

## TABLE OF CONTENTS

### TABLE OF CONTENTS

Executive Summary	3
Introduction	3
Business Continuity and Disaster Recovery	4
Overcoming WAN Failures	5
Terrestrial WAN Backup Does Not Assure Business Continuity	5
Satellite-based Networks Provide Reliable Service	6
Selecting a WAN Backup Solution	8
Integrated VSAT Solution Addresses Broad Range of Customers	9
Expanding Service Providers Opportunities with VSAT Networks	11
Conclusion	11
Appendix	12

## EXECUTIVE SUMMARY

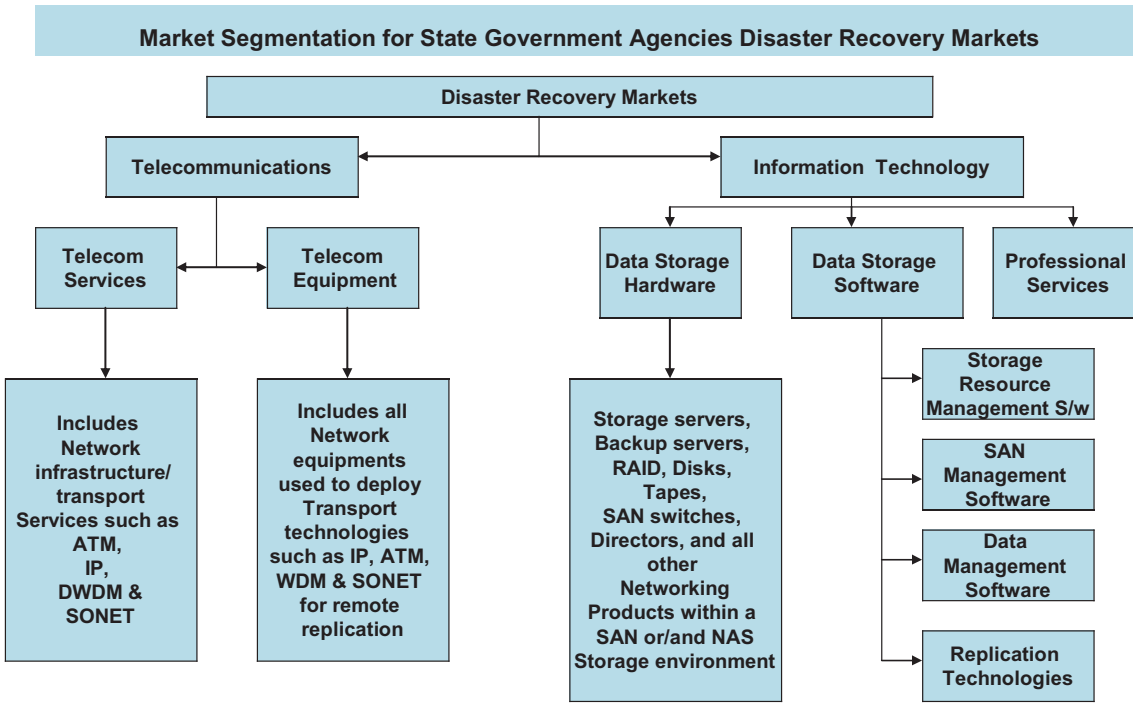
For many enterprises, the IT infrastructure is an integral component of their business success strategy. But the network services businesses use do experience outages from time to time for a number of reasons ranging from human error or malicious intent to equipment failure and environmental factors. Inability to access critical information can not only hurt an organization's reputation and bottom line but may even result in unnecessary loss of life and property. For these reasons, few businesses today can afford to be without a business continuity and disaster recovery plan. Cisco, by integrating (very small aperture terminal (VSAT) technology into its enterprise routers, offers IT managers a reliable, single-box solution for satellite-based WAN backup, one that is much less vulnerable than terrestrial WAN backup alternatives. For wireline service providers, the VSAT-in-a-router solution is an opportunity for expanding their service portfolio.

