## A WEBTORIAL

# NEW SATELLITE-BASED IP DATA SERVICES FOR THE ENTERPRISE

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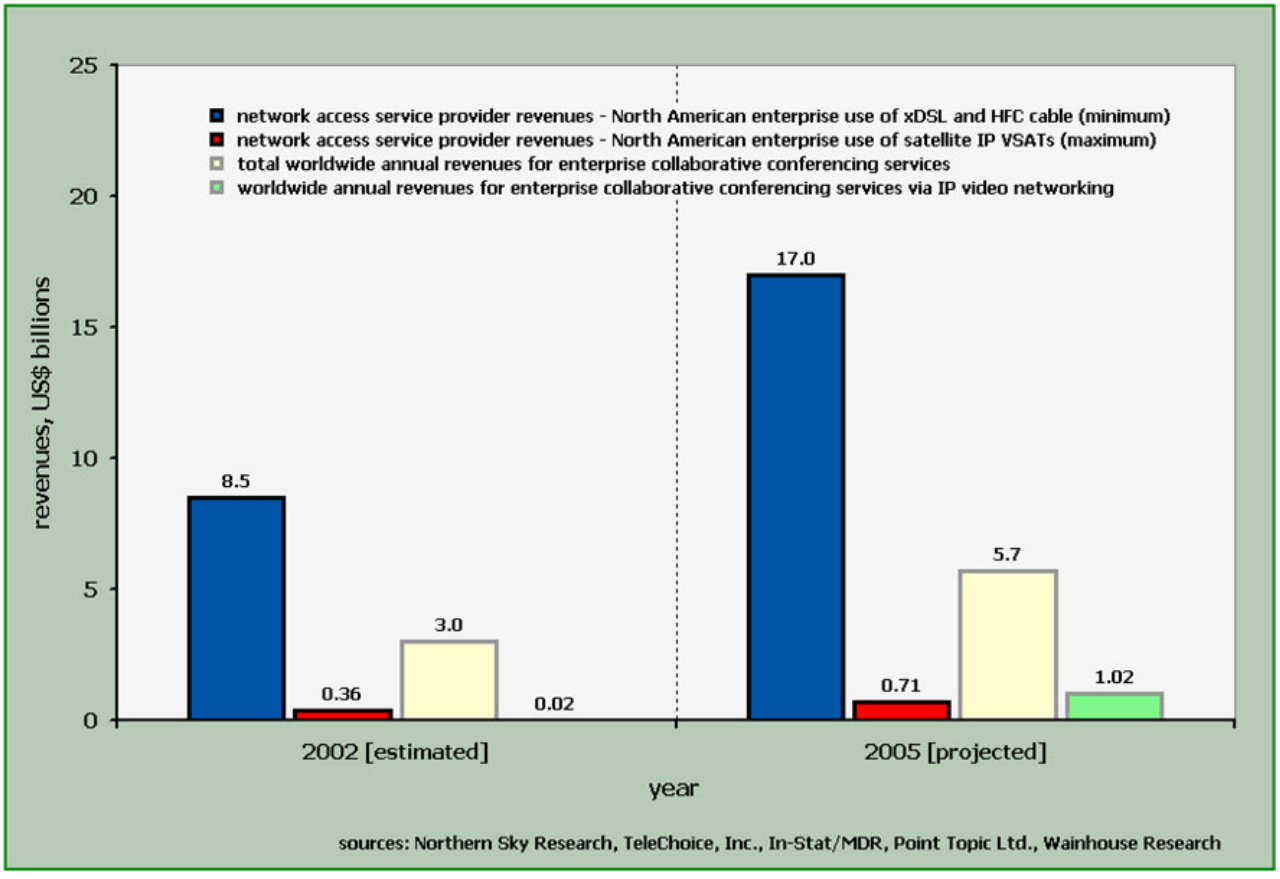
### Introduction

Despite all of the recent collapses and turmoil within the telecom business sector, there remain steady and substantial year-on-year increases in the volumes of data traffic that enterprise sites generate, and which they need, in some proportion, to transmit one to another. While specific business applications that were earlier predicted to be major drivers of new traffic - both intra- and inter-enterprise - have not materialized, others continue to both appear and evolve, though nowadays with substantially less fanfare.

**Figure 1 Growth Projections in the Enterprise Data Services Sector**




For example, DSL and cable modems represented more than 95% of all business broadband subscriptions in 2001. Small business and remote office use of both xDSL and cable network access services grew by better than 50% in the U.S. from 2001 to 2002. (It is noteworthy that the now sizeable HFC cable portion of this market has been the subject of almost no concerted marketing effort in the U.S.) Total North American revenues from all such services are projected

to exceed US$10 billion annually this year. Comparatively, satellite-based network access service providers have had only limited success - to date - in this market. Estimations and comparative projections made by Northern Sky Research for North American operations are included in Figure 1 above. Even including both one- and two-way transmission offerings, this analysis reveals that 2002 enterprise broadband satellite services generated no more than 4% of the DSL and cable revenue total. Notably, the take-up of the newest services introduced in the North American market (by Hughes Network Systems, Gilat/Spacenet, and others) do not show the sharp initial surge as was experienced in this business sector, particularly by the DSL operators, in the initial terrestrial broadband service 2000-2001 roll-out phase.

We deal with four topics in the balance of this white paper. Current satellite terminal technologies are briefly reviewed first, followed by an overview of performance levels offered in network access services today. Some new service initiatives, based upon use of the same technologies but potentially either augmenting or complementing pre-existing terrestrial IP network facilities are outlined in the second half of the paper. We conclude with a summary of business case outcomes for such growth services. **Our "headline finding" here is that satellite service providers, currently making only limited inroads in the enterprise IP data networking market, have concrete opportunities to substantially improve this situation through a repositioning of their activities in network access and content distribution services**.

**Current Technological Foundations**

The very newest of the satellite-based services, as covered by the data included in Figure 1 above, are two-way network access offerings, using terminals having both transmit and receive components at each of the customer sites. Such terminals and the associated central hubs plus gateways, as are operated together to provide services of this type, are commercially available today from several manufacturers.

