December 1997

Ascend

COMPETITIVE ANALYSIS

Ascend MAX TNT Vs. Bay Networks 5000 MSX w/5399

Version 1.0

Ascend Competitive Marketing Group

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1 Executive Summary

The purpose of this report is to provide competitive attack strategies based on a detailed analysis of Bay Networks access concentrator solution based on the System 5000 MSX chassis and 5399 modules.

While Bay Networks is not a significant force in the access concentrator market, they are now attempting to expand sales of their slow-selling System 5000 product as an access concentrator platform. The System 5000 was initially developed over four years ago as a collapsed backbone central hub/routing platform for Fortune 500 corporations. Since the product has gained only moderate success in the corporate marketplace and Bay has lost considerable market share to Cisco in that space, it is now looking for other solutions such as the access concentration to re-capture its position.

In Q2'97, Bay Networks had a 1.4% share of the worldwide access concentrator market and only a .8% share of the world access concentrator port sales, a small fraction of Ascend's market share. Ascend's MAX™ (line of concentrators had a 50.6% share of worldwide access concentrator analog ports and 62.2% of ISDN PRI ports —leadership in both key segments (Dell'Oro Group Q2'97).

Given Bay's lack of focus in this market, minor market share, and laggard status in features and technology, we don't expect them to be a long-term player in this market. Bay may be expected to heavily discount their product in a last-ditch effort to sell inventory and potential customers may need to be reminded of the high cost of being stuck with obsolete, non-standard products.

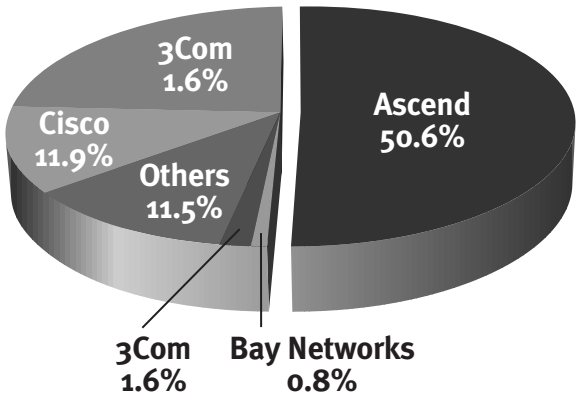

Figure 1 — Market share in total remote access concentrator Ports, Q2'97 by the Dell'Oro Group

Company Weaknesses

Bay Networks has many weaknesses in addressing the remote access market:

- **No Experience, No Commitment:** Bay has little experience in the access concentrator marketplace, and customers should question its long-term commitment to this market given its laggard status in terms of product development and very small market share.
- **Track Record of Being Late to Market:** Bay Networks has consistently been late in bringing new products to market. Bay Networks is a late entrant in the remote access market with a repositioned four year old system 5000 corporate backbone product targeted at the ISP market.
- N**o xDSL Products or Strategy—Late to Market Again:** Bay Networks lacks an explicit Digital Subscriber Line (xDSL) strategy and is behind the competition in offering DSL products. In fact it is unclear if or when the System 5000 will support xDSL services. The xDSL market is well recognized and industry leaders like Ascend are already shipping products. Customers should carefully evaluate whether they want to partner with a company such as Bay Networks that is so far behind the market. How can customers compete when partnered with a vendor that is so far behind in important new markets and technologies? To duplicate the features and functionality of the MAX, Bay customers would have to purchase xDSL concentrators as well as analog/ISDN concentrators at a much higher combined cost.
- **Slow development cycle:** One of the reasons that Bay Networks is such a minor player in the remote access market is its historic slowness at addressing customer needs. Now the market is so far ahead of them that they will never obtain the customer base that allows them to truly understand large remote access network customer needs. Bay Networks also cannot obtain the economies of scale that will allow them to price their products competitively in the long term (the company may have short-term fire sales). Ascend learns a great deal from leading-edge customers like UUNET and BBN who have large, worldwide mission-critical networks. This in turn provides benefits to all the smaller companies that purchase Ascend products.
- **Poor Product Quality, Support and Partnerships—A Technology Laggard:** A recent survey of 3000 network equipment resellers performed as part of VAR Business Magazine Annual report on Network Hardware (Oct. 15, 1997) placed Bay Networks firmly in last place. In the review it stated that its scores in the partnership area suffered the most, "But Bay's product quality and functionality and support scores plummeted, too, dropping to seventh from first overall in the products/pricing category and to seventh from first in support." VAR Magazine further added "VARs cite another area of focus as a problem for Bay: The company's image, VARs say, factors into its poor Report Card performance. Aside from its financial setbacks, many VARs no longer see Bay as a dynamic innovator. They see Bay as more of a technology laggard with no identifiable image in the market."
- **Unfocused:** Bay Networks is not focused on any one-market segment and is trying to be "all things to all people" in the networking business. This lack of focus is expected to continue to plague them in their latest attempts at entering the remote access market.
- **No Market Momentum, Ongoing Market Share Losses:** Bay Networks is suffering on many fronts right now: loss of market share in corporate market, poor financial results during the past years and employee layoffs. The company is struggling to find a path towards growth and has not yet shown that it can achieve this on an ongoing basis. In its latest quarterly earnings report (ending Sept. 30, 1997) while overall sales were up, remote access sales were still stagnant. Al Tobia, a securities analyst at Nationsbanc Montgomery Securities, said that "router and remote-access revenue were flat, and hub revenues were up 4 percent." (Source: Internet Week , Oct. 20, 1997) Given the fast growth rate of the remote access market, this stagnant sales report shows that Bay Networks is rapidly losing what little market presence it has.
- **Repackaged Old News:** Despite new management the company's new strategy is only a slight re-spin of the previous strategy and the company has yet to deliver. A recent industry magazine review of Bay Networks' new strategy was summed up as follows: "Adaptive Networking may be Bay Networks, Inc.'s new strategy, but it is based on very few new ideas" (Network World, May 12, 1997).