## INTRODUCTION

Most organizations today have a significant investment in their IT infrastructure to increase productivity and enhance their competitive position. Almost half of medium-size businesses (those with 100 to 499 employees) spend \$500,000 or more annually to meet their IT and telecommunications needs; for a majority of large enterprise (those with 500 or more employees), IT/telecom expenditures run a million dollars or more a year. A substantial amount of the telecom budget is for intra-company communications because about 75 percent of medium-size businesses and approximately 90 percent of large enterprises have multiple locations. Additionally, businesses also need to communicate with partners and they need access to the Internet.

Because few IT managers will want to underestimate the vulnerability of their IT infrastructure, including the possibility of losing telecom services, business continuity and disaster recovery is now top-of-mind for many IT managers. In fact, IT and telecom are the two broad segments constituting the disaster recovery market (See Figure 1). But whereas considerable attention is paid the IT aspects of disaster recovery, planning is also needed to ensure the availability of the communications infrastructure—for the primary data center *and* remote sites.

**Figure 1: Disaster Recovery Markets**



**BUSINESS CONTINUITY AND DISASTER RECOVERY**

The terms business continuity and disaster recovery are often conflated or used interchangeably, but they actually have very different meanings:

- **Business Continuity** is the ability to maintain acceptable operational capability during and after a disaster
- **Disaster Recovery** is the response to a disaster that has degraded operational capability below an acceptable level

Business continuity is a large and diverse field covering all aspects of an organization. However, because of the increased reliance on productivity tools, most of the focus today is on the IT aspects of business continuity, such as disk replication, backups, and redundant data centers. But there is another, often overlooked yet critical aspect of business continuity: having a backup WAN in the event of loss, temporary or extended, of the primary network. Moreover, it is not enough to have WAN backup capability for just the headquarters; rather, disaster recovery planning should also include WAN backup for remote branch locations. This is necessary because, were a widespread disaster to occur, WAN backup for the data center will do little good if remote branch sites cannot access it.

## **OVERCOMING WAN FAILURES**

Malicious acts, such as the one that led to the collapse of the World Trade Center or natural disasters like Hurricane Katrina in 2004, thankfully are few and far between. Even so, telecom services have and will experience disruptions despite all of the availability, reliability, and survivability designed into terrestrial carrier networks. Downtime of an organization's WAN can result from service provider equipment malfunction, human error, fire, power outage or any number of other reasons, not to mention the proverbial backhoe. The effects of a severe, protracted loss of network availability can be especially devastating to a business. According the U.S. Department of Labor, "Only 40 percent of businesses survive after a disaster and only 28 percent of those last longer than a year afterwards."

Yet, it is precisely in such disruptive situations when the primary network is compromised that organizations need to have in place a business continuity and disaster plan. Such a plan should assure that remote locations maintain near seamless access to mission critical information, including connectivity to a secondary data center should the primary data center experience an outage. Such a WAN backup capability will be especially important for certain organizations such as government agencies at the federal, state and local levels, as well as financial services firms and other vertical segments.

## **TERRESTRIAL WAN BACKUP DOES NOT ASSURE BUSINESS CONTINUITY**

Organizations typically rely on one of two types of solutions to ensure continued access to network services. Many have redundant network connections, such as a second T1/E1 line to their service provider. Another, somewhat more reliable method of maintaining business continuity is procuring WAN service from a different carrier so that there is always the second service provider to fall back on should the primary service provider experience a network outage. Although both these methods provide some level of service assurance, it should be kept in mind that service providers often use the same rights-of-way (e.g. along railroad tracks and tunnels) for their fiber routes. A devastating fire in a Baltimore tunnel in 2001 highlighted the vulnerability of terrestrial networks by disrupting the services of multiple Tier 1 carriers. Moreover, if a disaster affects a large area, as what happened with Hurricane Katrina—hardly an isolated example of a disaster having a wide geographic impact—the loss of almost all communications alternatives is practically assured.

Although in recent years some enterprises have taken to considering wireless communications as a WAN backup option, the new 3G cellular services do not offer the availability or the data rates required by most enterprises. In any event, cellular networks have the same liabilities as wireline networks in a major disaster because cellular networks use the terrestrial infrastructure to backhaul traffic from base stations to the core network. Moreover, cellular services, even if they are available in the event of a major disaster, can quickly become overloaded.