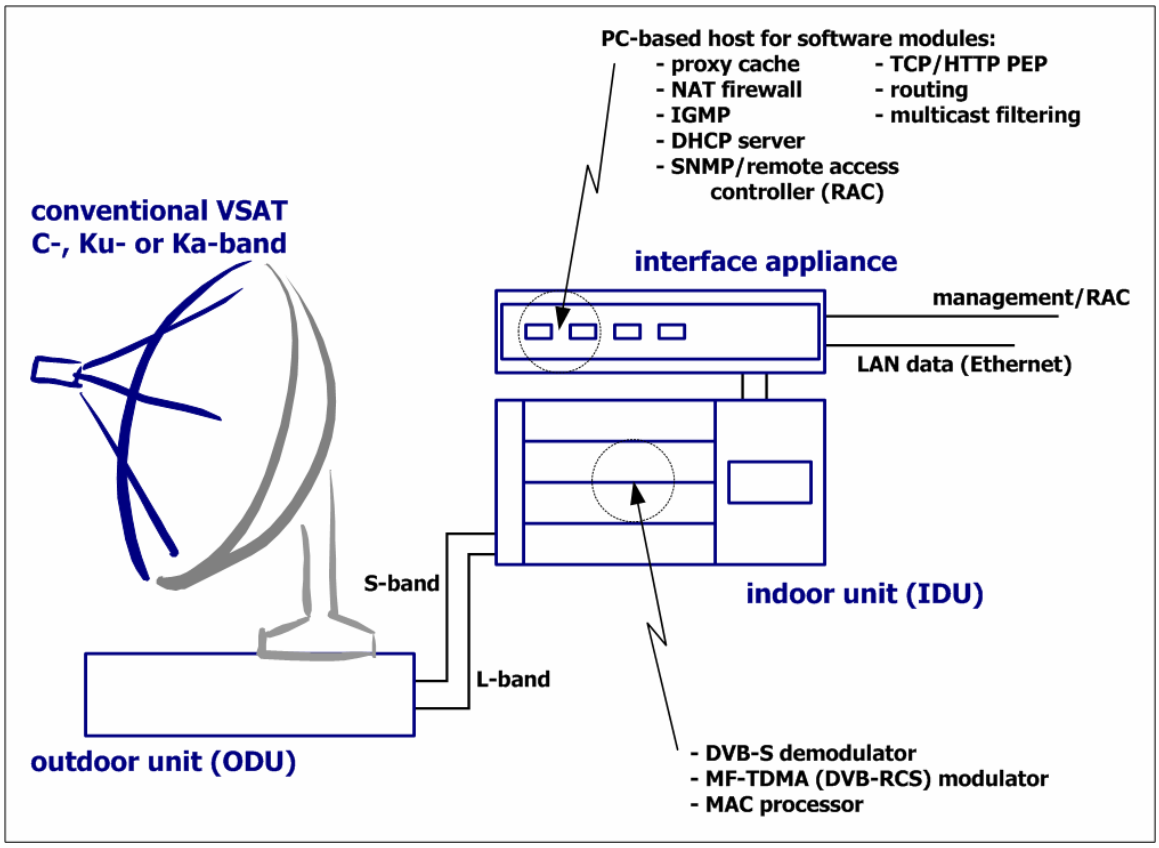
The transmission schemes utilized (at the physical layer) between the hub and the terminal(s) can be classified into three categories.

- There are systems which are fully proprietary – a good example of this would be the infrastructure developed and marketed by Tachyon, Inc. (http://www.tachyon.net), with Tachyon itself acting, in this instance, as an NSP.
- At the other end of the scale are several companies which only offer equipment (to either service provider or enterprise customers) and do so via adherence to well recognized and international standards. Representative examples in this group would include the Satellite Multimedia Delivery System terminals (http://www.raytheon.com/products/smds/ ) as produced by Raytheon's Satellite Access Systems group, and the 2 Way-Sat system available from Newtec N.V. (http://www.newtec.be). These are fully compliant with the Digital Video Broadcast – Return Channel by Satellite (DVB-RCS) standard.[1]
- Finally there is then a "middle category" of vendors – those who use some specific elements from an accepted standard. Currently this involves, universally, the adoption of the precursory and one-way DVB standards for the outbound transmission (from hub to terminal), and the addition of IP packet encapsulation to the original video broadcasting capabilities. The inbound (return) transmission is then implemented via some proprietary technique. Examples within this category include the Skystar series product line from Gilat Satellite Networks (http://www.gilat.com), the DIRECWAY platform (which has supplanted the earlier one-way DirecPC products from Hughes

[1] There is actually a set of related standards that are applicable to these systems. For reference, they are available from the European Telecommunications Standards Institute (ETSI) and include: EN 301 790 ("*Digital Video Broadcasting: Interaction Channel for Satellite Distribution Systems*") and TR 101 790 ("*Digital Video Broadcasting: Interaction Channel for Satellite Distribution Systems, Guidelines for use of EN 301 790*").

Network Systems, http://www.direcway.com), InterSKY from Shiron Satellite Communications (http://www.shiron.com) and the LinkStar system from ViaSat, Inc. (http://www.viasat.com). Figure 2 below provides a generalized schematic showing the basic architecture and components included within current terminal products (but specific to full use of the DVB-RCS standard).

**Figure 2 Architecture and Components of an IP VSAT for Enterprise Network Applications**




The principal driver behind the use of standards-based technology here is cost saving, in that economies of scale can be gained by the use of common components and chipsets. Additionally, there is the prospect of interoperability. Some manufacturers have demonstrated this for commercially available DVB-RCS equipment, with groups of different terminals operated via a common hub and management system. However, we are not aware that any service provider has yet committed to using terminals as customer premise equipment from any more than one single manufacturer. As a separate initiative, development activity is also now focused on co-opting the well-known DOCSIS HFC cable standard and specifications for satellite terminal use.[2] This is a strategy similar to that taken earlier by several companies involved in infrastructure provisioning for broadband terrestrial wireless access systems. (However, it should be noted that this latter case did not prove to be workable on both the technical and financial levels within the first-generation of fixed broadband wireless access (F-BWA) service offerings.)

[2] The original development of the Data Over Cable Service Interface Specification (DOCSIS) was pioneered through a consortium established by the North American CATV industry, and later transferred to the CableLabs organization. All components of the current release (2.0) of the standard are publicly available from CableLabs.

**Current Service and Performance Characteristics**

As can be gathered from the brief review above, the satellite service provider community is not short of technological capabilities and operational standards in facilitating simple IP network access. In fact, it would not be that difficult to make a listing of thirty or more vendors of either complete turnkey platforms for such satellite services or of customized hardware appliances and software which would enable specific applications for enterprise users via these platforms.

The actual services available today vary (of course) by geographic coverage, and are – as indicated already – of two types. All of the original services, as initially offered in the 1997 through 2000 time period, involved one-way transmission and therefore required a satellite receive-only terminal. Nowadays such services typically operate in a broadcast mode, are utilized exclusively for large file transfers and for audio or video streams, and are almost always absent a requirement for any permanent terrestrial return path. Though a majority of the one-way offerings to enterprise customers involve the transmission of IP datagrams, this is not actually a universal requirement in specific circumstances (for continuous 24 by 7 business TV feeds in MPEG formats, for example). In fact many of the enterprise services are provided in affiliation with conventional video broadcasting facilities and operations. They are essentially piggybacked onto the same DVB infrastructure as is used for video contribution and distribution by satellite to studios, MSO headends, etc. Some business news video content may in fact be common to both services, and the IP-based transmissions can be the beneficiary of under-utilized or "free" satellite bandwidth.

The range of services successfully offered, over several years already, by Microspace Communications (http://www.microspace.com) serve as a good example here. One-way data and video distribution service is available from Microspace throughout the continental U.S. and also separately in Europe, North Africa and the Middle East, at fixed full-time transmission rates between 20 kbps and 2 Mbps, costing between $5,000 and $30,000 per month (respectively) on an extended duration contract (five years), independent of the number of receivers deployed. The current services require Ku-band antennas, with a minimum 1 m diameter.

The second service family is the complementary set that utilizes satellite links in both inbound and outbound directions as the basis of a two-way network access platform for enterprise customers. Figure 2 above provides a generic and snapshot view of the full feature set which can be assembled to support any service provider with satellite NSP ambitions, and that can be put in-place today. As indicated there, the CPE terminal will likely consist of three parts. Firstly there is a conventional small antenna and RF/IF outdoor unit (ODU). Secondly, a customized indoor unit for receive and transmit processing. Note that this IDU receives the entire broadcast transmission of IP data for all customers (in DVB format). And third, there in an interface appliance providing routing, security, management and applications support between the WAN and the enterprise LAN. This is likely to include at least some of the features listed at the top of Figure 2. In certain cases, terminal vendors incorporate one or more of these features either as a standard component or as an option integrated with the IDU. Some of the original systems offered for commercial service to enterprise users actually included very few of these features – in some cases because they were derived from terminals developed initially for consumer use (and in which the IDU can then be a PCI card, used directly in an expansion slot internally within a single PC and having a direct cable connection to the antenna unit).