Perceived Company Strengths

- **Company size, New Management:** Despite their problems in recent years, Bay Networks is still one of the larger networking companies and with new management from Intel the company may make a turnaround at some point. At the same time one could argue that Intel management knows little about the networking business and the environment is much more competitive than the monopoly environment that Intel management is used to.

Product Analysis

The 5000 MSX is marketed by Bay Networks as the "One Platform for All Your Needs"—but what this really means is that Bay Networks would like to lock customers in to their systems. While this may be good for Bay Networks, what are the chances that Bay will have the best product for all of customer's needs—especially given their track record of inadequate attention to the remote access market? Most network service providers like the opportunity to integrate where it makes sense, and to buy "best of breed" products. Bay Networks does not provide this opportunity to customers.

The 5000 MSX with 5399 RAC modules is a combination old/new product. The 5000 MSX is simply a renamed version of a four year old System 5000 designed as a marketing stop-gap measure to allow the company to address the market where it has historically had virtually no presence—the remote access server market.

The 5399 RAC modules are integrated ISDN/digital modem modules that incorporate routing and T1/E1/PRI termination on a single module.

Key Issues with the 5000 MSX remote access solution:

Hardware Support:

- Lack of migration path to higher-speed DSL technologies—no support for IDSL, SDSL or RADSL modules (in fact this may be extremely difficult given the backplane architecture of the 5000 and may require backplane upgrade for customers).
- Lack of NEBS compliance (equipment robustness test, required for use in Telco central offices)
- Lack of support for HSSI interface module for high-speed Frame Relay backbone connectivity
- Lack of support for cost-effective Frame Relay (only support for T1-speed Frame Relay via router module—even low-speed Frame Relay support requires an additional expensive $12,000 router module)
- Ethernet backplane limits the capability of product. Twelve 10Base-T Ethernet segments on the standard backplane. No switching of TDM data to other modules—all traffic must be packetized and unpacketized, an additional delay with additional processor overhead at each step (steps which are unnecessary).
- Other backplane options that have 100Base-T Ethernet segments are available, but have same problem of forced packetization delays. A backplane with Ethernet and ATM also an option, but still all the data from the PRI/T1 circuits go over the Ethernet segments of the backplane.
- Lack of STAC hardware compression for ISDN
- Lack of support for T3 module, which will result in much higher costs for Bay Networks System 5000 owners—up to $150,000 over five years higher. T3 module support impossible given current digital modem architecture.

The Cost Savings and Other Benefits of T3/DS3 Circuits

The MAX TNT™ has a DS3 module that can save customers up to $150,000 over a five-year period compared to products like the Bay Network's System 5000 which does not support DS3 circuits for dial or dedicated access.

