AnyMedia® Access System 800 Solutions Guide

Achieving Optimum Growth in Strategic Markets: Infrastructure and Service Efficiencies at Minimal Cost

Lucent Technologies
Bell Labs Innovations



EXECUTIVE SUMMARY

Despite the current downturn in the global economy, industry analysts predict continued growth for the telecommunications industry, worldwide, with opportunities across a broad range of markets. In the broadband services sector, a number of emerging applications show strong growth potential, including: voice-over-data service, wireless data services, and residential broadband packages. Several underserved markets also exhibit new promise, including: the small and medium-sized enterprise sector (SMEs), multi-tenant units (MTUs) and multi-dwelling units (MDUs), and voice services for undeveloped regions.

Currently, a growing competitive threat from cable operators is also being acknowledged by industry analysts. The key issue is cable's ability to deliver a "triple play" bundle of telephony, high-speed Internet access, and digital television. Although this significant advantage has not yet been promoted effectively in most markets, it remains a serious danger as the broadband marketplace evolves—particularly since it could take subscribers away from telecommunications carriers' existing voice and data services, as well as dominate emerging service sectors. It also presents a vivid demonstration of the importance of strategic positioning before competition heats up in broadband markets.

Service providers that develop an expansion plan for controlled growth will be able to benefit from today's emerging and underserved markets, while protecting against competitive incursions. An economical path to expansion can support a wide range of growth strategies. Yet it also minimizes risk, through a cost-conscious approach to capital investments and operations. To be successful, however, the growth plan must address the special needs and challenges related to serving smaller segments of customers within a given market, including:

Maintaining subscriber satisfaction, while driving down costs

Carriers must be able to meet a diverse range of subscriber demands, while keeping capital and operating expenditures well below the income target customers can generate. That means finding competitive new ways to deploy TDM and IP/ATM-based solutions, with minimal investment in new infrastructure, overlay networks and reducing operating expenditures to a minimum. Any carrier that can achieve this level of efficiency will be positioned to benefit from the untapped subscriber demand in a broad spectrum of smaller service areas, now and in the future.

Keeping capital costs to a minimum

Cost-effective capital investment starts with a solid understanding of the target customers' infrastructure requirements, rather than hasty equipment purchases based purely on low cost-per-port. To be cost-effective in smaller environments, network hardware must:

- Be scaled appropriately, eliminating the inefficiencies of operating with excess capacity.
- Support a broad range of subscriber service demands with a minimum of equipment—while making sure that performance is maintained at levels that satisfy subscriber expectations.
- Integrate smoothly with existing infrastructure.
- Leverage existing network capabilities while offering an economical migration path.
- Reduce voice and data network interfaces to a single network connection.

Reducing operating expenses

Lowering the cost of operations can translate directly to higher profit margins. But reductions can only be achieved through enhanced levels of efficiency, or else customer satisfaction may decline. As a result, carriers that enter emerging and underserved markets must find highly efficient, cost-effective methods to address each of these classic operating concerns:

- **Cut** the time and expertise needed for equipment installation and service start up to an absolute minimum.
- **Streamline** network and service management with easy-to-use remote management features—which must integrate seamlessly with existing systems.
- **Deliver** services more quickly, reducing the effort, and therefore time, required to deliver existing and new subscriber services, and reduce the amount of post-installation support through service efficiency, high network availability, and reliability.

The competitive advantage

Carriers who develop an effective expansion plan for smaller, and possibly strategic, customer segments will be in a better position to extend service offerings, expand market coverage, and increase bottom-line profitability. Additionally these carriers will achieve greater efficiency in service delivery and improve subscriber satisfaction and loyalty. More specifically, the advantages can include:

- **Additional revenues**—by entering underserved and emerging markets, carriers have an opportunity to gain additional income from previously untapped sources, often without pressure from multiple competitors.
- **Greater market share**—using a more cost-effective approach and by bundling technologies into required customer solutions, carriers can offer a variety of new services that expand their base of opportunity.
- **Reduce customer churn**—more efficient operations result in a reduced amount of time to activate new customers and an increase in existing customer satisfaction.
- **Higher levels of brand loyalty**—when service quality is high, subscribers are less likely to switch to a different service provider. As customer retention is achieved, subscribers will choose addtional value-added services.
- **Protection from existing and new competitors**—the ability to deliver a broad range of services at minimal cost helps fend off many forms of competition, whether from legacy telephone operators, new broadband service providers, cable companies, or satellite operators.