Perhaps the best known independent service provider currently using a two-way platform for broadband access is Aramiska, headquartered in the Netherlands (http://www.aramiska.com). The service itself is actually provided from teleport facilities in Belgium, with full European coverage, and is based exclusively on Newtec's DVB-RCS compliant 2 Way-Sat system (see above). Three grades of access service are provided at inbound transmission rates between 512 kbps and 2.048 Mbps. The corresponding and asymmetric return channel rates are between 128 and 512 kbps respectively. Aramiska maintains worst-case contention ratios of 8:1 on the inbound link and 4:1 in the return channel. These basic performance levels are typical of those

offered with xDSL business grade service packages in Europe. Monthly charges, as of May 2003, are between €149 for the 512/128 kbps service up to €549 for the E-1 equivalent inbound offering (i.e., currently in the range $170 to $625 per month, per site). The Aramiska services use Ku-band antennas, with a minimum 75 cm diameter dish located at each enterprise site. Customers have the option of purchasing the complete terminal (a list priced outlay of €4,900), or of leasing it at a fixed monthly rate plus a one-time installation fee. Service availability is no less than 99.7% (as recorded over the more than twelve months that the service has now been operated). The CPE includes an interface appliance (per Figure 2), branded as the Aramiska ARC network services unit, providing a web cache, DNS server, NAT and DHCP functionalities, a mail server (including virus detection) and a TCP performance enhancing proxy (PEP).

This last mentioned component of the ARC unit deserves some additional comment. Use of geostationary satellite transmission capacity for IP-based communications has long been frowned upon within the data networking community. This originates from the known dependence of throughput on a link operated using TCP/IP and round-trip delay(s). The most serious impact of the approximately 550 ms delay on a two-way FSS connection arises from the actual selection of the size of the TCP data window. A range of maximum window sizes have been implemented by those writing and assembling common PC operating system software, some as low as 8 kbytes. A 64 kbyte window imposes a maximum throughput rate of approximately 1 Mbps on a two-way satellite transmission. Clearly this might render Aramiska's offering of a 2 Mbps inbound transmission capability meaningless – if it were to be devoted to a single connection operating under TCP for an extended period. No such limitation applies however to network traffic utilizing the UDP/IP stack.

Less well known in the networking community at large is that almost all systems available for commercial access service provision today remove the window size restriction by use of a PEP. Aramiska actually integrates the SkyX protocol, a proprietary development of Mentat, Inc, (http://www.mentat.com) into its ARC interface appliance. This uses dynamic window (re)sizing and is completely transparent to the end-user. (As many in the satellite communications community had predicted, PEP implementations have now become an important research topic relative to data transmission over other much more "non-ideal" links, most notably for mobile wireless carriers.) Mentat's SkyX includes several other features which further optimize performance (and also specific applications), largely based upon an efficient acknowledgement algorithm which needs to sense only errored transmissions on the direct and dedicated path offered by the satellite link, as compared to both errors and congestion on a multiple path (and also multi-hop) terrestrial interconnection. The use of SkyX and similar proprietary proxies normally results in an ability to sustain individual connections at throughputs on a conventional satellite link of up to 10 Mbps. Generally TCP PEP implementations such as these require a server to be installed and operate at the gateway/hub location, so as to re-establish regular TCP/IP conditions (including fixed window sizes) in the terrestrial backhaul network.

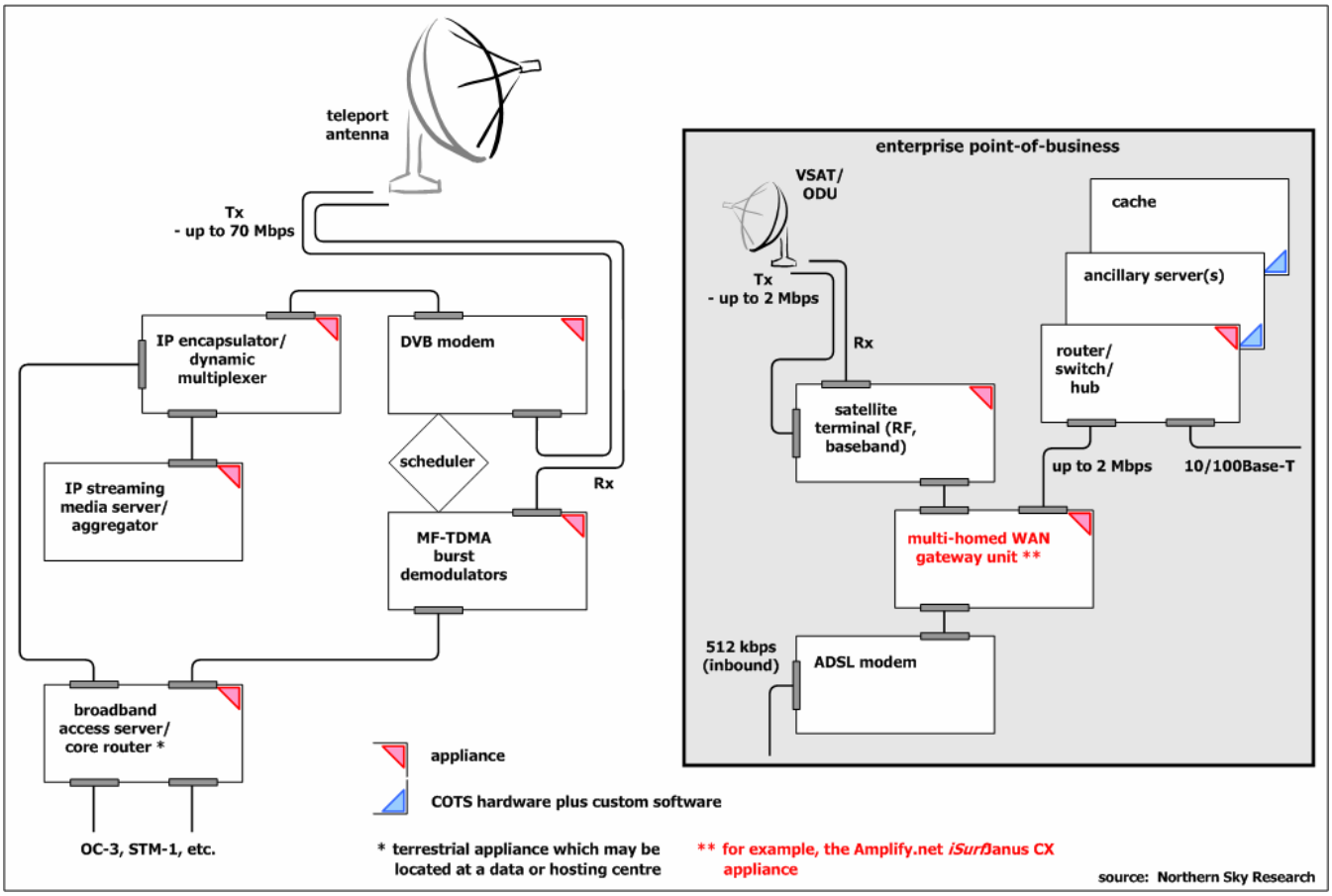
This short summary of the PEP underscores the importance of the appliance responsible for interfacing between the satellite link (or links) in the wide area network and the enterprise local area network. This is not only because features such as a firewall and routing capabilities are important (and are offered as fully integrated components in many other terrestrial and wireless access services), but also because the appliance itself allows the service offering to include a centralized management capability by the NSP. This is critical commercially, because the terminals themselves will often be located at enterprise facilities where the on-site personnel have only a limited knowledge of networking procedures and configuration/management. Basically, in order to be fully competitive, it is very important to any NSP to be able to offer both a fully- and remotely-managed service (or set of services) via this type of appliance. Unfortunately this point has been largely overlooked, at least until recently, by the satellite service providers, despite the potential advantage they would hold in monitoring and managing all enterprise CPE terminals from a single location (the hub/gateway).