The MAX TNT directly supports channelized DS3 circuits, which become cost-effective at approx. 10 T1 lines and above. This means that for the cost of 10 T1 lines (approx. $1750 per month, $175 per DS1 is the same as a 28 T1 DS3. Therefore, a DS3 user gets 18 DS1 circuits for free when they buy a DS3. In other words, they avoid expenses of over $3000 per month that they would have had to pay if they could only use T1 lines for 28 T1s worth of bandwidth instead of a DS3.*

Over a one-year period the MAX TNT customer using a DS3 circuit instead of 28 T1 lines would save over $36,000 and over a five-year period, over $150,000.

Moreover, because DS3 lines are provisioned over fiber rather than standard copper wiring, they are much more reliable, and entirely immune to standard electrical interference that affect T1 lines (for example rain can cause significant interference on T1 lines, and doesn't affect fiber-provisioned DS3 circuits). The Pacific Bell sales people we've spoken to say that there is a significant trend towards DS3 circuits precisely because of these cost and performance benefits!

For larger installations that the higher density products like the MAX TNT and System 5000 are selling into, the benefits of T3 circuits represents a huge and long-term saving.

** Note: Pacific Bell pricing for a five year period has been used in this analysis as a point of reference only. Please see your local Telephone Company for pricing in your area.*

Software Features Lacking in Bay Networks Approach:

- Lack of support for bonding of B-channels (for ISDN dial-in customers)
- Lack of Non-Facilities Associated Signaling (NFAS) support—means less efficient usage of PRI bandwidth (NFAS allows you to use a single D-channel for up to 8 PRI circuits—giving you up to 7 additional BRI circuits for "free".)
- Lack of OSPF, BGP4 on the 5399 modules results in less flexibility in routing configurations
- Lack of multicast V1 & V2 Support—means less efficient usage of bandwidth and potential problems for customers using ISDN with the Multicast Backbone (MBONE)
- Lack of dedicated modules for Frame Relay Support for high-speed interconnects to Frame Relay switches, or support of customer frame access
- Lacks support of high-end WAN access management solution that effectively addresses GUI management support for multi-vendor environments—e.g. Cisco backbone routers, Ascend WAN access routers, etc. Bay Networks only provides (via Optivity) management for their own products, or basic MIB access to third-party hardware. Ascend NavisAccess™ provides complete visual, compiled MIB support for many Cisco, and other third-party products. Optivity 8.0 offers only a small subset of the remote access management features of NavisAccess, and has a starting price of approx. $12,000.
- Lack of award-winning dynamic firewall solution* for access router (Bay has only a more basic stand-alone firewall capability)
- VPN support only available through non-integrated third-party security approaches—e.g. VPNet. Requires additional hardware and additional management tools; resulting in higher cost and additional management overhead as compared to the integrated Ascend solutions.
- No Extended RADIUS support—only basic RADIUS features compared to Ascend's Access Control™

**Ascend won the PC Magazine review of firewalls with its Secure Access™ Firewall in the October 1997 Issue.*

Performance Issues with the System 5000 MSX w/5399 Modules:

- Severe performance degradation as call connection load is increased. Considerably lower throughput than the aggregate throughput of the MAX TNT (See the Tolly test report, or Section IV of this document for more details)
- Heavy retransmits on analog calls
- Poor installation and configuration (rated "Poor" in PC Magazine review of the Bay 5000 MSX, Sept. 23, 1997). Four different user interfaces required to configure device: Quick2Config GUI program, DOS-based network administrator program, console port administration, Telnet session administration. The console port, Telnet and NA screens break into different sub screens that have even more nested menu/configuration programs with incongruous interfaces.
- No local user ID administration
- Independent program (called ERPCD) which is part of Bay's Access Control Protocol (ACP) software and which is required to forward Radius requests. ERPCD may require a separate platform and if running on NT, requires NT Server as Primary Domain Controller. These constraints limit your flexibility and increase installation and configuration times.
- Each T1/modem card requires a separate Class C subnet. You also cannot easily administer IP pools over separate cards; essentially, they act as independent logical devices contained within a single box—very poor design that limits customer flexibility.