## SATELLITE-BASED NETWORKS PROVIDE RELIABLE SERVICE

A satellite-based network is a highly reliable backup solution in the event there are problems in the terrestrial WAN. Enterprises have been using VSAT technology for more than two decades, in the beginning largely for transaction oriented applications such as credit card authorization, lottery, and content distribution. Independence from the terrestrial infrastructure combined with advances in technology enable VSAT networks to provide high-speed communications almost anywhere.

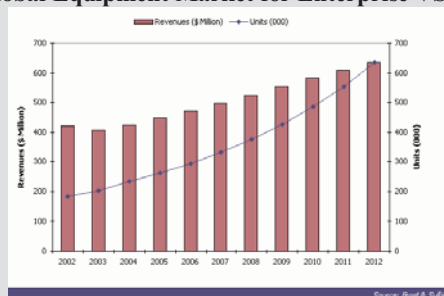
With Cisco having integrated VSAT technology in its enterprise routers, IT managers now have a simple and efficient one-box WAN backup solution. The Cisco IP VSAT Satellite WAN Network Module, which is configured like any other network module, is supported in Cisco 2800 and 3800 series Integrated Services Routers (ISR) and in the Cisco 2600 XM, 2691, and 3700 series access routers, platforms suitable for branch office sites as well as small and medium-size businesses. Because the Cisco VSAT network module is interoperable with Gilat's SkyEdge hubs, satellite service providers operating SkyEdge hubs handle the satellite configuration and manage services for customers.

The Cisco VSAT network module has a number of capabilities for making optimum use of satellite bandwidth, which is up to 10 Mbps outbound (from the satellite service hub to remote sites) and 2 Mbps inbound (shared bandwidth from remote sites to headquarters). To compensate for signal propagation delay (latency) that occurs in any communication using a high-altitude satellite, certain features embedded in the Cisco VSAT network module improve the performance of the IP network, such as TCP acceleration, HTTP acceleration, and TCP acceleration of IPSec-based virtual private network (VPN) traffic.

### Satellite-based Networks: A Proven Technology

North America is the largest market for satellite-based services with an installed base of well over a million VSATs. North American VSAT sites are expected to increase by about five percent this year. There are also hundreds of thousands of VSATs in use throughout Western Europe, and the market is estimated to grow about ten percent next year. Satellite technology simply offers another medium for communications. It also offers global coverage and supports almost all of the applications that run on terrestrial networks.

### Global Equipment Market for Enterprise VSATs



Some of the key benefits of VSAT networks include:

#### Multicast Delivery

The ability to distribute information to hundreds or thousands of sites simultaneously is an inherent advantage of VSAT networks. Terrestrial networks accomplish the same task by sending the data to each location individually, making for a far less efficient process. This makes satellite the technology of choice for content distribution needs such as digital signage, business IPTV, interactive distance learning and so forth

#### Reliable Universal Coverage

Satellite communications are available almost everywhere; a VSAT will operate anywhere provided it has an unobstructed view of the satellite. Satellite networks are able to deliver very high availability (99.95%) and, because of this, are often used as the primary network. For many organizations, a satellite network is the technology of choice for critical information transfer and for providing coverage in areas that lack good infrastructure.

#### Scalability and Flexibility

VSAT networks are easily scalable because all that is needed to add another location to the network is to deploy a terminal at that location. Independence from local exchange carriers enables quick deployment anywhere in the USA, while maintaining the same service for all branches. For these reasons, many large enterprises have opted for satellite-based networks.

For the IT manager, the integrated VSAT-in-a-router solution offers a number of benefits such as:

- Full redundancy, which includes hot-standby routers and satellite-based backup. Failover can be based on the Hot Standby Routing Protocol (HSRP) so the redundant router seamlessly takes over if the main router fails.
- Switchover from the primary, terrestrial network to the VSAT network is measured in a few seconds--not in tens of seconds, as is generally the case with a standalone VSAT-based WAN backup solution.
- Optimized support for VoIP traffic to ensure integrated end-to-end quality of service (QoS)
- Security for enterprise-wide data traffic using VPN technology. Encryption is based on the embedded security such as 256-bit IPSec available in Cisco routers.
- Lower management/operations costs because the VSAT network module can be configured and managed centrally by the satellite service provider. The customer's IT staff can monitor the status and performance of the VSAT network module and the satellite connection using Cisco's CLI (Command Line Interface) or the CiscoView device management application.
- Cisco's TAC (Technical Assistance Center) ensures the highest level of support for enterprise customers
- Geographical redundancy because the backup satellite infrastructure (hub) is at a physically separate site

In sum, a VSAT network offers a straightforward method for enterprise-wide communications and for connectivity with business partners as well as Internet access (See Figure 2).