Overall, this cost-effective approach to growth and extension of services allows carriers to expand strategically, at a controlled pace, with minimal expenditures and risk in an uncertain economy.

THE MARKET SITUATION

Although the telecommunications industry is currently operating within a difficult global economy, analysts foresee continued opportunities for growth in all regions over the next few years. The International Data Corporation (IDC), for example, projects a compound annual growth rate (CAGR) of 8.4% for global telecommunications revenues—driven chiefly by worldwide expansion of access lines, along with rapid growth in data networking services. Opportunities for service providers to extend their offerings exist in both emerging and underserved markets, targeted at both residential and business customers. In addition, service providers need to be aware of the competitive threat to their existing voice and data offerings emerging from cable companies in some regions.

The Opportunities

In general, today's greatest opportunities for growth lie in two types of smaller customer segments. The first type includes emerging broadband applications for residential and business customers—capabilities that are in the earlier stages of implementation. Carriers that are prepared to cost-effectively serve these segments have an outstanding opportunity to claim market share, expand service offerings, and gain additional revenue.

The demand for broadband capabilities is greatest among developed countries in Europe and Asia, in those areas where deregulation, government support, and growing competition have enabled more widespread broadband implementation. In Western Europe, high-speed data connections will continue to be the fastest-growing market sector, according to IDC, particularly for broadband access and IP VPNs.

Table 1 - Western European Broadband Access Connections by Country, 2000-2005 (000s)

	2000	2001	2002	2003	2004	2005	CAGR 00-05
Austria	116	285	527	841	1,223	1,647	70%
% change		145%	85%	60%	45%	35%	
Belgium	190	378	663	1,043	1,504	2,018	60%
% change		99%	75%	57%	44%	34%	
Denmark	78	179	343	600	887	1,213	73%
% change		130%	92%	75%	48%	37%	
Finland	24	97	251	483	769	1,041	113%
% change		302%	160%	93%	59%	35%	
France	416	826	1,599	2,927	4,908	7,708	79%
% change		99%	93%	83%	68%	57%	
Germany 301	1,963	4,579	7,783	11,721	15,834	121%	
% change		552%	133%	70%	51%	35%	
Greece	0	0	10	35	79	139	69%
% change		N/A	N/A	245%	130%	75%	
Ireland	0	0	16	55	118	201	65%
% change		N/A	N/A	239%	114%	70%	
Italy	48	402	1,114	2,329	3,972	6,129	164%
% change		737%	177%	109%	71%	54%	
Netherlands	218	494	1,008	1,681	2,400	3,181	71%
% change		127%	104%	67%	43%	33%	
Norway	28	135	260	452	709	991	104%
% change		380%	93%	74%	57%	40%	
Portugal	17	38	95	179	304	493	96%
% change		121%	153%	89%	70%	62%	
Spain	61	463	1,047	1,964	3,332	4,895	140%
% change		660%	126%	88%	70%	47%	
Sweden	67	294	608	1,054	1,600	2,270	102%
% change		338%	107%	73%	52%	42%	
Switzerland	35	128	291	577	908	1,295	106%
% change		265%	128%	98%	57%	43%	
UK	64	295	673	1,267	2,051	3,056	117%
% change		361%	128%	88%	62%	49%	
Total	**1,663**	**5,975**	**13,084**	**23,270**	**36,485**	**52,111**	**99%**
% change		259%	119%	78%	57%	43%	

Source:IDC, 2002

Emerging growth opportunities

Industry analysts are predicting growth in the following service areas:

Voice-over-data services, which IDC predicts will play a much stronger role in businesses worldwide over the next few years, claiming usage from the landline sector.