Summary Comparison of Ascend MAX TNT's Advantages Over Bay Networks 5000 MSX

Key Customer Requirements	Ascend MAX TNT	Bay Networks 5000 MSX w/ 5399 RAC
Clear product strategy, Strong track record of user/installation success.	Ascend has a clear leadership position based on a robust platform with high density and complete integration of analog, ISDN, Frame Relay and xDSL technologies. • MAX TNT is the leading carrier-class product on the market today. MAX TNT is used in 85 of the world's top 100 ISPs and leverages Ascend's access software development used in over 40,000 MAX family installations worldwide. • Worldwide market share: 62.2% of the PRI access concentrator sales • 50.6% of all analog access concentrator ports	Bay Networks is trying to retrofit an old and unsuccessful product—the System 5000—for the remote access market. Bay Networks has neither the focus nor the development expertise for a long term commitment to this market so they have come out with a quick, stop-gap solution that they will try to force-fit into the remote access concentrator market. Key issues are: • Long term commitment to the product line given that Bay has less than a 1% share of market • What is the future growth path for a product that is only using 10 MB or even 100 Mbps Ethernet in its backplane? Remote access modules do not currently use ATM backplane. Forklift upgrades for new higher-speed backplanes and services like DSL are usually unacceptable for network service providers with important production networks. • Lack of xDSL solutions or stated strategy • Lack of DS3 support and the cost and management efficiencies that accrue from DS3 support
Scalability/Flexibility	• Up to 336 digital modems/ISDN circuits per Chassis • Up to 672/720 concurrent analog or ISDN sessions per system • Up to 28 T1/E1/ PRIs or one DS3 per system • Software upgradable modem/bit-pump code • Support for range of xDSL technologies • Support for high-density xDSL technologies (224 ports IDSL, 240 SDSL, 90 ports RADSL) • Support for advanced RADIUS software from Ascend Access Control • Comprehensive SNMP management support and multi-vendor management support via NavisAccess • Broad range of expansion modules for all applications • Total Telco rack density potential—2016 modems/7ft. rack	• Up to 576 modem/ports per chassis • Up to 24 T1, T1/PRI, E1 or E1/PRI spans supported per chassis. • No support for xDSL technologies (lacks IDSL, SDSL or ADSL support) • No HSSI support • No T3 support • No cost-effective Serial WAN Support—must buy router module for Serial WAN ports at a cost of $12,000 • No Frame Relay module (comparable to the MAX TNT Frameline™ module). An expensive Frame Relay option is available with router module. • Total Telco rack density potential—over 2300 modems, but severe performance degradation as call connection load is increased. (See the Tolly test report, or Section 4 of this document for more details). • Heavy retransmits on analog calls

Key Customer Requirements	Ascend MAX TNT	Bay Networks 5000 MSX w/ 5399 RAC
High Performance	• High-speed RISC CPUs on every module • Distributed processing support and route caches on every expansion module to minimize delay and maximize throughput • High-speed TDM backplane for native forwarding of data to destination modules and remote sites (via Frame Relay) as needed—reducing delay times and unnecessary packet conversions • High-speed 155 Mbps cell-based backplane. • DS3 Support	Packetization of all backplane data, with resultant delays. • Lack of Serial WAN ports for high-speed forwarding of data over Frame Relay connections in NSP network • Little to no co-ordination between modules—no redundancy of modules • Slow and inefficient 10 Mbps Ethernet backplane in standard System 5000 MSX chassis. Higher speed, higher priced backplanes are available. • Severe performance degradation as call connection load is increased; Considerably lower throughput than the aggregate throughput of the MAX TNT (See the Tolly test report, or Section IV of this document for more details) • Analog call retransmit problems.
WAN Connectivity	Full range of WAN connectivity options: • Redundant DS-3 support • T1/E1/PRI • High-speed Serial—HSSI • Serial WAN—V.35, RS449 • Frame Relay UNI/NNI support • Support for 4032 Frame Relay PVCs	• Limited Frame Relay connectivity—low-speed, expensive option with router module • No DS3 support • No HSSI Support • Limited Serial WAN support—very expensive as part of router module.
LAN Connectivity	Autosensing 10/100 Ethernet connectivity is standard with every chassis management controller. Optional 5-port Ethernet multi-segment LAN module.	Must purchase 24-port 10/100 Ethernet module for Ethernet connectivity.
Bandwidth Management and Control	Comprehensive set of features including Multilink PPP (MP), Multilink Protocol Plus™ (MP+), Multichassis MP and MP+ • B-channel aggregation within the chassis or between multiple chassis • BACP support • NFAS support • DS3/T3 bandwidth aggregation support • Bonding of ISDN B-channel support	Limited bandwidth management and control • No dynamic B-channel aggregation within the chassis or between multiple chassis • No BACP support • No NFAS support • No DS3/T3 bandwidth aggregation support • No Bonding of ISDN B-channel support • No Multicast support