#### What is a Cisco VSAT NM?

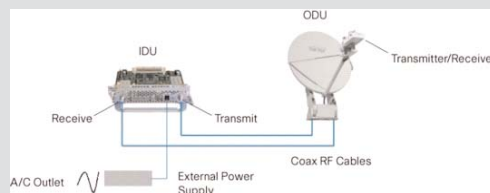
A VSAT, so called because of the relatively small size of the dish, is a type of terminal for sending and receiving transmissions via a satellite. The size of the dish varies from 24" (0.6m) to 95" (2.4m) in diameter, depending on whether it is operating in the C, Ku, or Ka band. VSAT describes any fixed satellite terminal that supports one-way (receive only) or two-way (interactive) voice, data, and video communications.

The Cisco integrated VSAT network module works in the C and Ku frequencies in a star topology in which all remote sites communicate with each other via a hub earth station operated by a satellite service provider. C-band operation is generally more expensive than Ku and Ka bands because it requires larger, more costly equipment, such as the antenna and transceiver. But the C-band is also more reliable (99.999 % availability), one reason it is favored for financial applications.

The Cisco VSAT-in-a-router solution is offered by Cisco or by its distributors and resellers. A VSAT operator, such as Spacenet, provides the external antenna and integrated Transmitter/Receiver (ODU).



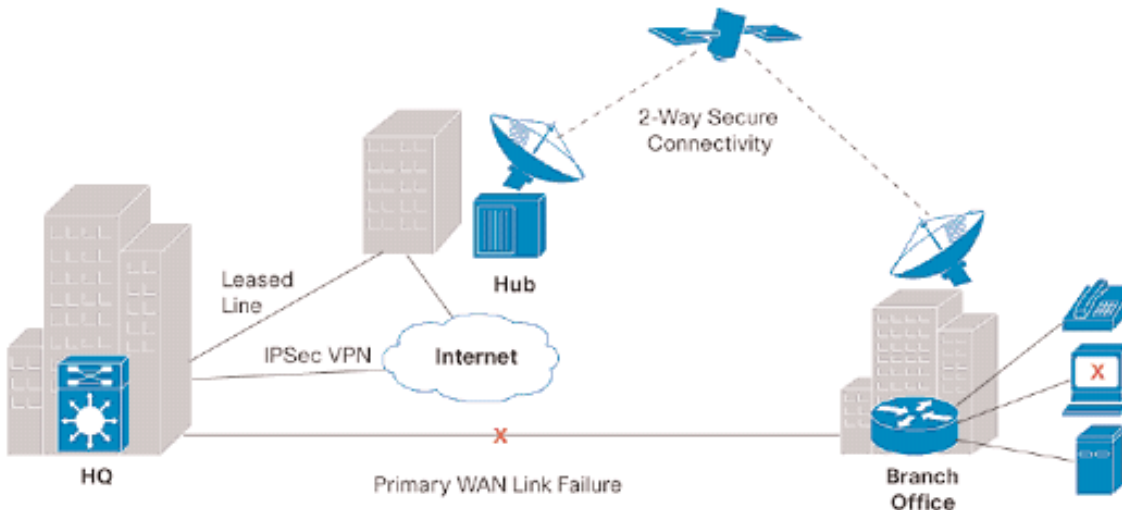
Cisco VSAT Network Module in an ISR series router



Cisco VSAT NM connected to Antenna and ODU

The Network Module slot is used for various network interfaces such as T-1, fiber, GbE and now also for satellite communications.

