Wireless SDSL for the Business Sector

Broadband Services over BreezeACCESS VL

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Broadband Access – A Rapidly Growing Market[1]

With the rapid increase in the demand for user bandwidth and the equally impressive growth in availability of competitively priced solutions, the demand for broadband access has never been greater. World broadband lines stood at 150.5 million as of 31 Dec 2004, with a record 50 million increase in lines overall, and 26.5 million increase in the second half of the year alone. This represents the biggest half-year worldwide increase to date. DSL has a majority 62% of world broadband market share compared to a 38% share made up of cable modem and other technologies.

In the Business sector, where Internet access and VPN are viewed as the main services, worldwide DSL lines stood at over 11.4 million as of 30 June 2004, a 24% increase from the 9.2 million business lines at the end of 2003. The great majority of business DSL lines use the ADSL technology developed primarily for residential use. Less than 10% use the various forms of symmetrical DSL, including SDSL, and SHDSL. Other technologies such as ADSL2+ or VDSL will also be used to provide business-grade symmetrical services in future. It is estimated that the total installed base of these 'Symmetric DSL' or SyDSL lines increased from 650,000 to 1.2 million worldwide by the end of 2004.

In today's telecommunications industry, broadband access is one of the fastest growing sectors, leading to an intense competition on market share between the incumbent carriers and the cable companies, and attracting competitive service providers that seek ways to gain a share of this lucrative market.

Wireless DSL Solutions for the Business Sector

Using high-capacity Broadband Wireless Access systems for provisioning of wireless SDSL-like services to the business sector present a highly attractive alternative to both new and incumbent service providers. Due to its significantly higher coverage, a WDSL Base Station at the local exchange can provide services to customers located up to 10 km away. In addition, a stand-alone Access Unit can be used to extend coverage to specific areas. Due to its very small size and low power requirements, the stand-alone Access Unit can be installed almost anywhere – in a street cabinet, on a pole or even on the roof-top or side wall of a suitable building. Another benefit from

[1] Source: http://www.point-topic.com

the significantly higher number of potential customers that can be reached by each WDSL Access Unit is the increased efficiency of customer acquisition campaign resulting in a much lower acquisition cost per customer in the target area.

Alvarion's WDSL presents a low risk solution based on mature products and minimal initial investment.

All-Wireless xDSL network

Alvarion's Wireless DSL (WDSL) systems enable competitive service providers to offer highly attractive service packages to the business sector while bypassing the wired infrastructure, with the added potential benefit of using the same infrastructure for provisioning of services to the residential sectors, With system architecture that enables fast rollout and pay-as-you-grow strategy, operators can offer SDSL-like services as well as special services that surpass the performance available with standard SDSL technologies, such as significantly higher link rates. The same system can be used to provide a very wide range of services, covering the needs of both the business and residential sectors, and exhibiting exceptional flexibility that allows offering special service package to customers with special demands.

Complementing xDSL networks with Wireless DSL

In most countries the struggle for market share in the broadband access sector is primarily between the two owners of the feasible infrastructure, namely ILECs and cable companies. The access technology serves an important role in this competition, as the incumbent carriers use DSL to provide broadband services over their existing copper infrastructure, and the cable operators build upon the inherent limitations of DSL as an important part of their competitive message. Even in the few countries where cables are not a viable option, DSL is far from being a unanimous solution.

Due to the inherent limitations of wired DSL, ILECs cannot provide suitable broadband services to a significant percentage of their potential customers. Alvarion's Wireless DSL (WDSL) enables providing broadband services to subscribers that cannot be economically served using xDSL, and to offer suitable services to certain subscribers with special demands such as high uplink rates or committed bandwidth.

As an overlay solution, WDSL can be used to provide services to subscribers in the same area served by the xDSL network. An overlay system may be the solution of choice where the infrastructure has reached its full utilization due to lack of DSLAMs or copper pairs.