Key Customer Requirements	Ascend MAX TNT	Bay Networks 5000 MSX w/ 5399 RAC
Investment Protection	• Long history of success in the access concentrator/network service provider market, market share leadership (Over 50 times the sales of Bay Networks in the Remote Access Market) with market proven, field-tested products • MAX TNT software is based on MAX 4000 software—which has over a 3-year track record in over 30,000 installations. • Market-proven ISDN expertise • PCMCIA expansion slots for memory cards • IDSL support • SDSL, RADSL support • Multiple LAN support	• Bay is new to the remote access business with limited success and experience in the market. Lack of success in market should lead customers to question the company's long term commitment to the market. • Entirely new product (modules), not extensively tested in field and in large networks • System 5000 MSX lacks PCMCIA expansion slots for ease of memory expansion • Bay lacks a growth strategy for the 5000 MSX to support xDSL level products.
Routing Interoperability	• Support for IP, IPX, OSPF, RIP2, IP Multicast	• Lacks OSPF and Multicast support in the 5399 module
Network Management	• Support across product families and multi-vendor equipment—device grouping • NavisAccess—manage entire network equipment from single terminal. • Includes precompiled MIBs and comprehensive GUI-based management of many third-party products	• High-cost, single device management, very limited GUI management of third party products, lacks precompiled MIBs and graphical device management of market share leading equipment such as Ascend and Cisco
Ease of Use and Configuration	• Single Telnet interface for complete installation and management • Optional NavisAccess GUI interface for complete SNMP-based management of MAX TNT • Local user ID administration	• Very poor ease-of-use and configuration ratings. This translates into a heavier support and management burden over the long term. • No local user ID administration
Security and VPN capability	Comprehensive security options including: • RADIUS extensions (120+) • TACACS/TACACS+ support • Token-based security support • Calling Line ID (CLID) support • Secure Access™ Integrated dynamic firewall option (The Winner of the PC Magazine Editor's Choice Award for Firewalls—October, 1997) • VPN support for over one year with ATMP, PPTP • Commitment to L2TP, L2F	• Limited security support • Limited RADIUS support (no extensions) • No TACACS/TACACS+ support • No integrated, award-winning, dynamic firewall software • VPN capability just announced—via third-party equipment. Poor integration and management of third-party equipment.

Key Customer Requirements	Ascend MAX TNT	Bay Networks 5000 MSX w/ 5399 RAC
Carrier Network Support	Important carrier-class features : • Back-up support of modem modules. If modem module fails, another modem module will take over for it. • Support for redundant T3 connectivity • NEBS compliance • Redundant, hot-swappable power supplies • Distribute processing • Hot-swappable expansion modules • Expandable memory sufficient to store multiple software images for fail-safe software upgrades • Support for internal and external clocking—with a stratum 4 internal clock • Load-sharing across modem modules and HDLC/Hybrid Access™ modules.	Limited Carrier Network support: • Lack of support for redundancy in WAN connectivity—if modem module fails, all calls coming into that 5399 module (except ISDN calls) will fail. • Lack of support for T3 lines • Lacks NEBS compliance • Redundant, load-sharing power supplies • Distributed processing • Hot-swappable modules

2 Description of the Bay Networks 5000 MSX

Product Description

An overview of the Bay 5000 MSX:

