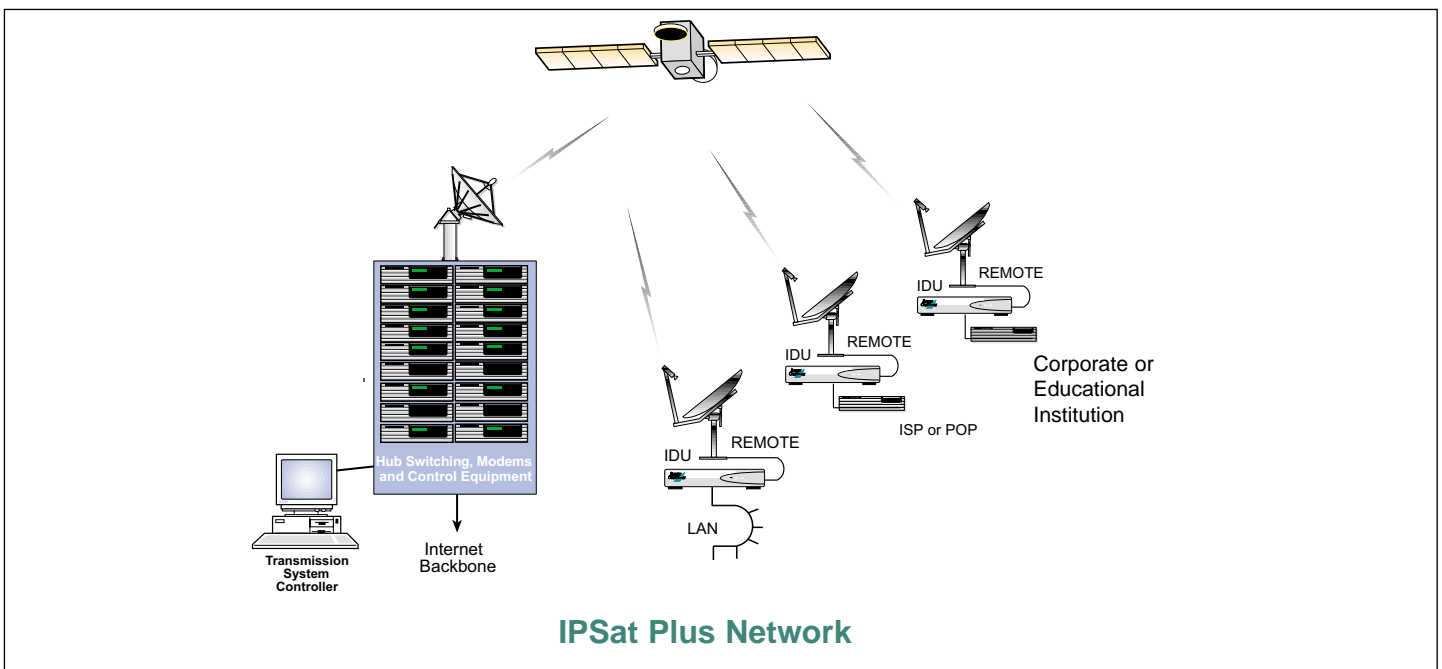
## SYSTEM DESIGN

IPSat Plus is an IP Packetized system utilizing a common high-speed outbound Time Division Multiplexed (TDM) channel to broadcast packets to all of the remote sites in the network. Each remote terminal receives all of the broadcast packets and filters out only packets specifically addressed to it. The remote uses a Time Division Multiple Access (TDMA) channel to communicate to the master hub. Each remote has a continuous low level burst to maintain communications along with an optional SCPC channel to handle file transfer.

The outbound TDM channel can operate at speeds up to 72 Mbps. Hundreds of remote sites can be supported in a single network. The inbound TDMA channels can operate at rates up to 512 kbps allowing a small startup configuration at the hub in addition to low space segment costs.

## IPSat Plus Features

- ▶ Designed for Internet
- ▶ TDM/TDMA Star Topology Network
- ▶ Powerful Network Management System
- ▶ SCPC Support Channel
- ▶ High-Speed Outbound Channel Allows Caching of Movies, Games etc.



## MASTER HUB

The nucleus of the IPSat Plus system is the central hub where all the packet traffic is concentrated and routed. Traffic can be directed to Enterprise hosts, PABX systems, LAN servers etc., or to IPSat Plus terminals providing complete connectivity from any system port to any other system port.