## New Service Initiatives

### a) Dual Access

The schematic included in Figure 3 below provides a generic overview of a service platform which can provide network access to small and medium enterprise sites via a hybrid terrestrial and satellite scheme. It only differs from the primary access configuration outlined above in respect of one additional appliance – the multi-homed WAN gateway unit, commercially available from specialized vendors such as Amplify.net (http://www.amplifynet.com). Vendors of such appliances have primarily targeted the utilization of their equipment in all-terrestrial scenarios – most regularly where a medium sized enterprise office or facility already has either fractional or full T-1/E-1 access and is seeking to augment that. Traditionally adding such a second connection without this type of appliance often entails upgrading the pre-existing router and then coordinating complex BGP and OSPF routing procedures with the service providers. A simplified solution is available through the use of a business grade DSL connection, for example, via the WAN gateway unit. Another similar application example is the case where the enterprise wishes to add either full or partial redundancy to a critical access link at a specific enterprise location (through the use of network access connections to two different NSPs). The multi-homed traffic WAN gateway (sometimes also termed a route expeditor) normally includes all of the functionality needed at the LAN-WAN interface: for example, static routing capabilities, NAT functions, a stateful firewall, DHCP functionality plus a DNS server.

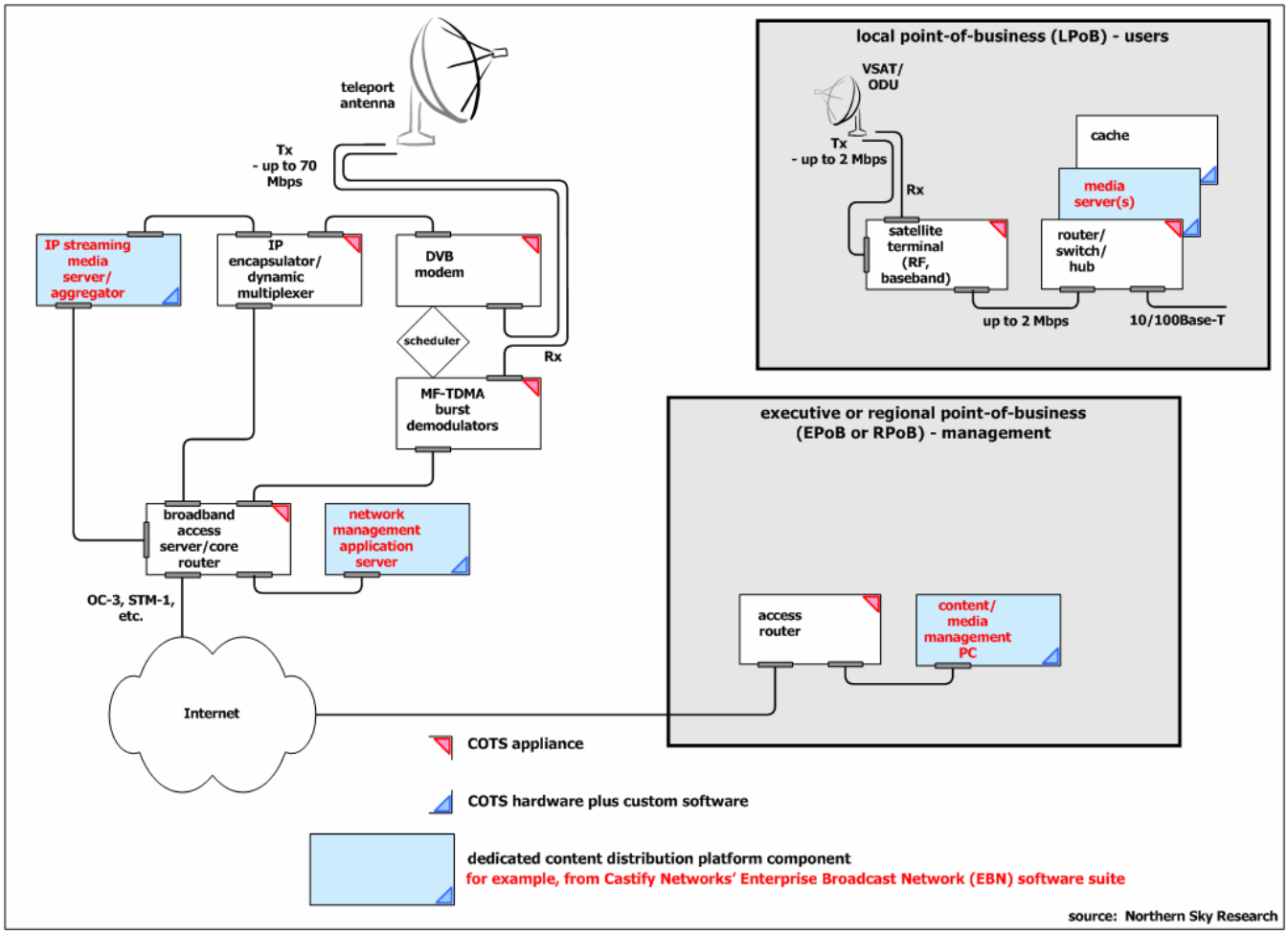
**Figure 3 A Dual-Access (Hybrid Terrestrial and Satellite) Service Scheme**



b) **Multicast-based Content Distribution**

Content distribution networking has been a target of a broad range of developmental effort, most initially conceived in the 1995-1996 timeframe and subsequently dominated by several venture capital funded startup companies from 1998 forward. Virtually all of the pre-2000 focus was placed upon providing distributions to ISPs as a means of supporting network access in the consumer marketplace.

**Figure 4 An Access plus Multicast Content Distribution Service Scheme**




The development of smaller scale and specialized content distribution infrastructure and services for the enterprise user (eCDN) has only recently gained significant momentum and clear(er) focus. Though market requirements continue to evolve, it is clear at this point in time that eCDN infrastructure should enable at least the following set of functionalities and operational specifications across the full enterprise:

i. the eCDN should support and enable multiple and fully-managed content-dominated applications – since it is highly unlikely that any one single application will be dominant (even within a single enterprise) over the amortization period applicable to the software and hardware required for its implementation at the network level,

ii. multicast transmission options should exist as an integral element of the eCDN, inclusive of a built-in transmission management capability plus (also) multicast-to-unicast conversion at the WAN-to-LAN interface,
iii. the enterprise must have control over its own content assets and suffer no constraints as to content data format,
iv. built-in support for streaming multimedia data formats, in both live sessions and via on-demand requests, since such content already plays an important role in specific enterprise verticals,[3]
v. built-in data encryption and authentication (of both sender and user) routines,
vi. the ability for users to access distributed content and participate in live events – in full – from behind a corporate firewall, and,
vii. the availability to enterprise IT management of content access and usage statistics.

Some of these requirements are included and reviewed in a short but topical report issued earlier this year by the NetsEdge Research Group.[4] The NetsEdge report itself advocates outsourcing of enterprise eCDN capabilities to a service provider "for the vast majority of enterprises".

