AN EXECUTIVE WHITE PAPER ON:

THE NORTH AMERICAN MARKET FOR WIRELESS LOCAL AREA NETWORKS

A STRATEGIC RESOURCE FOR SENIOR MANAGERS WHO WANT TO MAXIMIZE GROWTH AND PROFITABILITY

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TECHNOLOGY MARKET RESEARCHERS AND STRATEGISTS SINCE 1971

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INTRODUCTION

Mass market acceptance and adoption of wireless LAN (WLAN) systems is just around the corner - at least according to many industry pundits. However, after closer scrutiny, the situation bears striking resemblance to an age-old issue in high-tech markets: Technology in search of a solution/application as opposed to (the more favorable) application/issue driving technology development/adoption. While this may not be the only 'issue' faced by the WLAN sub-industry, it may be the most overlooked.

The wireless LAN market grew up in vertical spaces such as industrial warehouses and retail environments (where the latter was the case). Recent market trends indicate a paramount shift with a technology possessing much broader, or horizontal, market appeal. Among the most significant trends to have occurred has been the development - and potential market acceptance - of a standard that offers true interoperability. Namely 802.11b. Unlike 802.11, which did not specify direct sequence over frequency hopping, 802.11b specifies direct sequence as the standard spread spectrum 'technique.'

In the wake of these developments, the WLAN competitive environment has changed almost overnight. No longer are Telxon/Aironet, Symbol Technologies, Proxim and Lucent the only names that surface when discussing the WLAN market. A list of current participants mimics a who's who of the networking industry - Cisco, Nokia, 3Com, Nortel to name a few. However, this is not necessarily surprising. These companies were just waiting for something of the magnitude of 802.11b to occur.

However, it is important to note that 802.11b is not the end all and be all of WLAN technologies. First of all, even before the dust has settled, companies are furiously working at developing higher throughput 2.4GHz solutions (20+ Mbps) and radios that operate in the 5Ghz band (802.11a and HiperLAN2). Not to mention 'standards,' such as HomeRF, based on frequency hopping radios. Making HomeRF more of a competitive standard to 802.11b, the FCC recently approved wide band frequency hopping, allowing data rates of up to 10 Mbps. However, with this dizzying development pace, suppliers may have forgotten one key ingredient - end users.

GLOBAL WLAN MARKET

VDC estimated the size of the wireless LAN market at $481.8 million in 1999, up a modest 29% from 1998. However, growth through 2004 for both revenue and unit shipments is expected to accelerate dramatically, exceeding 40% and 55% for revenues and units respectively. High level factors driving market growth include:

- introduction of Ethernet-like speed wireless LANs through 802.11b products - Cisco/Aironet was the first company to introduce a 11Mbps radio operating at 2.4GHz; this technology quickly became the basis for the 802.11b standard, resulting in a flurry of market activity;
- transition from a technology with a primarily vertical market focus to one with broader horizontal applicability;
- market entrance of network and telecommunications technology giants such as Cisco (through the Aironet acquisition), 3Com (OEM relationship with Symbol Technologies), Nokia and Nortel 'validating' the technology's broader market appeal;
- solidification and significant support of the Bluetooth personal area network standard - while this does not represent a WLAN technology per se, its implications are significant; perhaps most important is the merging of wireless personal, local and wide area network solutions; and
- acceleration in 5GHz based standards activity - undoubtedly one of the most significant issues that will impact the development of the WLAN market will be technology migration, specifically from frequency hopping and direct sequence systems to ones utilizing OFDM on the PHY layer.

Global WLAN Market Growth Segmented by Product Categories
(Millions of Dollars)

	1998	1999	2000	2001	2002	2003	2004	CAGR
NICs	171.8	223.3	363.8	541.6	783.6	1,076.3	1,431.4	42.4%
Access Points	114.6	146.2	226.4	353.0	533.6	762.4	1,043.3	44.5%
Bridges	45.7	59.4	83.1	118.7	167.3	230.7	303.2	37.1%
Software/Services	41.0	52.9	71.5	99.2	137.1	187.1	248.2	35.0%
TOTAL	373.1	481.8	744.8	1,112.5	1,621.6	2,256.5	3,026.1	41.7%

- approval of wide band frequency hopping by the FCC should drive HomeRF opportunities in home and potentially small office environments - however, rapid penetration of 802.11b (especially through OEM relationships with PC suppliers) could impact HomeRF shipments; time will be a critical factor as wideband offerings are not expected to be available until early to mid 2001 r one and a half years after the introduction of 802.11b.

Forecasted global growth rates for wireless LAN hardware and software and services range between 35% and 45% compounded annually through 2004. As wireless LAN technologies are expected to be increasingly distributed through indirect channels, software and service revenues generated by wireless LAN hardware suppliers are not anticipated to grow at the same rates as hardware offerings. Further, much of the software supplied is not sold separately and rather is packed with access points.

Unit growth rates are expected to be somewhat higher as wireless LAN selling prices continue to decline. However, in anticipation of higher priced next generation technology introductions, the overall price reduction curve is not as steep as many may initially anticipate. For example, as next generation 5GHz are introduced and gain initial momentum, NIC and access point year-to-year ASPs are expected to flatten as a result of the higher priced offerings.

NORTH AMERICAN WLAN MARKET

The North American market for WLAN radios or NICs was estimated at $143.6 million in 1999 and is forecast to grow by a rate of just over 40% compounded annually through 2004. Overall unit shipments reached over 890,000 in 1999 and are expected to exceed 7.4 million in 2004 - growing at an annual rate of 52%. This discrepancy in revenue and unit growth is indicative of not only economies of scale realized by volume, but perhaps more importantly by the rapid reduction in average selling prices of these technologies. The best supporting evidence is Lucent which has landed significant OEM partnerships, with price being cited as one of the leading factors.

