

CONSTELLATION

CREATING RELATIONSHIPS

iDirect Technical Superiority for IP Over Satellite

1. A True One Box Solution (5-in-1 Functionality)

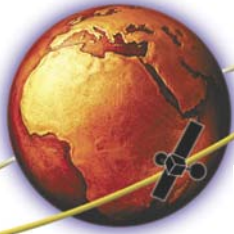
The NetModem II+ provides a simple and elegant "One Box" Solution that delivers a satellite modem, IP router, TCP optimization over satellite, 3DES Link Encryption and QoS/prioritization in one box. This has a tremendous benefit to the Network Operators and End Customers. The benefits include:

- Solution Flexibility
 - TDMA or Point-to-Point-IP Mode (Software change)
 - Mobile or Maritime Application Support
- Lower Hardware Costs
 - Most vendors solutions require multiple boxes (Satellite Modem, IP Router, TCP Acceleration, Encryption, QoS/Prioritization). This is especially true with SCPC based solutions
 - Typical multi-vendor solution costs ~\$20,000 (list)
- Lower Operational Costs
 - Rack Space
 - Power
 - Higher MTBF
 - Lower Training Costs
 - Sparing Costs
 - Inventory Management
- Ease of Management
- Increased End User Satisfaction
- Fewer Vendor Contracts

2. Significantly Higher IP Throughput When Compared to Competitive Solutions

iDirect's technology was built from ground-up to be optimized for IP over satellite. The key advantage to the iDirect architecture is it's ability to yield more IP Throughput relative to total satellite capacity. Satellite capacity is a Network Operator's greatest recurring expense in providing IP satellite services. The iDirect technology enables both greater IP performance for end users, and lower satellite costs for the Network Operator, when compared to competing implementations.

In certain configurations, the iDirect solution yields up to 80% higher IP throughput over the same satellite capacity when compared to some of the competitive solutions. This allows the Network Operator to drastically reduce overall costs, be competitive, and provide a better service to its customer base.



3. Business Class Reliability and Availability

Corporate network are slowly but surely becoming “mission-critical” to the success of many businesses. Reliability and availability are now an absolute minimum necessity for any organization. Traditionally this meant implementing a very expensive and high maintenance systems to provide this functionality. iDirect technology has implemented a field tested, state-of-the-art technology that provides the reliability and availability at a fraction of the cost of traditional systems. iDirect systems have been designed and implemented for 99.99% availability at the hub sites and over 99.9% availability at the remote locations. iDirect has also implemented multiple levels of checks and balances to ensure continued operation of the overall network, even through rain and other weather conditions. Within the iDirect system, no one system can bring a network down (as some of our competitor’s technologies have been known to do).

The competitive advantages of providing a business class reliability and availability solution, that is cost-effective, are numerous. Customer retention, customer satisfaction, and overall market leadership are a few examples.

4. Built-in Traffic Engineering Capability

Any successful Service Provider or Network Operator understands the importance of Traffic Engineering a network. Traffic engineering ensures an optimal performance of any network infrastructure, while maintaining a very cost effective solution. iDirect provides world-class traffic engineering tools and capabilities that allow a Network Operator to design and maintain a network of any type or requirement.

As different customers or different applications have different traffic characteristics, it is important for network operators to be able to design a network to support these requirements. The iDirect solution has traffic engineering features and capabilities that address layer 1 – layer 4 of the OSI stack. This tremendous flexibility and feature richness allows a network operator to design the most optimal solution to support any type of application.

Traffic engineering features include,

- Different Encoding Options
- Variable Frame Length (Support of realtime traffic and non-realtime traffic)
- Ability to change carrier size in 100 Hz range. Highly granular.
- Rate Limiting capability on a remote-by-remote basis.
- CIR or Committed Information Rate (Dynamic and Static) Capability
- VIR or Variable Information Rate Capability (Allows for burstability)
- QoS or Quality of Service. Class based queuing for prioritizing and allocating bandwidth for different types of traffic. This ensures mission critical applications bandwidth even during congestion times. Group QoS Support.
- Deterministic TDMA (See sub-section)



5. Deterministic TDMA (D-TDMA)

TDMA allows a single allotment of bandwidth to be efficiently and effectively shared among multiple users that take turns transmitting bursts of data through a common high-speed channel. TDMA has been proven to be the most efficient in terms of throughput and satellite resource requirements, allowing bandwidth to be available when needed without requiring customers to pay for a channel that they are not using. iDirect technology allows satellite resources to be oversubscribed at any desired level and still deliver acceptable performance. iDirect's adds significant efficiency and performance improvements to the TDMA architecture, by dynamically allocating available time slots to any branch that needs the bandwidth. The iDirect Protocol Processor analyzes TDMA slot allocations and bandwidth requirements at each remote multiple times a second and allocates them fairly. iDirect's current upstream bandwidth allocation scheme allows a network operator to assigned bandwidth to a remote in a deterministic manner. This allows for a significantly improved response times and increased efficiency in the manner the bandwidth is allocated to each remote terminal.