Wireless data services, which are currently very strong in Japan. Across the whole Asia-Pacific region, IDC projects 28% CAGR for 2001-2005, while increases of 38.5% CAGR are predicted in Western Europe, for the same time period. Competitors are already rushing to capture regional and international 3G markets,

	2000	2001	2002	2003	2004
China	82,500	185,400	432,000	1,002,800	2,297,500
Hong Kong	185,500	319,136	486,890	690,000	915,950
Malaysia	15,000	33,425	67,581	125,364	203,231
Singapore	36,600	156,528	330,915	537,517	792,000
Taiwan	150,000	850,000	1,425,000	2,090,800	2,825,500
Thailand	1,000	6,532	20,249	52,647	95,554
Total	**470,600**	**1,579,480**	**2,797,468**	**4,530,139**	**7,129,735**

according to IDC, because they hold promise for wireless data services, as well as easier roaming for voice calls. Many have begun laying the groundwork with licensing, partnerships, content development, and infrastructure development.

Residential broadband service packages, such as multi-channel voice-over-DSL (VoDSL), video/music on demand, and broadcast TV. The Yankee Group predicts that the value of the residential broadband access market in Europe will rise from $1.1 billion (E1.2 billion) in 2001 to $9.4 billion (E11.3 billion) by 2006, with ADSL accounting for nearly 80% of revenues. However, many industry analysts agree that a compelling package of content and applications is crucial for stimulating widespread consumer demand for broadband—while generating substantial new revenues.

Underserved business and residential markets

An array of promising growth opportunities also exists in small markets that have remained underserved because carriers believed them to be uneconomical—either because the carrier could not acquire the technology needed for implementation, or service rates required to sustain a reasonable profit margin would drive away subscriber interest. It is now time for carriers to re-assess these situations, because technology integration, port density, performance, Quality of Service (QoS), redundancy, and power consumption have been improved and optimized, while the demand for new services and better options remains extremely high, waiting for carriers that can provide cost-effective delivery.

Higher-bandwidth services for small and medium-sized enterprises (SMEs), in developed countries. Large enterprises have long driven the trend toward higher bandwidth services, but the SME sector has lagged behind because many advanced data services have been cost prohibitive. Now, the introduction of broadband access via the local loop using DSL, cable, and fixed wireless technologies should at last enable this sector to satisfy their demands affordably in Western Europe, IDC predicts—and points out that Asian-Pacific businesses are also seeking new ways to handle their networking challenges. In the same vein, the Yankee Group recommends that ADSL providers should tap the SME market in China, where it is part of the high-growth business segment. Typical multi-service packages could include high-speed data services for fast intranet, extranet, and Internet access, combined with voice services. But many other broadband business-to-business collaboration and Web hosting services could be included to enhance SMEs' business capabilities.

Narrowband and broadband service packages for shared buildings, including multi-tenant units (MTUs), multi-dwelling units (MDUs), hotels, office buildings, apartment complexes, commercial, and institutional buildings. This market includes many of the SMEs described above, along with residential customers, business travelers, professional groups, and larger organizations that could benefit from an economical mix of narrowband and broadband services.

Voice services in less developed countries, as access lines and wireless infrastructure are implemented in countries like China, India, Malaysia, Brazil, and Mexico. According to IDC, the Latin American (LA) telcommunication sector is still "grossly underserved" and—with recent deregulation in many countries—offers significant opportunity for domestic competition, although "access to international markets is still contentious." Voice services in the LA region are expected to increase at a CAGR of 13.2% by 2005.

In the Asia-Pacific region, IDC predicts that voice revenues will increase at a CAGR of 8.5%, led by strong demand for basic access lines. With its huge population, India is expected to become one of the largest markets in the region as penetration of fixed lines increases from the national average of 2%—and as the political and regulatory climate continues to improve for both landline and wireless services.

The revenue potential in this broad array of emerging and underserved markets is wide open to any type of carrier—new, incumbent, wireline, or wireless—that can meet the business and technology challenges.

The Competitive Threat from Cable Companies

In several regions of the world, cable operators are positioned to compete head-to-head with telecommunications companies—not only in broadband markets, but in voice sectors, as well. Industry analysts point out that cable operators have a distinct advantage over ADSL providers, because they can provide a complete bundled package of voice, video, and broadband Internet services.