The central hub facility is typically comprised of three main components:

**Antenna:** A high gain antenna subsystem operating at Ku-, C-, S- or Ka-band frequencies.

**RF:** Microwave amplifiers, receivers and frequency converters usually packaged in a redundant configuration for added reliability.

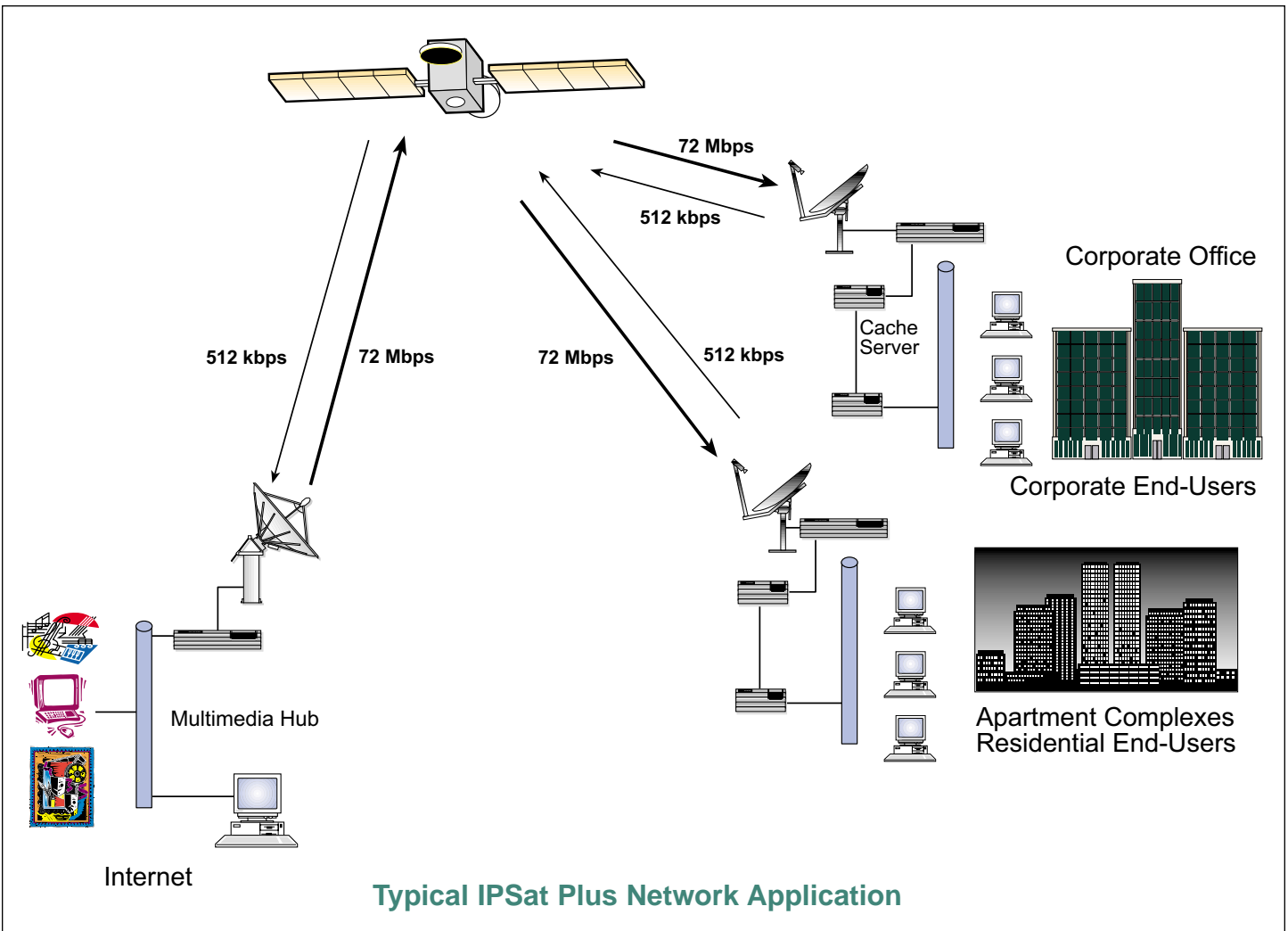
**Modems and Baseband:** Performs modulation, burst demodulation, packet switching, data routing, protocol emulation and interfacing with the user's equipment.