The schematic included in Figure 4 above provides a generic overview of a service platform which can provide both network access and content distribution services to small and medium enterprise sites via hybrid terrestrial and satellite facilities. One means of achieving this is cited, as an example, in the Figure – through the use of eCDN software available from Castify Networks (http://www.castify.net). Castify's Enterprise Broadcast Network (EBN) product supports both terrestrial and satellite operations to high-end (server-based and two-way) receivers as well as low-end terminals (as would be hosted on a single PC or a set-top box). Specific early-adopter service providers are now beginning to facilitate a range of services, some on a pilot basis, based upon at least some of this infrastructure. The services themselves can accommodate a wide range of intra-corporate applications, including e-learning/training, incorporating IP-based video content in both live and on-demand formats, plus web-based conferencing capabilities, also inclusive of video streaming, as well as software and file distributions inclusive of content for intranet-based websites. Furthermore, legacy applications such as distance learning and EFTOPS (both two-way) and point-of-sales advertising (one-way) can be transferred to the eCDN service platform with the end-user customer gaining resultant benefits from improved cost efficiencies plus the built-in service expansion options.

**Business Case Analysis and ROI Estimations**

It is evident from several independent surveys that the low level of marketing success for current satellite-based services is not attributable to a lack of acceptance by users. For example, Figure 5 below contains consolidated inputs gathered from a random set of respondents (almost 400 in total) to a publicly-available user survey covering three modes of access use – personal, small office/home office and regional office/branch office.[5] The respondents were permitted multiple inputs for the company on which they reported. What is readily clear from this data summary is a confirmation of which access services are actually in use on a per enterprise basis – the data set does not reflect the volume of business which each access service has gathered. An important finding here is that satellite, SDSL, terrestrial fixed wireless and cable modem services have essentially equal ratings by usage in the important remote office and branch office category, which include those facilities where more than one single end-user requires network access.

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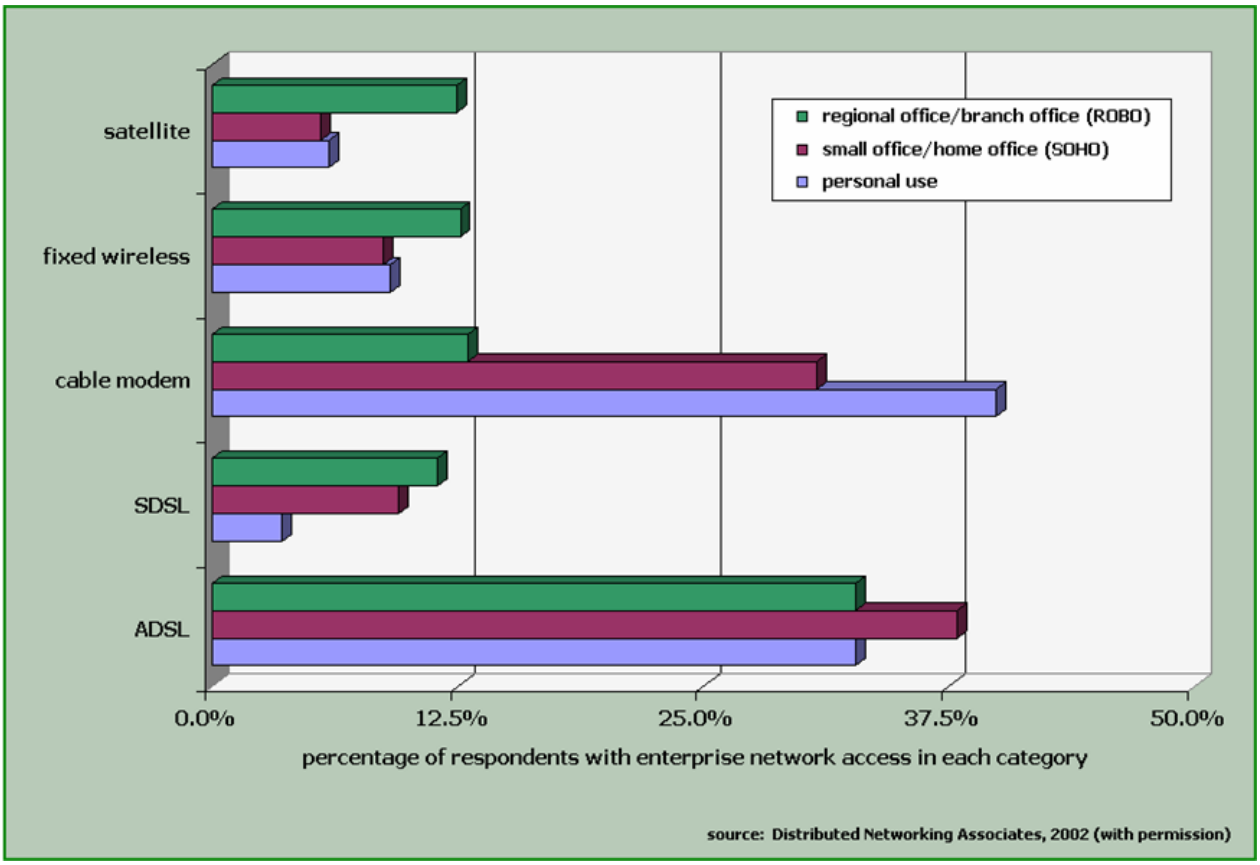
[3] "*Enterprise Broadband Media Applications in the Financial Services Sector*", (KPMG International/Carmel Group), July 2002, available from: http://www.microsoft.com/windows/windowsmedia/enterprise/pdf/kpmg/KPMG_EBM_Whitepaper_Final.pdf

[4] "*The Future of Enterprise Content Distribution (and eCDN Service Provider Opportunities)*", Peter Christy and John Katsaros, NetsEdge Research Group, January 2003, available at http://www.netsedgeonline.com/

[5] *"The Broadband Access and Teleworking Survey"* was published by Distributed Networking Associates in September 2002. It also deals with other aspects of satellite-based access services, and is available in full from the Webtorials website, at: http://www.webtorials.com/index.htm

**Figure 5 Survey Results: Overall Enterprise Use and Acceptance of Various Broadband Access Options at mid-2002**




Northern Sky Research has recently undertaken a comprehensive set of analyses covering the prospects for an expanded range of satellite-based services to the enterprise. This analysis effort has been initially centered on estimating return-on-investment (ROI) to enterprise users in a variety of different scenarios and uses a microeconomic foundation. Attractive ROIs for individual enterprise customers are a critical pre-requisite for the network or application service provider. Without a relatively short-term positive ROI outcome at the enterprise level, no NSP/ASP – either alone, or in affiliation with a terrestrial service partner – can sustain any realistic expectation of success in today's marketplace.

The following elements are important input-side assumptions in this new analytical work:

- The entire enterprise, business or agency, (headquarters, regional and/or branch offices and all local or remote sites), has state-of-the-art terrestrially based networking infrastructure already in place at the local area network (LAN) level.
- All such enterprise or agency locations are also able to make some type of wide area network (WAN) access via terrestrial means, either now or by immediately contracting for this service with a telecom or network service provider.
- What two-way satellite access services (using current satellite capacity) may then provide is either a cheaper alternative to this terrestrial access or an augmentation of the terrestrial network connectivity, to obtain broadband access (in the 1 to 4 Mbps range).

- A service provider can also facilitate a range of eCDN-based services, based on at least some of the same (common) infrastructure.