BreezeACCESS VL Network Architecture

The BreezeACCESS VL product family is a packet based wireless network deployed in cellular cells. Each cell includes a base station with access units (AU) and subscriber units (SU) at the users' premises. The solution is exceptionally modular and can use per base station one AU with 360 degrees coverage for low entry costs or several AUs with 120, 90 or 60 degrees sector antennas, DC/AC power options and redundancy. The high capacity of an AU may reache net aggregate FTP traffic of 32 Mbps utilizing bursts of 54 Mbps over the air and advanced techniques for maximizing performances. These include among others, packet concatenation, adaptive modulation scheme per SU, automatic transmit power control (ATPC) per SU, automatic SU distance measurement, and built-in spectrum analyzer with Automatic Clearest Channel Selection (ACCS) for minimizing interference effects. A single AU can serve up to 512 SUs. The SUs are installed at the enterprises premises and may support aggregated FTP traffic of up to 22 Mbps. Both the AU and SU come with 10/100BaseT auto negotiating interfaces for connecting to the WAN and LAN as needed. The solution is an enhanced distributed switch with built-in advanced access suite that includes QoS, data encryption VLANs truck, access and hybrid support, packet filtering, and add-on optional modules for VoIP GWs and Wireless WiFi routers for SMEs and residential users.

BreezeACCESS VL utilizes advanced orthogonal frequency division multiplexing (OFDM) technology with non line of sight (NLOS) capability. With its NLOS, long reach and High capacity BreezeACCESS VL ensures reaching large number of subscribers of optimizing the business potential.

BreezeACCESS VL also comes with advanced suite of management and diagnostic tools including AlvariSTAR – Alvarion's carrier grade network management system.

Benefits of Using BreezeACCESS VL

- **WiMAX services - Today!**
  - Combining OFDM non line-of-sight technology (the technology that is the basis of the WiMAX 802.16 standard), extended reach, high capacity, QoS mechanisms, and **an enhanced access suite.**
- **Investment protection**

- Co-location of future WiMAX base stations with existing BreezeACCESS VL equipment enables BreezeACCESS VL CPEs and WiMAX CPEs to provide services simultaneously in the same sector, all managed with the AlvariSTAR carrier grade NMS platform now and in future

- **Low cost, fast installation**
  - Built-in SNR indicator bar – integrated on the outdoor unit enables fast antenna alignment with no external equipment
  - Always-on adaptive modulation and Automatic Transmit Power Control (ATPC) optimizes link performance during installation and operation
  - Automatic clear channel selection (ACCS) for automatic selection of the Channel that have the least interference.
  - Fast and simple CPE installation and easy to implement redundancy
- **Reduced infrastructure - Low initial investment and fast ROI**
  - Fewer sites required as a result of high capacity, long reach and NLOS
  - Support for multiple subscriber profiles within the same sector and network
  - Modular and flexible for pay-as-you-grow (base station and stand alone), AC/DC, variety of antennas, variety of CPEs with the option to upgrade CPE rates over-the-air
  - A stand alone AU can be installed in street cabinets, on a pole or in other suitable locations
- **Lower operating expenses**
  - Minimal infrastructure requirements reduce the number of sites to support
  - Remote management firmware and configuration download/upload
  - Enhanced diagnostic feature set
- **Provides SDSL equivalent services and more**
  - Symmetrical as well as asymmetrical connections
  - Enables provisioning of committed bandwidth (CIR) services
  - Very high rates options – up to 3E1 (6144 Kbps) and more

Wireless SDSL Services over BreezeACCESS VL

Correct planning is important for maximizing performances of wireless SDSL service. The factors that should be taken into account can be divided to two basic groups: the wireless medium and the operator policy. The first include factors related to the terrain, population density, and environmental conditions, together with product capabilities. Operator's policy considerations include over subscription ratio, and the business strategy that dictates the target customers: business only, or business together with residential customers using the same network. The following table displays the calculated results for several typical scenarios:

Scenario	**Business service**	**Residential service**	**Additional factors**	**Estimated capacity per AU** (assuming generic distribution of users in the sector)
A	2048kbps downstream 2048kbps upstream Over subscription 1:10	None	Cell distance 1km (Urban scenario)	20 users Aggregated AU capacity of 9.5Mbps
B	2048kbps downstream 2048kbps upstream Over subscription 1:10	512kbps downstream 128kbps upstream Over subscription 1:20	Cell distance 3km 70% residential users 30% business users (Urban scenario)	46 users (13 business, 33 residential) Aggregated AU capacity of 7.9Mbps
C	2048kbps downstream 2048kbps upstream Over subscription 1:10	512kbps downstream 128kbps upstream Over subscription 1:20	Cell distance 10km 80% residential users 20% business users (Rural scenario)	42 users (14 business, 28 residential) Aggregated AU capacity of 7.2Mbps

* The calculations take into account different modulation per user and retransmission percentage per user, assuming generic distribution of users in the sector.

For scenario A, a three sector base station can serve 60 DSL users in an urban area or Business Park. The backhauling can be conducted with a BreezeNET B wireless point-to-point link.

Business Case for Wireless SDSL Service

Assuming a network of 10 cells with scenario A leads to the following cost analysis:

Fixed Costs:

Access equipment cost:

10 base station with 3 sectors and power supply redundancy	$201,200 (list price)
600 SU (using SU-6-BD)	$660,000 (list price)
Total access equipment cost	$861,200 ($1,435 per SU)

Installation costs: $300,000 ($30,000 per site, $500 per SU)

Overall fixed cost: $1,187,800 ($1,980 per SU)

Maintenance Costs:

Sites leasing cost	$12,000 per month ($1,200 per site per month)
Site Internet peering cost	$10,000 per month ($1,000 per site per month)

Total maintenance for all sites: $22,000 per month ($36.7 per SU per month)

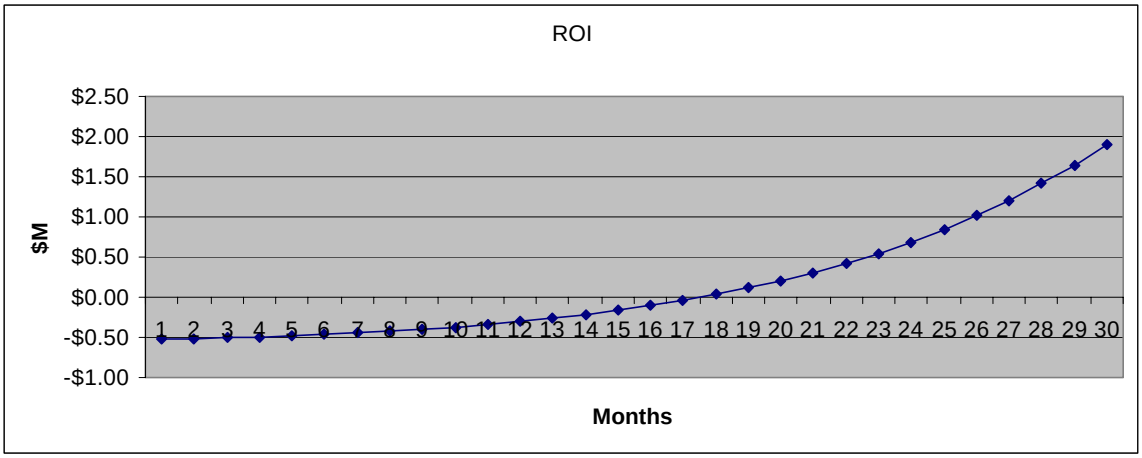
Wireless SDSL service fees and intake rate:

Service price per SU	$480
Installation services per SU	$480
Service intake rate	10% increase in number of users/month, starting with 40 users on first month

Business Case Results:

- Return of investment after no more than 18 months
- Full capacity of the network is reached after 30 months
- Initial investment of $0.5M, assuming all base stations are installed on the first month

Return Of Investment (ROI) graph for scenario A business case:



Summary

This paper showed that a wireless SDSL-like service can be economically delivered over Alvarion's BreezeACCESS VL Broadband Wireless Access system. Further more, the capabilities and features of the BreezeACCESS VL solution enable offering higher rates or asymmetrical types of services, which can better meet specific customer needs and provide a source of higher revenues.