## TRANSMISSION SYSTEM CONTROLLER

The IPSat Plus Transmission System Controller (TSC) manages, controls and optimizes bandwidth usage. The TSC is responsible for increasing or decreasing remote terminal return data rate based upon a variety of configurable parameters such as priority, time of day and traffic patterns. The TSC commands and controls remote terminals via the 72 Mb outbound DVB carrier. All requests to increase bandwidth or relinquish bandwidth back to the network are sent from the remote terminals to the TSC through each remote guaranteed time slot.

## MONITOR AND CONTROL SYSTEM

The IPSat Plus Monitor and Control System (M&C), which is an integral part of the TSC, monitors and controls all hardware on the network for faults and failures. The M&C can be used to perform system maintenance or to adjust transmission parameters such as frequency, power control, etc. The M&C runs on a single Windows NT™ platform and communicates to all IPSat Plus hardware locally and all remote terminals via satellite.



# IPSat Plus Technical Specifications

|                                     |  |
|-------------------------------------|--|
| Frame Size                          | User Selectable from 250 msec up to 1 Second   |
| Number of Remotes per Burst Channel | 20 remotes per channel   |
| Burst Channel Bandwidth efficiency  | Up to 96 % at 512 kbps   |
| Bandwidth On Demand Response Time   | Bandwidth is reallocated every frame   |
| First Click Access Time             | 1 frame (nominal)  |
| Quality of Service Features:        | User Selectable Information Rate with Minimum Guaranteed Minimum Bandwidth Allocation<br>User Selectable Remote Terminal Priority<br>Satellite TCP/IP Optimization |
| Ethernet Interface                  |  |
| Physical Interface                  | 10 Base T/100 Base, IEEE 802.3u (RJ45)   |
| Protocols                           | UDP, TCP, ARP  |
| IP Addressing                       | User Programmable  |
| IP Filtering                        | User Programmable Static Rates   |
| Packet Delivery Modes               | Unicast, Multicast   |

## FORWARD DATA CHANNEL

|                    |   |
|--------------------|---|
| Modulation         | QPSK                                    |
| Data Throughput    | Up to 72 Mbps                           |
| Symbol Rates       | Up to 45 Msps                           |
| FEC                | Concatenated Reed Solomon and Viterbi   |
| Viterbi rates      | 1/2, 2/3, 3/4, 5/6, 7/8                 |
| Reed Solomon Rates | 188/204 (DVB)                           |
| DVB Compliant      | EN 300 421, EN 301 192                  |
| Hub Modulator      | DM240 Digital Video Broadcast Modulator |
| Remote Demodulator | IPSat Plus Internet Satellite Terminal  |
| Redundancy         | 1:1 Redundancy Option Available         |

## TDMA RETURN CHANNEL

|                  |   |
|------------------|---|
| Modulation       | QPSK  |
| Data Throughput  | 512 kbps (2.048 Mbps, optional)                             |
| FEC              | Viterbi 1/2, 3/4  |
| Remote Modulator | IPSat Plus Internet Satellite Terminal with Burst Modulator |
| Hub Demodulator  | IPSat Plus Burst Demodulator                                |
| Redundancy       | 1:1 Redundancy Option Available                             |

## TRANSMISSION SYSTEM CONTROLLER

|                           |   |
|---------------------------|---|
| Monitor & Control         | User control from the Hub of all Forward channel and TDMA Return channel parameters for both the Hub and the Remote<br>Received signal level, Eb/No, carrier offset, and fault summary for both the Hub and the Remote site equipment<br>MPEG and IP Packet statistics<br>Remote Buffer Fill Status<br>Dynamic Bandwidth Allocation<br>Automatic Remote Uplink Power Control<br>Automatic Remote Path Delay calculation, tracking, and correction due to satellite movement<br>Automatic Remote Frequency Correction<br>Automatic Remote Data Rate Correction |
| Status Reporting          |   |
| IPSat Plus System Control |   |

Contact your Radyne ComStream representative for more information on Internet via Satellite Systems or for equipment specifications on the Modulators and Demodulators used in the IPSat Plus system.

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