The analysis itself has been pursued via a spreadsheet-based toolkit. This toolkit has two key foundation elements. First, it subsumes a model of the demographics of the modern enterprise. It was not necessary to break new ground here; many suppliers of specialized hardware, software and telecom and data networking services to the enterprise have attempted to capture representative case studies based upon hierarchies of corporate headquarters, regional/branch facilities and local business sites. However based upon exploratory work done previously, we concluded that it would be more useful for these constructions to be parametric and by this means gain an opportunity to cross-compare a wide range of differently sized, structured and distributed companies (plus commercial and public-sector agencies). Second, and perhaps more importantly, we sought to have this same model stand as a building block for ROI estimations and business case development involving both access and distribution services (and combinations of both).

Satellite transmission holds unique capabilities, in principle, as regards content distribution in a broadcast transmission mode. To our knowledge however, few combined access and distribution business models have been pursued in practice. Again, based upon exploratory work done earlier, we had concluded that this trend was to the detriment of the satellite industry. In summary, the overall flow of analysis possible with the use of our complete spreadsheet package is as follows:

i. adoption of access services, and potential financial payback from these, within the enterprise,
ii. deployment of applications reliant on distribution services within the enterprise, with potential paybacks based upon either pre-deployment of satellite terminals for access service or scenarios where no satellite service preexists,
iii. the provision of access services to a range of customers, and ROI projections for this service deployment, by a satellite service provider, and,
iv. the addition of distribution services, targeting the same enterprise customers, with either independent or combined ROI outcomes to the service provider.

More details relative to steps i. and ii. here are included in the flowcharts provided as Figures 6 and 7 below. Key sets of inputs required to complete the access services analysis are concerned with the demographics of the enterprise and comprise a business facilities based audit of:

- the number of enterprise sites requiring network access,
- the average number of employees at these sites,
- an access bandwidth allocation per employee user,
- a contention ratio (applicable at the LAN-to-WAN interface), and,
- a redundancy factor,

together with establishing requirements for improved broadband access at selected sites. The same primary demographic inputs are retained unchanged for the distribution services model (per Figure 7), where distribution services subsume all of the current and prospective eCDN-based applications mentioned above. However, it should be noted that the only basis on which an ROI can be estimated for broadcast distribution service use in our model is via savings, to the enterprise directly, of travel costs for its personnel, as associated with their attendance of, and participation in, a wide variety of conventional in-house business meetings and conferences.

**Figure 6 Flowchart for ROI Estimations – primary and dual network access**

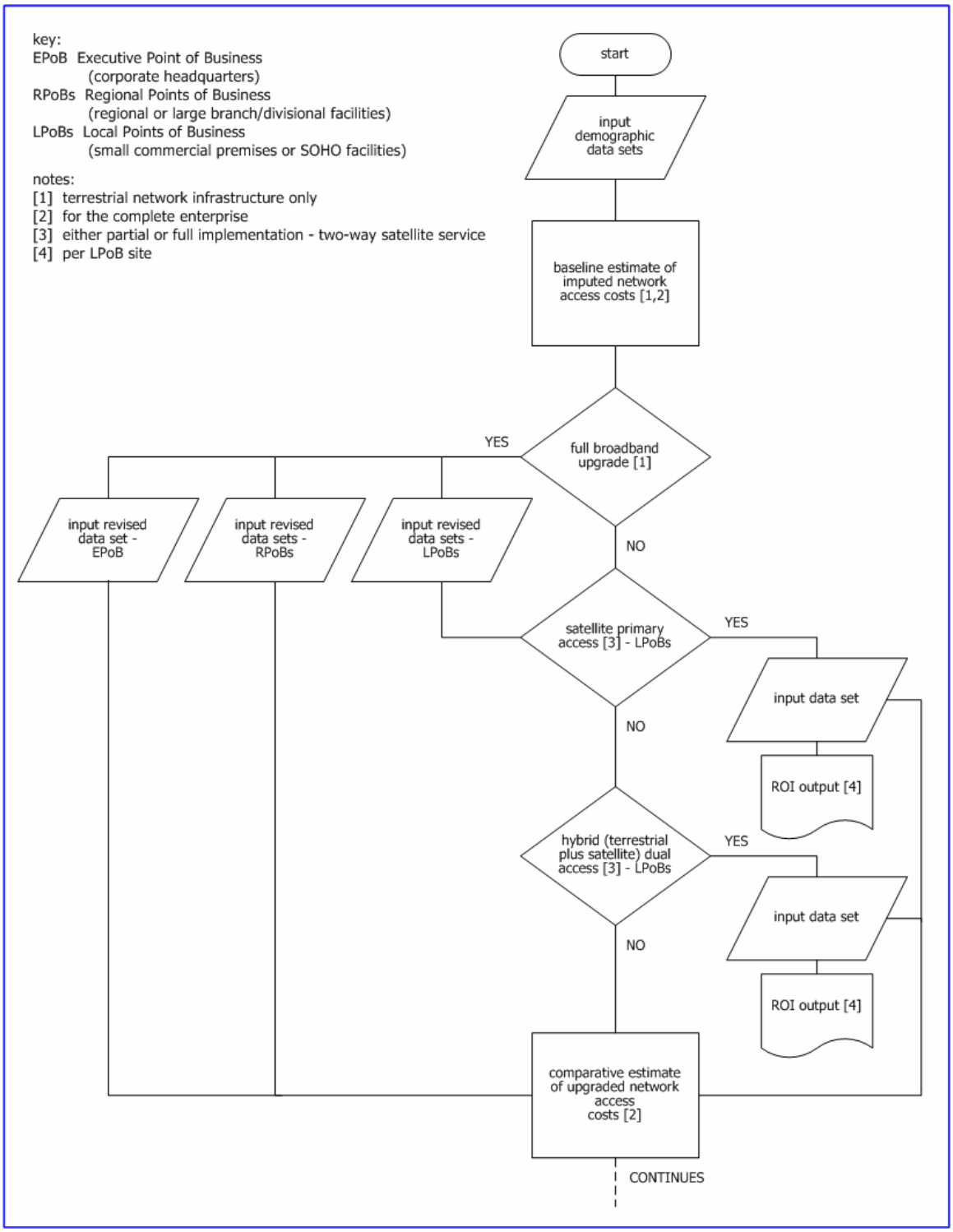
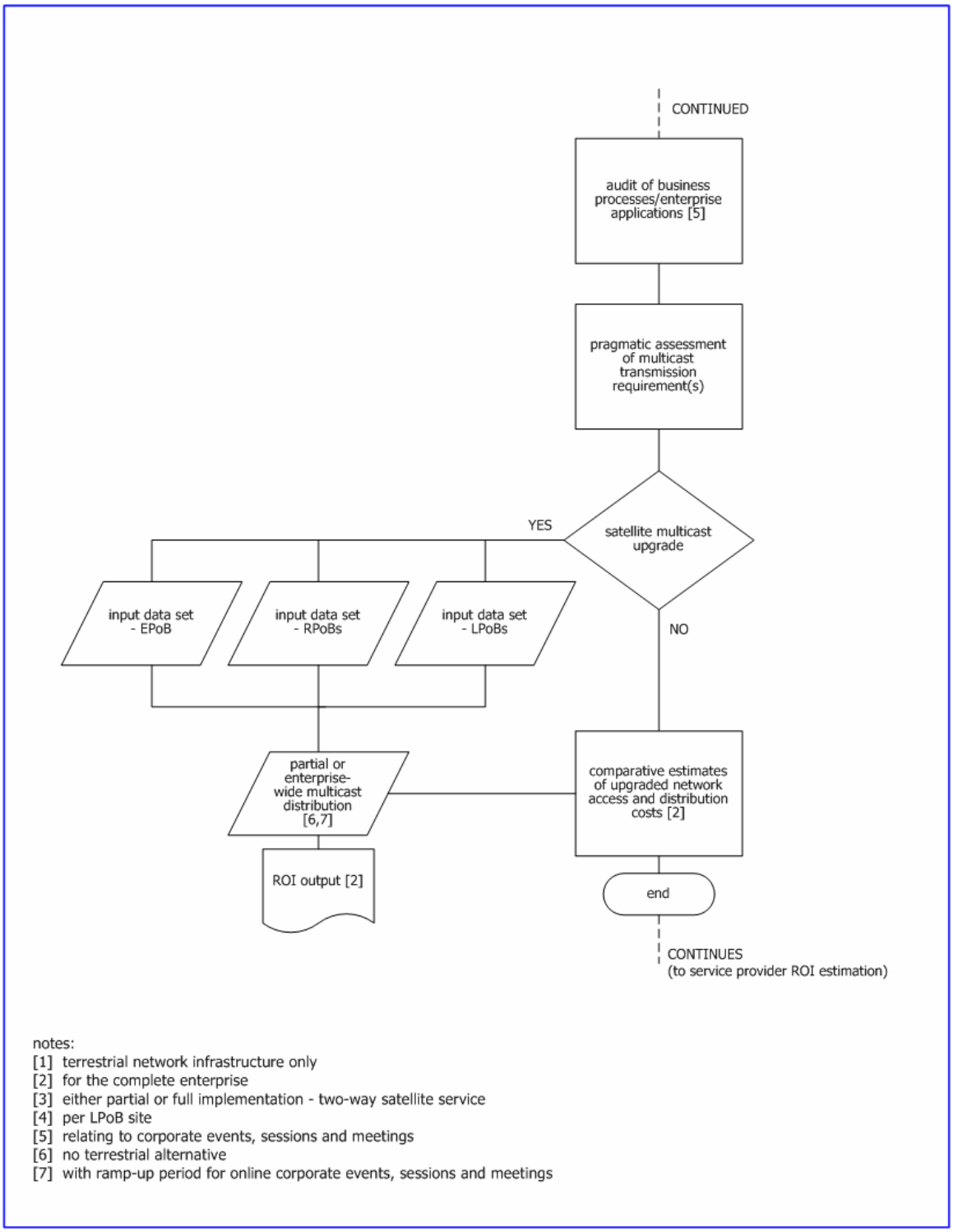