- Modular, 16-slot system for integrating analog, ISDN over T1/E1/PRI
- Power supplies and supervisory modules both plug into the back of the chassis
- All other expansion modules (or "Blades" in Bay terminology) plug into the front of the chassis
- All modules take up one slot
- A basic system is comprised of an Network Management Module (NMM), Ethernet module, and 5399 RAC Modules.
- Support for up to 576 modems, and 24 T1/PRIs
- Claimed support for over 2300 ports in a Telco rack (8" Rack)
- Modular midplane architecture—multiple options but must include standard 10Base-T support for 5399 modules
  - Standard midplane includes 12 10Base-T segments
  - Optional midplane includes 12 10Base-T segments and X 100Base-T segments
  - Optional ATM midplane includes 12 10Base-T segments and high-speed ATM bus
- 10Base-T and 100Base-T Ethernet LAN modules supported
- Supports integrated analog/ISDN
- Supports proprietary x2 56 Kbps technology as well as K56Flex standard
- Frame Relay support requires purchase of additional router module. Only low-speed, T1/E1 speeds supported—not cost-effective (router module, memory, and serial module cost over $15,000). Force customers to use third-party Frame Relay solution.

Current 5000 MSX List Prices (US$)*:

Part Number	Product	Price
5000N	5000 Chassis w/ 12 Ethernet 10Base-T Segments	$ 2,495
AD2201001	5000EN Chassis w/10Base-T and 100Base-T Segments	$ 2,995
AD1402002	5000BHC Chassis w/ 10Base-T and ATM Support	$ 5,495
AD0005E04	AC Power Supply	$ 1,000
5110	Supervisory Module	$ 1,000
AD2207003	5616A Network Management Module (NMM)	$ 5,495
CX1004E21	5399 Module w/ ISDN only Support	$ 9,995
CX1004E22	5399 Module w/ DSP Modems and ISDN Support	$ 19,995
AD2204003	5605P 24 Port 10/100 Base-T (auto sensing) Module	$ 4,795

Note: Upgrade of 24 digital modems for 5399 ISDN module is $13,000
Quoted by Bay Networks Sales Representative on Oct. 15, 1997

Overview of the Bay Networks 5399

The Model 5399 Remote Access Concentrator Module is a remote access server built on a single blade (card), which is designed to run in the Bay Networks System 5000 chassis (called the 5000 MSX when configured with RAS modules). Given the need for at least an Ethernet module, in a realistic configuration the maximum density is 576 modules per chassis.

Architecture

The 5399 is based on a multiprocessor architecture with one DSP per modem. The 5399 supports two (2) E1 or T1 interfaces with sixty-two (62) or forty-eight (48) DSP modems respectively per card.

The 5399 provides no LAN physical layer or serial backhaul interfaces these must be provided by other cards placed in the System 5000 chassis.

Interconnection between the 5399 and other cards in the System 5000 chassis is via a 10 Mbps Ethernet interface built in the back plane connector of the 5399. There are 12 x 10 Mbps shared Ethernet backplanes built into the System 5000. The 5399 can be connected to any of these.

The System 5000 chassis is Bay's standard Enterprise chassis designed for collapsed backbone applications in large corporate networks. It can support Token Ring, Ethernet, ATM, Switched Ethernet, Switched Token Ring and a propriety high-speed bus designed for router interconnection (Parallel Packet eXchange). Bay Networks provides 10/100 Ethernet, 4/16 Token Ring, ATM, FDDI, Switched Ethernet, Switched Token Ring and router cards.

Two oversights in the product range for the System 5000 is the lack of ATM support in the router module (5380) and there is no Switched Ethernet card, which will attach to the shared Ethernet backplanes. This omission can be problematic when an ISP is using an ATM based backbone architecture.

The 5399 will be supporting both 56k modem technologies and support is planned for the 56k standard when ratified. Note both K56flex and X2 may not coexist in the same 5399 but may be mixed at will with in a chassis on a blade by blade basis. (this is a licensing restriction not hardware or software).

One awkward requirement of the 5399 is that the 5399 does not directly communicate with the RADIUS server, authentication requests are sent to a proprietary server known as the ACD server, which acts as the RADIUS "PROXY" or gateway. Bay Networks has a ACD and a RADIUS implementation to run on UNIX and NT, but it is not FREE.