In Europe, telecommunications companies have so far maintained an edge, with the exception of the UK, where NTL and Telewest have used both price cuts and joint marketing campaigns to successfully boost cable modem deployments, which currently outstrip those of BT's ADSL product, the Yankee Group reports. However, despite ADSL's current lead in most European countries, this market remains dynamic, and cable companies still have a clear opportunity to exploit their "triple play" offering of telephony, high-speed Internet access, and digital television, according to IDC. As competition in the broadband market heats up, the cable "triple play" advantage threatens to erode carriers' existing voice and data service offerings, as well as any emerging video services.

BUSINESS CHALLENGES

Today's emerging and underserved markets offer a broadly diverse opportunity. The key business issue for service providers is: how to successfully capture these markets—and protect against competitive threats—with a minimum of expenditure and risk. That goal can be achieved by using an expansion plan that allows for incremental growth, while minimizing capital expenditures and operating costs, yet maintaining customer satisfaction.

A plan that allows for controlled growth provides an important advantage to service providers, particularly in uncertain times. It offers an economical way to extend integrated voice and data services into small markets of many types, gaining a foothold in emerging sectors, benefiting from the untapped demand in underserved markets, or gradually attracting subscribers from competitors by offering services that are not otherwise available.

For this type of expansion plan to be successful, however, it must carefully consider the special needs and challenges of operating in small markets. The following factors all need to be addressed:

Satisfying new and existing subscribers

In both large and small markets, subscribers want communication services that meet their needs and interests, whether that means simple dial-up voice connections or the latest multimedia capabilities. They want satisfactory performance from their service, including quick start up and responsive support. And they want to pay a fair price for any service they subscribe to. However, small markets don't benefit from the economies of scale and higher-volume revenues available to larger markets. Consequently, subscriber satisfaction must be achieved through enhanced levels of efficiency across all areas of expense.

Reducing capital expenditures

When carriers rush to claim market share, one of the classic errors that's made is hasty equipment purchase, based on up-front price, rather than careful consideration of actual costs over time. This error is particularly dangerous in small markets, where the first step in driving down capital expenditures must start with gaining a solid understanding of the infrastructure requirements. To be cost-effective, network hardware must satisfy the following principles:

Per-port cost—Port pricing is an important factor in choosing economical equipment, even if it is not the only issue to be considered. Finding appropriate hardware with a service-efficient cost per port is the first step in minimizing up-front capital investment, but this pricing must be evaluated as part of the complete cost picture, including: the range of services to be offered, reliability, and future proofing.

No excess capacity or wasted space in a Central Office—For small markets, network hardware must be scaled appropriately, allowing for incremental growth and eliminating the inefficiencies that come with excess capacity. Even if line pricing is low, capital investment is wasted if it goes toward purchasing equipment with unused ports. If housed in a Central Office, this excess capacity will also add to ongoing operating expenses through its oversized footprint.

Multiservice support—Because smaller customer segments can present a highly diverse range of subscriber demands and preferences, carriers should be prepared to address these requirements through the most efficient use of network infrastructure, with a minimum of hardware. Ideally, that means having the ability to offer multiple services from a single platform. This approach eliminates the initial investment in overlay networks and avoids the operating costs that arise when managing more complex networks. Not only should the platform be able to support both narrowband and broadband capabilities, it should also have the flexibility to add or change services easily, as subscriber needs change over time. This broad range of service support and adaptability is extremely important for minimizing equipment expenses. It can also play a crucial role in fending off competitive threats by allowing new, enhanced services to be launched as quickly as possible.

Smooth integration with existing equipment—To eliminate installation and maintenance costs, all new network equipment should integrate seamlessly with the existing network resources. While the expenses involved in the integration process—or the time required to correct problems that arise out of incompatibility—are not reflected in the initial investment, they are an actual cost of each purchase decision.

Support for existing telephony requirements—For greatest economy, new equipment must provide support for existing network capabilities. While this issue is particularly important in remote areas where the infrastructure is at an early stage of development, it is also a critical competitive factor in maintaining economy in more technologically advanced markets. Being able to support the full spectrum of service capabilities from narrowband POTS to advanced broadband without maintaining multiple networks provides crucial cost savings.