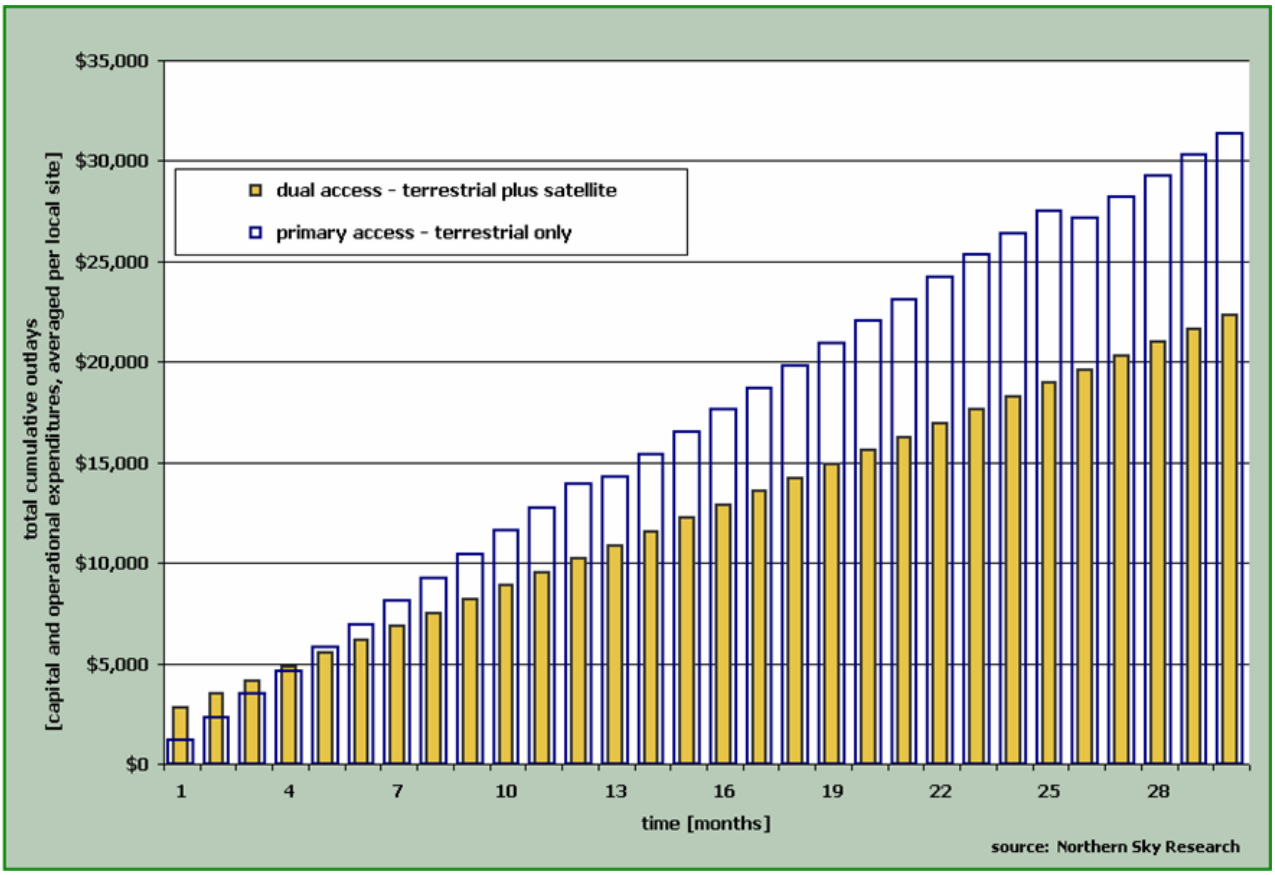
**Figure 7 Flowchart for ROI Estimations - satellite-based network access**




notes:
[1] terrestrial network infrastructure only
[2] for the complete enterprise
[3] either partial or full implementation - two-way satellite service
[4] per LPoB site
[5] relating to corporate events, sessions and meetings
[6] no terrestrial alternative
[7] with ramp-up period for online corporate events, sessions and meetings

Figure 8 provides an example output from the spreadsheet. It applies to a case where a satellite-based service is used to supplement basic ADSL access, which is already in use at a significant number of remote enterprise office sites. These ADSL services provide 512 kbps inbound, normal for baseline business-grade services in many countries. The satellite service is used to upgrade this access to the equivalent of a full T-1 or E-1 connectivity (inbound), at all locations where no xDSL upgrade is available from the terrestrial provider. One primary assumption made in this case is that all new satellite terminal equipment is leased to the enterprise by the satellite service provider, whereas all other CPE including the gateway appliance is purchased outright. In this instance, and for a medium large multinational corporation with business premises in the U.S. and Europe, the model produces a positive payback **for the enterprise** – as estimated on an averaged basis per site - within just five months of deployment. Within two years, the ROI approaches 45%, even allowing for annual decreases in the cost of the comparator terrestrial service. In this example case, the enterprise is charged between $500 and $850 per month per site for the satellite portion of the service (dependent on geographic location).