**Figure 2: Satellite-based Networking**



## SELECTING A WAN BACKUP SOLUTION

Customers have several options for WAN backup to ensure business continuity. On the terrestrial side, the choices typically are redundant connections from the service provider or using a second service provider for WAN backup. On the wireless side, the choice is between 3G service and, if using satellite technology, either a standalone VSAT network (which was the only satellite-based option available until recently) or an integrated VSAT solution that supports seamless backup of the terrestrial WAN.

The table below shows the differences and benefits of terrestrial and wireless WAN backup solutions for business continuity and disaster recovery.



**Table 1: Business Continuity Options**

	Redundant T1/E-1 lines (using the same service provider)	Redundant WAN (using a second service provider)	3G Wireless	WAN Backup with Standalone VSAT	WAN Backup with Integrated VSAT in Router
Resilience to technical failure (local)	Medium	Good	Good	High	High
Resilience in event of widespread disaster	Low	Low	Low	High	High
Failover	Fast	Fast	Slow	Slow	Fast
Seamlessly integrated services and failover	Yes	No	No	No	Yes
VoIP quality	High	High	Medium	Low	High
Seamless VPN	Yes	Yes	No	No	Yes
One-time deployment cost	Low	Mid	Low	Mid	Mid
Monthly cost for backup	Mid	Low	Low	Low	Low
Monthly cost of traffic	Low	Mid	High	High	High
Typical data rates	1.6 Mbps or 2 Mbps (outside U.S.) symmetrical	1.6 Mbps or 2 Mbps (outside U.S.) symmetrical	EV-DO: 1Mbps downlink/100kbps uplink UMTS: 300kbps downlink/64kbps uplink	2Mb/s Downlink 1Mb/s Uplink	2Mb/s Downlink 1Mb/s Uplink

**INTEGRATED VSAT SOLUTION ADDRESSES BROAD RANGE OF CUSTOMERS**

Cisco’s integrated VSAT solution can be used by a variety of organizations for WAN backup and will particularly appeal to certain vertical sectors, including government, financial, and retail.

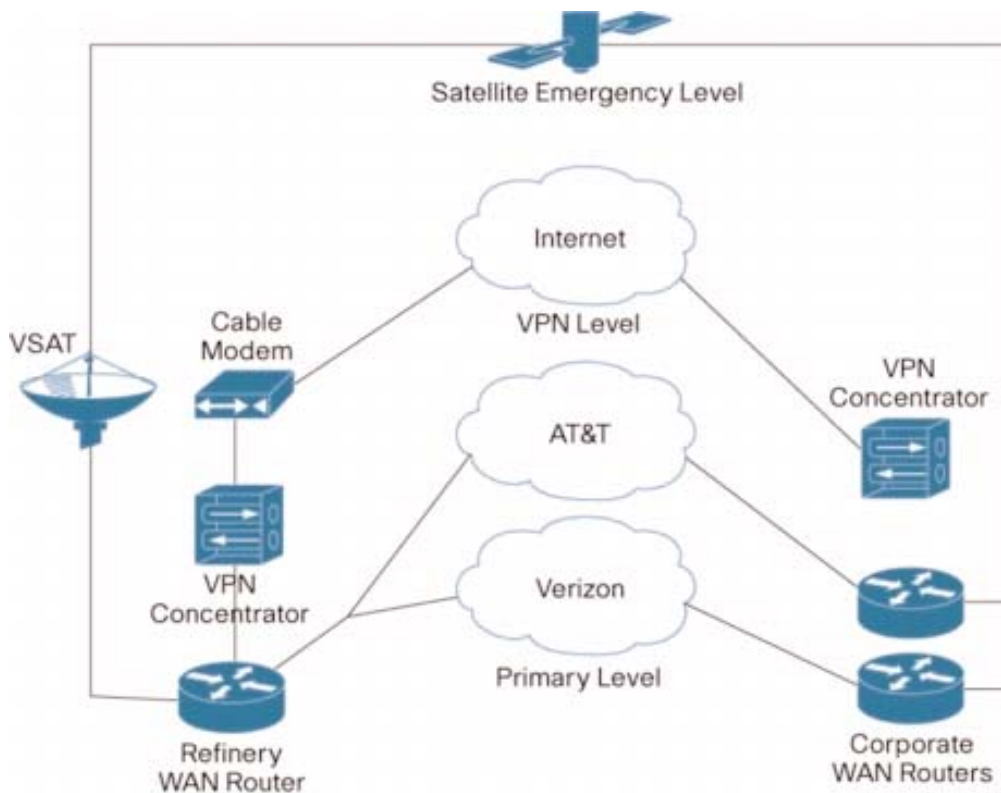
- Large enterprises with multiple (even thousands) of remote locations depend on the network and need reliable WAN backup.
- Medium-size enterprises typically focus first on WAN backup for headquarters and strategic sites.
- Financial institutions are especially sensitive to business continuity and so for them WAN backup is a top concern for both headquarters and remote branch locations.