Economical network migration—Costs associated with an existing POTS network and broadband network may be reduced by merging network and service infrastructures and taking advantage of the efficiencies related to combining circuit and packet-based services in a single architecture. To drive down capital expenditures over the longer term, the right platform not only integrates and provides an easy evolution from circuit to packet, but should be self-contained to include power and ringing, which would be of significant benefit to carriers in smaller countries with existing, older, telephony infrastructure.

Reducing Operating expenditures

Assuming that operational expenses directly affect a carrier's bottom line as a percentage of revenue, it is only a matter of simple math to calculate that every percentage point saved by reducing costs is a percentage point that can be subtracted from the expense column and added to the revenue column. These expenses include a wide variety of ongoing business activity, such as service set up and activation, loop qualification and ongoing circuit maintenance for DSL service, network monitoring and management, training for customer support and technical personnel, and customer service. Even minor enhancements in these activities can yield crucial savings for carriers entering small markets. Major improvements can reduce costs even further and can also result in greater subscriber satisfaction through better network performance and customer support. The primary areas of challenge include:

Minimizing start up time—The time and expertise needed for initial equipment installation and service start up must be reduced to an absolute minimum. Carriers need to carefully consider how easily new hardware can be implemented and assess the procedures used to activate each type of service. In the rush to claim market share, many DSL providers, in particular, have not optimized their service activation procedures. Carriers who plan to provide these services in small markets need to find ways to make the work of their field technicians and service personnel in regional support centers as uncomplicated and effective as possible. Optimized procedures that take advantage of automation wherever possible will keep costs down while helping to ensure that subscribers are not frustrated by service delays or other start-up problems.

Streamlining network and service management—Three factors are important for cost-effective network and service management in small markets. Carriers must make sure that their management system is easy to use, preferably with a simple graphical user interface (GUI). It must provide remote management capabilities that allow effective, centralized control over small markets in any location. And it must integrate easily with the carrier's existing management system. All three factors are crucial for maintaining high network performance, at lowest cost.

Deliver services more quickly, reducing the effort, and therefore time, required to deliver existing and new subscriber services—One of the most effective ways to reduce the time required, and the potential issues associated with delivering narrowband and broadband services is through careful selection of hardware and software. Both must have proven reliability and redundancy, along with high-quality network management that catches problems before they affect network performance. When problems do occur, the way they are handled can have a significant impact on the revenue generated by a customer. For example, problems on a DSL network can have many causes, which are resolved in very different ways. Truck rolls can be expensive and, for the most part, unnecessary when other options exist. These costs can directly impair maximum profitability, unless carriers develop effective tools and procedures for diagnosis and remediation.

TECHNOLOGY CHALLENGES

The technology challenges of serving emerging and underserved markets are based on their diversity. These small markets may be located in any geographical area—with wide-ranging infrastructure and climate—and subscribers may express interest in the full range of narrowband and broadband services. Yet all these conditions must be handled at lowest cost. As a result, the specific challenges include:

Integration with existing infrastructure—To keep costs low, new capabilities must be able to integrate seamlessly with whatever type of infrastructure already exists, even if it is largely underdeveloped, and leverage the existing capabilities.

Flexibility—The network must be able to meet a broad range of subscriber demands right away, then allow services to be added or changed, easily and economically. Ideally, that means offering multiple services from a single platform, which offers high levels of efficiency and requires minimal management. In fact, IDC predicts that integrated multiservice platforms will continue to be implemented on a global basis, because they provide cost savings for new carriers as well as introduce new revenue opportunities.

Low overhead—Network resources must keep costs down in several ways: through low initial purchase price; fast, easy installation; uncomplicated management; simple ways to replace parts and add new services; reliability that minimizes the need for repairs, while also using minimal rack space and providing cost-efficient power consumption.

Immediate service delivery—The network must allow for future growth and development by offering a smooth, economical migration path to packet-based services while enabling the immediate delivery of existing services.

LUCENT SOLUTIONS

Lucent Technologies offers a solution specifically designed to meet the needs of carriers that want to extend service to smaller customer segments—the AnyMedia® Access System 800 (AMAS 800). Like the field-proven standard AMAS shelf, the new AMAS 800 is an integrated multiservice access node that supports a full range of applications, from the most basic voice POTS services to the most advanced broadband data (DSL) applications. But this compact system delivers its capabilities in a cost-effective, standalone unit that is scaled to markets requiring no more than 256 subscriber ports. Housed in an easy-to-install package, the AMAS 800 includes power and optional ringing functions, battery back-up, and the Lucent WaveStar™ ® AM 1 Plus (SDH) add drop multiplexer. Because it provides everything needed for quick service start up, the AMAS 800 can be deployed easily and economically across a broad spectrum of underserved and emerging market opportunities. Plug-and-play application packs enable simplified services provisioning.