**Figure 8 Dual Broadband Access - Terrestrial Plus Satellite vs. Terrestrial**

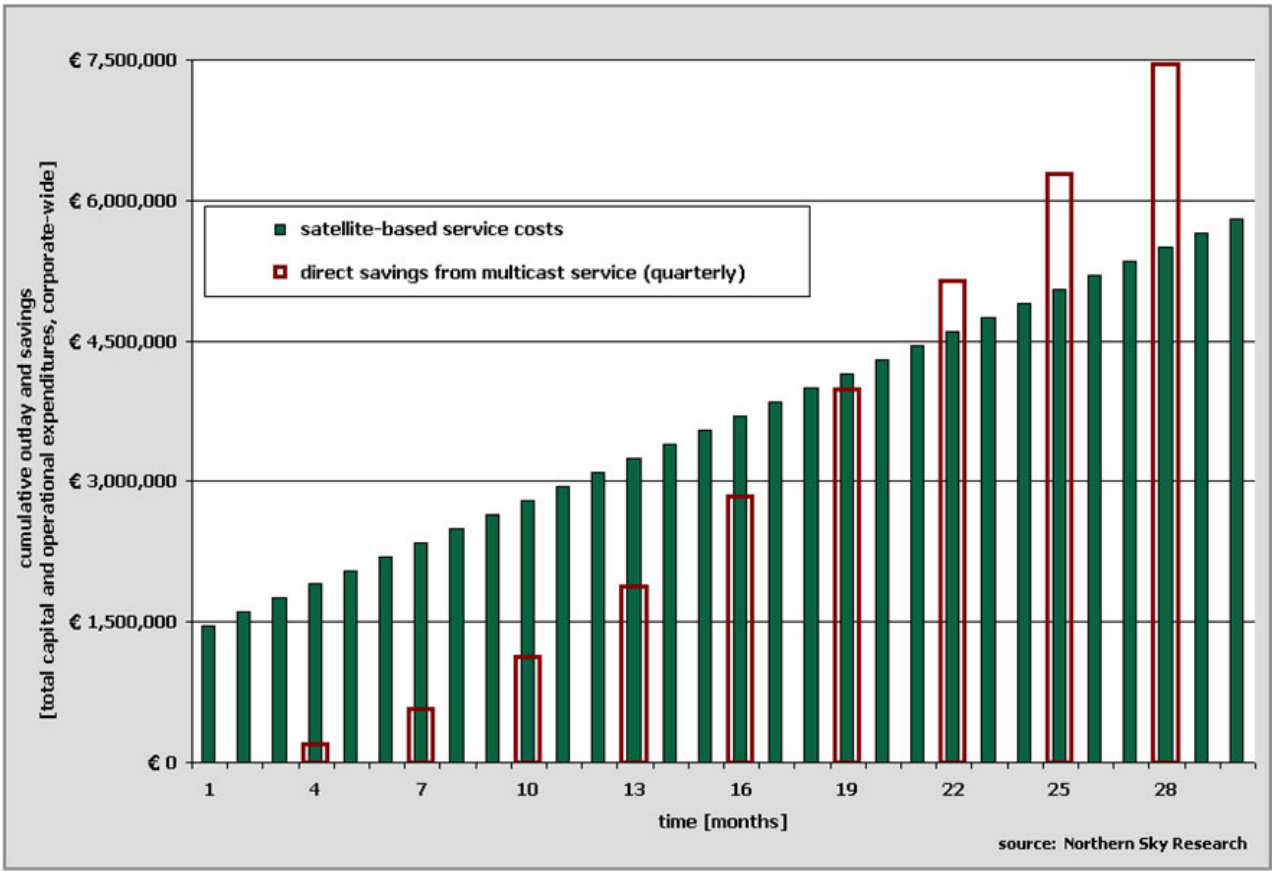



This application of the dual-access scheme, as it is set out in Figure 3 above. is well suited to current satellite-based access platforms, but it is a market opportunity that has not yet been well addressed or promoted by the service providers.

Additionally, Figure 9 provides an example of an output derived for a satellite-based broadcast service. The service scenario modeled in this instance covers a very similar multinational to that considered already, but one that is based in Europe. The service platform utilizes a best-of-breed IP-based eCDN software package, with all of the capabilities that such products can now provide

(such as both live and on-demand content, including streaming video and synchronized presentations to the desktop, with distributions of supporting files and content all accessible to the end-users via a customized web portal). Each of these features can benefit from built-in satellite multicast support. In the case where, necessarily, a high proportion of all enterprise sites are assumed to be equipped with at least a one-way (satellite receive-only) terminal, such as would be needed for near-to-universal web-based conferencing, the scheme produces a positive ROI **across the entire enterprise** in a little more than eighteen months. However, one of the restricted assumptions included here is that there is no instantaneous conversion of meetings and conferences to a web-based conferencing format. Rather, only a portion of the business events and meetings are eligible to be conducted on-line, and, even then, the conversion to an on-line format has a ramp-up period (taken to be eighteen months in this case) across the corporation as a whole. In this example case, the enterprise is charged €350 per month per site for the satellite multicast service (for a 1.280 Mbps distribution capability).

**Figure 9 Broadband Multicast Applications – Satellite-Based Service(s)**




Interestingly, some single applications, such as distance learning programs, yield better returns to the enterprise or agency which offers them. This arises because generally a larger audience is involved more frequently and because such programs are regularly offered exclusively in the on-line format. In such circumstances, ROIs can then approach 80% after two years, even when new terminals are required. This is, of course, a case for which satellite services have already proven popular when using traditional video broadcast infrastructure. However, it should be noted that the operational and marketing focus for the newest two-way satellite terminals has been centered to date on network access using unicast transmissions. The potential for

utilization of the very same equipment in multicast distribution schemes for the enterprise remains open – to our knowledge, very little detailed planning has been performed in support of this.

**Conclusions**

Insofar as access services are concerned, it should be readily apparent that the positive and attractive ROI outcomes we have presented for satellite-based service are in fact critically dependent on the direct costs of a competing terrestrial connectivity. This can be so by either a direct alternative implementation or indirectly. For example in the case shown in Figure 8 here the payback period depends directly on the cost of a T-1 terrestrial leased line, against which the dual access scheme is considered a competing option. Reality for any satellite service provider is the large installed base of basic broadband access connectivity to businesses and public-sector agencies alike, both xDSL and HFC cable based, together with established price points which will not now be overturned and which seem to contain acceptable margins to the telco, NSP/ISP and cable MSO companies who provide these services.

On the content distribution front, satellite-based service schemes have a unique advantage for enterprise applications involving streaming media to the desktop, since there is no readily viable terrestrial networking implementation available (at this time) which will guarantee delivery of the streamed content. Fully multicast-enabling routers and making QoS assignments for UDP-based video traffic in the WAN remain as very difficult challenges, to be attempted only through close coordination between the enterprise IT group and the terrestrial service provider over periods (usually) of several months for any modern and geographically distributed corporation or government agency.

Independent projections have recently confirmed that web-based conferencing applications which can benefit from the inclusion of streamed multimedia content are fast becoming important elements of the enterprise ASP market. As can be seen from Figure 1, a large portion of the total expected growth in this market is expected to occur within the IP video networking area. Satellite service providers have yet to mount serious integration, development and marketing initiatives corresponding to this opportunity. This will clearly disadvantage them given the momentum being established already by a range of terrestrial service specialists. Obviously, the ROI available to the satellite service provider remains a key factor in determining the full range of terrestrial- and satellite-based solutions that are open for enterprise applications such as those covered within Figure 9 above. A subsequent Webtorial will review additional and definitive analyses performed by Northern Sky Research in that area also, including comparisons with terrestrial service developments.

*This white paper contains excerpts from a recently published Northern Sky Research report series entitled **Satellite IP Data Services for the Enterprise**.*
*Complete information can be found at http://www.northernskyresearch.com/reports/ROI/index.html*

## The Authors

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