- Government agencies responsible for disaster recovery efforts and/or provide e-government services even in the event of a disaster

IT managers for the kinds of organizations stated above have several options for incorporating a VSAT service in their business continuity strategy. For some IT managers, a VSAT network will be the first choice for assuring business continuity. Others who opt to use a second service provider for a terrestrial WAN backup solution might go a step further and use VSATs as a tertiary network to assure access to the most critical applications in the event of a loss of both the primary and back-up terrestrial WAN. In fact, Valero Energy Corp, a Fortune 500 company and the first publicly announced customer of Cisco's VSAT solution, is doing exactly that.

Valero, the largest refiner in North America, has chosen the Cisco ISR with the integrated VSAT network module as a failover solution for maintaining communications between its refineries and its San Antonio, Texas, headquarters. Although Valero uses network services from two wireline carriers, the addition of a VSAT-based WAN backup capability gives the energy giant even greater assurance of maintaining business continuity (See Figure 3). Government agencies and financial institutions will also want to consider such an insurance policy against a disruption of terrestrial network services.

**Figure 3: Valero Uses Satellite-based WAN Backup**



## **EXPANDING SERVICE PROVIDERS OPPORTUNITIES WITH VSAT NETWORKS**

Most service providers rely on service level agreements offered customers to differentiate themselves from their competitors, and they understand the impact a loss of customer confidence can have on their success in a market that offers customers choices. With the Cisco integrated VSAT solution, service providers can add another WAN backup option to their product portfolio. They can offer a managed satellite-based WAN backup service by operating Gilat SkyEdge hubs or by partnering with a certified operator of Gilat SkyEdge hubs, such as Spacenet in the United States. They can also offer customers a hybrid wireline/wireless solution in which the VSAT network is used for specific applications, for example, multicasting

Whether a service providers chooses to operate a Gilat SkyEdge hub or offers VSAT-based WAN backup service in partnership with a SkyEdge hub operator, either way a big benefit for the customer is a one-stop shop: The customer only works with one service provider for the primary WAN service and satellite-based WAN backup. The customer has the convenience of having to make one phone call if a problem arises either on the wireline side or the VSAT side of the network.