Here's a closer look at how the AMAS 800 supports cost-effective entry into these markets.

Low cost-per-port for up to 256 ports

To keep port pricing low, the AMAS 800 is scaled for smaller markets, providing more cost-effective use of system capacity. To achieve these efficiencies, the standard AnyMedia shelf has been integrated with power and ringing functions and provides up to 8 application packs in support of both narrowband and broadband functions. This currently enables the AMAS 800 to reach 256 subscribers with a single self-contained unit. One or two slots may be equipped with the ATM controller (AFM); using two AFMs enables additional redundancy. This solution provides the ability to grow incrementally and enables voice, data, video, any time, anywhere.

Standalone integrated ATM and TDM package

Everything carriers need for quick service start up is provided in this compact, self-contained system—allowing fast, easy plug in and connection to a transport system. The AMAS 800 includes:

- Wall-mounted or rack-mounted steel cabinet (610 x 369 x 1000 mm)
- AnyMedia standard shelf, modified to support power module
- 8 application pack slots (supporting up to 256 analog voice lines, 224 xDSL lines, or any combination of voice and data)
- Power module which integrates the power unit, optional ringing generator, and back-up battery
- Optional WaveStar AM 1 Plus SDH multiplexer

Full spectrum of service options from a single platform

The AMAS 800 offers the same field-proven capabilities as the standard AnyMedia shelf, which means it can meet wide-ranging subscriber requirements, from basic POTS services for remote rural areas to advanced broadband offerings for premium business customers. Leveraging the complete portfolio of existing AnyMedia subscriber line cards, TDM controllers (COMDACs), and ATM Feeder Multiplexers (AFMs), it provides cost-effective, reliable dial-up services, while supporting the bandwidth capacity required for leased line data, and any high-speed broadband data applications for residential as well as business customers.

Standard TDM and ATM-based higher network interfaces are concentrated, cross connected, and multiplexed for any subscriber service via POTS, ISDN (BRI and PRI), HDSL, SDSL, ADSL (Full/Lite over POTS and over ISDN), SHDSL, and VDSL, which includes all interfaces to GSM and (future) UMTS base stations. It meets all standard network interfaces, including telephony via V5.1, V5.2, and leased line over E1s or E1s circuit emulated in ATM providing a single network interface—and data via ATM over E1 IMA, E3, or STM1. These service capabilities include:

Narrowband Services

V5.x switched services—AMAS 800 switched services are groomed and concentrated into V5.1 (according ETS 300 324-1) and V5.2 (according ETS 300 347-1) interfaces. These are homologated and adapted to several countries and switches worldwide.

- POTS (customer-specific POTS with different features, for example pulse metering, reverse battery)
- ISDN BRA: dial-up connection, 2 x 64-Kbps transmission capability for voice and data (two B-channels) and 16-Kbps transmission capability for signalling and data (D-channel)
- ISDN PRA via TDM (S)HDSL (V5.2 only): Transmission capability up to 30 B-channels (30 _64 Kbps) and one D-channel (64 Kbps). The B-channels are transported in the bearer channels of the V5.2 interface; the D-channel is transported in the communication channels of the V5.2 interface.

V3 switched service—ISDN PRA via (S)HDSL: Transmission capability of 32 bearer channels (32 _64 Kbps) including timeslot 0. The 32 bearer channels are transparent between the (S)HDSL interface and the network side.

Leased Line Services

- Analog leased lines (ALLs) supported via POTS subscriber line cards
- Digital leased lines (DLLs) supported via ISDN subscriber line cards
- Two kinds of (S)HDSL based n_64 Kbps and unstr. leased line services:
  - VLL: Digital leased line via interfaces according to V.35, V.36 or X.21
  - GLL: Digital leased line via interface according to G.703
  - UVLL: Unstructured leased line interfaces according to V.35, V.36 or X.21
  - UGLL: Unstructured leased line via interface according to G.703.