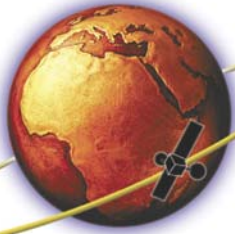
The use of TDMA in conjunction with dynamic slot allocation provides the most efficient use of satellite bandwidth. Most competitive solutions use Slotted-Aloha or Bandwidth Reservation mechanisms. These protocols are limited to 37% efficiency, thus potentially reducing the overall efficiency of bandwidth allocated (used). The iDirect system is over 98% efficient, which increases IP throughputs and thus potentially increase revenues to the network operator.

iDirect's D-TDMA has allowed numerous network operators now provide service with certain guarantees to its customers, as opposed to SCPC based solutions which are typically much higher cost to operate and maintain.

6. TCP Optimization Over Satellite

TCP Acceleration: Satellites seem an ideal means for offering Internet and intranet access over long distances and to remote locations. However, Internet protocols are not optimized for satellite conditions, and consequently, the throughput over satellite networks is restricted to only a fraction of the available bandwidth. iDirect engineering has addressed and overcome these issues. The TCP/IP protocol was not designed to perform well over high-latency or noisy channels. Geo-stationary satellite links are inherently slow and can be noisy. TCP/IP based data communication is almost useless at Bit Error Rates (BER) of 10^{-7} or higher. The TCP/IP shortcomings in the typical satellite environment—degradations due to slow-start, window size, and acknowledgment frequency—are well known. There have been attempts to deliver IP over satellite, but the satellite technologies have focused on connection-oriented transmission protocols that are really suited for voice traffic rather than IP, and unnecessarily waste expensive capacity.

Over the iDirect system this happens in both directions, where most of our competition only provides in one direction. In addition, one can achieve line rate throughput even with one TCP session. This allows a Network operator to provide superior and premium services to its customer base.



Web Acceleration: As web based applications are increasing the corporate networks, there are many different options on improving Web or HTTP performance over satellite. This can be achieved by using caching solutions and other methods. Most of these options increase overall costs of the network. iDirect's, built-in, industry leading Web acceleration provides, a no-cost, increased web or HTTP response time for better user experience. This allows Network Operators to defer the need to implement caching solutions and other expensive options, thus reducing overall capital investment

7. Hub Solution Scalability

The Hub Chassis is 20 slot, 10U, 19" Rack Mountable device, that is used to house the iDirect Hub Line Cards. It is a very scalable device that allows for multiple multi-inroute networks within the same chassis. The system is also scalable in the fact that one can have multiple hub-chassis in one location, serviced by the same NMS Server. This device is a completely redundant solution with power, fan, and line card redundancy.

The iDirect Hub Chassis platform currently delivers the following features:

- Scalability
 - o Bandwidth
 - o Multi-inroute architecture allows for better use of satellite capacity
 - o Frequency hopping allows for more efficient network design
 - o Scaleable protocol processors as load increases
- Carrier Class - fully redundant
- Multiple RFT outputs (Up to 5 per chassis)
- Support for Multiple multi-inroute network architectures
- Universal Line Cards can be configured as either downstream or upstream
- Support of SCPC or TDMA network architectures
- Allows for Daisy-Chaining of Hub Chassis to support a large multi-inroute network
- AC or DC power supplies
- Most capacity in a very small foot print
 - o 10U Rack Mountable Chassis (17.5 inches)
 - o 19" Rack Mountable
- Lower cost of entry allowing network operators to more easily provide service
- Exponential lower cost platform than alternative DVB based hubs
- Much quicker ROI
- Bandwidth limited solution
- Tremendous savings on monthly recurring costs on satellite space
- More revenue potential for Network Operators
- More savings for customers



8. ANY IP Application Supported

iDirect solution does not limit the end user on what IP applications they can use, as most of our competitors solutions do. It is important to make the network infrastructure agnostic of the applications that an end-customer is looking to implement. Over the iDirect system any TCP and IP application can and will work. iDirect has implemented numerous optimization techniques into the product to ensure the minimal effects of the physical latency of a geo-synchronous network.

Over the iDirect network application such as Voice (VoIP), Oracle, SAP, Citrix, Web, HTTP, SSL, e-Mail, FTP, RTP, H.323, VPN, and others have been successfully implemented by our customer base.

The iDirect solution has all the features and configuration capabilities to be used in both a high bandwidth and low bandwidth applications. In either networks all the iDirect features of traffic engineering, security, protocol optimization, and high-efficiency are not compromised.

9. Network Management System (NMS)

A major network management issue for large distributed networks regards scalability. As networks grow larger, additional personnel and 24x7 monitoring certainly help, but without a scalable network management infrastructure the task can quickly get out of hand.

iDirect's Network Management System (NMS) provides the necessary scalability and feature rich support tools essential to monitor and control operations from a centrally-located network operations center (NOC). The NMS also provides a common interface capable of managing iDirect's entire product line. It is the most comprehensive Network Management System in the industry. The iDirect NMS provides absolute flexibility by allowing networks to be partitioned along whatever lines make sense to our customers' concept of operations. By dividing the networks across multiple instances of the NMS, network operators can consider geographic areas, satellite transponders, or groups of remote branches separately, as appropriate.

A completely GUI based NMS provides the Network Operator with the features and functionality to do configuration, proactive monitoring, historical trend analysis, and centralized network maintenance. All these features help to reduce the overall operational costs for the network operator, while at the same time providing increased customer satisfaction.