In terms of access points, North American revenues were estimated at approximately $91.6 million in 1999, on unit shipments of 149,500, and is forecast to grow at over 40% compounded annually to reach $616 million by 2004. In terms of LAN connectivity, serial access points are expected to be discontinued and replaced entirely by Ethernet devices.

At $45.1 million, the market for building to building bridges represented approximately 14% of the North American WLAN market in 1999 and is expected to grow at a slightly lower rate than NICs and access points through 2004. Specific revenue and unit shipment growth is estimated at approximately 39% and 50% respectively.

While the FCC's recent approval of wide band frequency hopping will provide greater viability and sustainability for HomeRF and OpenAir offerings, recent 802.11b momentum and eventual migration to 5GHz should not be significantly impacted as initial 10 Mbps HomeRF products are not expected to be available until early 2001, after the critical Christmas season. However, the technology is expected to be adopted (initially selectively) in home environments where users are not impacted by 802.11b solutions (for example do not use them in their office). 802.11b systems are expected to grow at almost twice the market rate and account for over 60% of the market by 2002. In terms of 5GHz penetration, we expect limited volume in 2001 and 2002 with significant adoption by 2003. This will be driven by increased bandwidth requirements, wireless LAN and WAN convergence and potentially Bluetooth interference. It is currently unclear which of the two standards will prevail (or if both will survive). However, primary success factors will relate to price, manageability of the technology, and position in relation to personal and wide area networks.

WLAN Distribution

The development of overarching and competent distribution channels has been, and should continue to be, a major strategic initiative for suppliers of wireless LAN systems. Initial adopters of wireless LAN systems were tier one retail supply chain organizations that installed proprietary systems from one vendor. These accounts were typically supported directly by hardware suppliers such as Telxon, Symbol Technologies and/or Intermec Technologies. However, as the wireless LAN market has developed - from proprietary to standards based systems - and as cost has decreased substantially, indirect channel organizations are playing an increasingly central role in the development of this market. Channel management and strategic partnerships will become increasingly important competitive strategies.

WLAN End User Markets

While initial adoption of WLAN technologies was concentrated in retail, warehousing and manufacturing environments, future market growth will be driven by other emerging segments. Markets that are forecast to have the greatest impact on WLAN adoption include the corporate or enterprise market, small office/home office, telecommunications/ISP and public access. Initial market development is expected to occur in the enterprise segment, which in turn is expected to generate follow-through sales in other segments.

Top 10 Fastest Growing WLAN Vertical Markets
(In Descending Order)

1	Public Access
2	SOHO
3	Telecommunication/ISP
4	Enterprise
5	Education
6	Medical/Health Care
7	Warehouse/Distribution
8	Transportation
9	Manufacturing
10	Government

While 802.11b solutions are targeted more towards enterprise environments and HomeRF towards the home, perhaps the most critical segment with the greatest volume potential will be within small to mid sized offices. It is here that users will be evaluating WLAN as an Ethernet alternative (as opposed to a network extension in enterprise environments). ROI justification is probably most straight forward in this segment.

COMPETITIVE ENVIRONMENT

The WLAN market competitive landscape is a heated one. While competitive strategies are seemingly more cooperative, with strategic relationships playing an increasingly integral role as certain suppliers attempt to position themselves as solutions providers, companies' intentions can hardly be labeled altruistic. In fact, with the outcome of many companies largely dependent on standards development (and approval), the dynamic of the industry is often no different than political campaign strategies.

The overall makeup of WLAN competition has changed significantly over the past year and is poised for more change. The ratification of the 802.11b standard acted as a gateway to entry for many major IT companies - from networking giants such as Cisco to semiconductor heavyweights such as Intel and Texas Instruments. These developments brought into question how the traditional competitors were going to react and ultimately survive. Further, perhaps more than anyone cares to admit, spectrum allocation committees such as the FCC and ETSI, are central, not only in the success of specific technologies but more importantly in the success of specific companies.

Leading Vendors of WLAN Hardware to the North American Market

1	Lucent
2	Symbol
3	Proxim
4	Cisco
5	Breezecom
6	Enterasys

About VDC

Venture Development Corporation is a technology market research and strategy firm that was founded in 1971 by graduates of the Harvard Business School and M.I.T. Over the years, VDC has developed and fine-tuned a unique and highly successful methodology for analyzing and forecasting highly dynamic technology markets. VDC has extensive experience providing syndicated and proprietary analysis of the wireless LAN, radio frequency data communication and supply chain management technology markets. Findings are based on interviews with leading and emerging suppliers of WLAN systems and components, system integrators and distributors and surveys mailed to 10,000 current and prospective WLAN end users and extensive secondary research.

"The Wireless LAN Business Planning Service - North America Market Analysis" report is designed to provide subscribers with relevant up-to-date market intelligence to support product planning, market development and channel partnering decisions. The WLAN market is estimated, forecasted and trended for a number of WLAN offering categories, application clusters, end-user market segments, distribution channels and regional markets. Moreover, the study provides in-depth analyses of current and developing competitive environments including supplier market shares by product category. The study concludes with a discussion of major trends, issues and developments shaping structural changes to the market, the status of existing and emerging product developments, and strategic recommendations for leading and emerging suppliers of WLAN equipment and systems. For more information, please contact David Krebs at 508-653-9000 x134 or Marc Regberg at 508-653-9000 x 111.