Network TDM Capacity Extension—Extension of the TDM based network capacity is achieved by 4 built-in E1-interfaces on the SHDSL card, which allow SHDSL transport to the subscriber from the AnyMedia location for 2-Mbit leased lines application (PRI, Unstructured E1) not going through the COMDAC's cross-connect matrix.

Broadband Services

The AMAS can support all the same DSL-based services that are available for the standard AnyMedia Access System. These services are implemented according to all ITU standards.

ADSL—The AMAS 800 supports Annex A (ADSL-over-POTS), as well as Annex B (ADSL-over-ISDN). The ATM-based ADSL cards have passive splitters on board, so no additional splitter shelves are needed for deployments.

S(H)DSL—The AMAS 800 supports symmetric DSL (SDSL) and symmetric high bit rate DSL (SHDSL); for example, to provide VPNs for SMEs. Symmetrical multi-rate data speeds are available from 144 Kbps to 2.3 Mbps.

Voice over DSL (VoDSL)—This service can be supported, but selection and verification of IADs and compatible Voice Gateways—like the PSAX from Lucent Technologies or the Jetstream and TDSoft products from other vendors—are necessary to ensure AAL-2 Loop Emulation Standard (LES) interworking with standard V5.2 supporting voice switches.

Voice over IP (VoIP)—VoIP service can be supported using new IADs interworking with multiservice and soft switches to handle IP encapsulation, where the traffic is carried via xDSL/ATM. Like VoDSL, this service requires careful selection and verification of IADs and compatible Central Office equipment.

ATM-based Quality of Service (QoS)—QoS is implemented on the AMAS 800 by specifying bit rates to the ADSL ports, traffic man-agement parameters, and class of service to each circuit. The circuit is policed

and congestion managed to ensure that the QoS contract is met. Call Admission Control (CAC) algorithm is applied on a circuit when provisioned to determine if the new connection, with its associated set of QoS parameters, can be established—taking into account the set of connections that already exist in the system and the available system resources.

ATM connections are permanent virtual circuits (PVCs). VPI or VPI/VCI connections are provisioned with one of the following service categories:

- Constant bit rate (CBR)
- Real time variable bit rate (rt-VBR)
- Non-real time variable bit rate (nrt-VBR)
- Unspecified bit rate (UBR).

Multiservice market access

With this broad range of service offerings, carriers can appeal to a diverse selection of markets—or respond quickly and aggressively to competitive threats. They can choose to focus on a single service that is currently unavailable to subscribers or offer attractive new service packages that appeal to niche markets. The multiservice capabilities of the AMAS 800, with its plug-and-play application packs also make it easy to add or change services as subscribers' preferences evolve, or when new services must be launched as quickly as possible to prevent loss of customers to competing products. With the system's advanced broadband and packet capabilities, this flexibility and responsiveness will extend well into the future.

Flexible deployment

Because it does not require a temperature-controlled, air conditioned environment, the AMAS 800 can now be wall mounted in nearly any indoor environment or rack mounted in a carrier's Central Office. (Packaging for outside applications will be available in the future.) Trunking can be derived from any type of facility a carrier might have available, including copper, fiber, and microwave radio.

AnyMedia 800 networking

- TDM-based G.703 E1 interfaces
- TDM-based E1 traffic circuit emulated in ATM via the
- ATM-based E1-IMA, E3/DS3, STM-1 interfaces that offer:
- QoS support
- Local and remote daisy chaining
- E3, STM-1 redundancy
- V5.1 and V5.2 voice Services
- Optional WaveStar AM 1 Plus, which offers:
- Aggregate: Support for any SDH-based network architecture on STM-1 or STM-4 (optical)
- Tributary: 16 E1s plus 16 E1s, 2 STM-1, 2 DS3/E3 or 4 10/100 BaseT
- NMS: ITM-SC or ITM-CIT

Single ATM interface for all voice and data services

With the circuit emulation capabilities that encapsulate the TDM E1s in ATM, the AMAS is equipped with a single ATM network interface for all voice and data services.