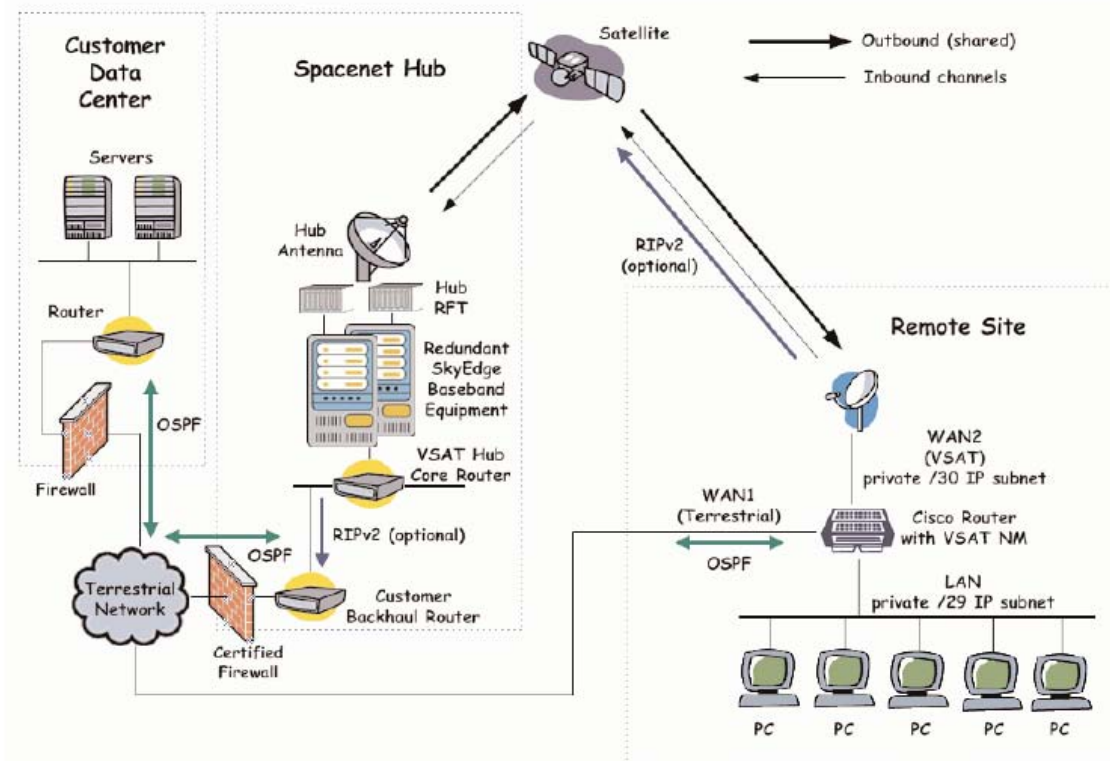
## **CONCLUSION**

Although terrestrial networks have an established record of providing reliable service to customers, network outages are an unfortunate reality because wireline services are exposed to a variety of disruptive events. Moreover, there is no way of predicting when an unplanned outage will occur or how long it might last. It should also be kept in mind that network outages only make news headlines when their effect is particularly onerous.

For customers considering a near fault-tolerant business continuity and disaster recovery plan, a VSAT network is a highly reliable option for maintaining communications. The Cisco IP VSAT Satellite WAN Network Module raises VSAT-based WAN backup to the next level by offering enterprises a seamless failover capability, VPN security, and QoS for voice traffic. IT managers have the added confidence of knowing the level of support they can expect from Cisco; for service providers it is an opportunity to augment their wireline services with a managed and flexible satellite-based solution for business continuity and disaster recovery.

## APPENDIX

### Sample Backup WAN Network Provided by Spacenet



In the diagram above, Spacenet provided a private /30 IP subnet to the satellite network segment, assigning a private IP address to both the VSAT network module and the router satellite interface. RIP is forwarded from the WAN1 interface of the router over the terrestrial network to the terrestrial core router located at Spacenet’s teleport or the customer’s data center. Arrival of RIP at the terrestrial core router tells it that the link is active and to route all traffic to the remote site over WAN1 (DSL or Frame Relay). OSPF is configured on the terrestrial core router (as the “low cost route”) and the hub core router (as the “high cost route”). If RIP is no longer received by the terrestrial core router, OSPF will route all traffic to the remote site over WAN2 (VSAT). Hot Swap Routing Protocol (HSRP) implemented on the remote site router will switch from WAN1 to WAN2 if terrestrial connectivity is lost.

## CONTACT US

**Bangalore**

**Bangkok**

**Beijing**

**Buenos Aires**

**Cape Town**

**Chennai**

**Delhi**

**Dubai**

**Frankfurt**

**Kuala Lumpur**

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**San Antonio**

**Sao Paulo**

**Seoul**

**Shanghai**

**Singapore**

**Sydney**

**Tokyo**

**Toronto**

**Silicon Valley**  
2400 Geng Road, Suite 201  
Palo Alto, CA 94303  
Tel 650.475.4500  
Fax 650.475.1570

**San Antonio**  
7550 West Interstate 10, Suite 400,  
San Antonio, Texas 78229-5616  
Tel 210.348.1000  
Fax 210.348.1003

**London**  
4, Grosvenor Gardens,  
London SW1W 0DH, UK  
Tel 44(0)20 7730 3438  
Fax 44(0)20 7730 3343

**877.GoFrost**  
[myfrost@frost.com](mailto:myfrost@frost.com)  
<http://www.frost.com>

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