Economical migration path for wireline services

Because the AMAS 800 is a next-generation platform that supports legacy services, it allows carriers to leverage their investment in existing infrastructure, today. Yet it also saves money in the future by transitioning easily to packet-based applications—which minimizes the cost of a carrier's inevitable network evolution. An example of this evolution is Lucent's introduction of a single packet network interface for voice and data.

AnyMedia products are all part of Lucent Technologies' commitment to improving and extending today's available POTS, ISDN, HDSL, SDSL, SHDSL (both TDM-based and ATM-based) and ADSL-based services—without changing the deployed system platform. The actions include:

- Increasing the capacity to the transport network (STM-4, VPRs)
- Introduction of higher density subscriber line cards (32 port xDSL)
- Introducing new standard subscriber technologies (VDSL)
- Migration steps to support "packet based" Next Generation Network (NGN) services and architectures, where
- The introduction of the single packet network interface via ATM is the first step (CES for TDM)
- IP based scenarios will be introduced

Cost-savings for mobile operators

The AMAS 800 offers two key advantages for the mobility market segment. It can groom the trunks from GSM base stations, as well as future UMTS base stations. This unique capability saves OPEX and reduces the cost of leased lines. The system's UMTS support also allows a smooth network evolution, with no change in infrastructure.

Reliability that keeps costs down

One of the most effective ways to reduce the time required for network service is by using hardware and software with proven reliability and redundancy, along with high-quality network management that catches problems before they affect network performance. The AMAS 800 provides the field-proven reliability of the AnyMedia family and Navis™ AnyMedia network management capabilities.

Easy network management and integration

Managed by Navis AnyMedia, the AnyMedia 800 offers easy-to-use management capabilities through a graphical user interface (GUI) centralized management, and seamless integration into existing AnyMedia networks.

The Windows-based AnyMedia Graphical User Interface—permits detailed control on a diagnostic level of all information that is available in one AnyMedia Access System. It is used as craft interface terminal for initial turn-up, system acceptance tests, and local maintenance purposes.

The UNIX based Navis AnyMedia Element Manager (NAM)—provides a permanent centralized or regional management point, from which multiple AnyMedia Access Systems can be easily monitored, provisioned, and controlled. Managed access network views, shelf view, multi-user profiling, flexible security, and filter and reporting features are supported via the NAM GUI clients.

The NAM's open architecture—enables integration in an overall management structure. The NAM presents all functionality in an open and well-documented way in CORBA/IDL format, which permits the element manager to exchange data with other systems, in any protocol, any information model, and on any management aspect. An SNMP-based northbound interface is also available for higher fault management integration.

SUMMARY

The AMAS 800's specially designed features and unique ability to support both TDM and ATM within a single platform make it powerful solution for controlled expansion—whether for strategic positioning or to gain new revenue streams—as well as valuable protection against competitors. With its broad selection of services and flexible deployment, it allows carriers to easily launch new services in any market they choose to enter, while continuing to support existing offerings. The compact, self-contained design makes service start up even faster and easier, because the standalone system is easy to install and connect to a transport system. Yet these services can be seamlessly integrated with any existing AMAS networks for simplified, centralized management.

To enhance profitability in smaller customer segments, the AMAS 800 minimizes both capital and operating expenditures and supports incremental growth. The key to its cost effectiveness lies in its small scale, which allows low line pricing and more efficient use of network capacity. But the system's design also delivers further economies, because it can support multiple narrowband and broadband service offerings from a single platform, in a space-saving package that can be flexibly deployed.

Besides supporting a carefully considered expansion, the AMAS 800 also enables the industry's fastest, most cost-effective response to competitive challenges. When competitors' service offerings threaten to lure away existing customers, the AMAS 800 enables carriers to offer their own enhanced services immediately. No new investment in infrastructure is required, since the AMAS 800 supports a full array of service offerings on a single platform—using easy-to-install plug-and-play application packs.

The AMAS 800 will continue to keep expenditures down, support new services, and fend off competitors well into the future, because its multiservice capabilities allow easy change and adaptation, as customer requirements evolve—without further equipment investments. For this reason, it offers the most economical migration path for both the wireline and mobile services segments, including UMTS base stations, and enables a smooth transition to packet-based networks.

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INS v1 03/02

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