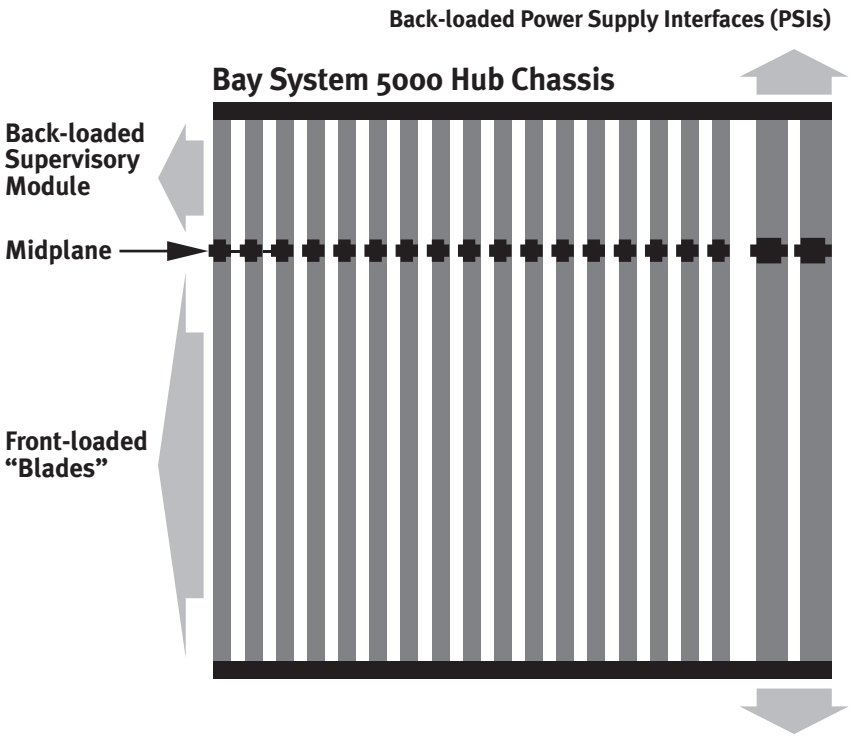

Figure 2 — System 5000 MSX Chassis with Ethernet Backplane

3 Detailed Analysis of the MAX TNT Vs. Bay Networks System 5000 MSX

Customers look for the following combination of attributes for access concentrator deployment:

- A proven platform and routing code base that can meet the availability needs of mission-critical networks
- Ability to scale, migrate with growing/changing access services
- Support for a full range of WAN connectivity options
- Comprehensive set of features to manage bandwidth efficiently
- Ability to provide "complete" solutions and next-generation technologies at a faster pace
- A solid reputation, market share and proven track record in the field
- Comprehensive security and VPN capability
- End-to-end network management and monitoring capability
- Carrier-class platform support—NEBS compliance, signaling conversion
- Low Total cost of ownership—Ease of configuration and management, high product capacity and scalability (in terms of advanced features and new technologies), and full technical support

Ascend has by far the largest installed base of access concentrators with a time-tested solution that has been deployed and upgraded significantly over a period of three years. The Bay Networks 5000 is relatively new to this market. Bay Networks has made a half-hearted and entirely unsuccessful entry into the remote access market and their market share numbers show this (.8 % Vs 50.6% in the recent quarter's numbers from Del'Oro Research).

With Ascend's leading market position and robust MAX family routing software that has been field tested in over 30,000 mission-critical applications around the world we don't see Bay Networks as a long term player in this market. Access routing concentrators provide access to critical network services (in corporate environments) and are the key revenue producing piece of equipment in Internet Service Providers/Carriers in Internet access applications. Developing high-quality, complete access routing solutions takes many years and involves close co-operation with large and innovative customers (such as BBN and UUNet in Ascend's case). It is an extremely high risk strategy for any company to rely upon products from vendors that have little experience, market share, or commitment to the market because they will likely lag behind the competition as the market progresses.

Ascend has consistently demonstrated faster time-to market, especially with the introduction of the high-density, carrier-class MAX TNT. With this significant introduction, the MAX line can offer the highest scalability and a range of products to facilitate full-scale deployment of remote access switches.

The following section provides an in-depth analysis of how the Bay Networks 5000 MSX compares to the MAX TNT.

Price (MLP- US$)

The Bay Networks 5000 MSX/5399 modem port pricing is lower than in the MAX TNT but that short-term cost advantage is outweighed by:

- Higher total cost of ownership due to:
  - Difficulty in initial configuration and support
  - Much higher long-term cost of the 5000 MSX because of its lack of T3 support
  - Very limited feature set of the 5000 MSX
  - Reduced flexibility in terms of access lines supported resulting in need for additional equipment purchases
  - High level of risk associated with purchasing a remote access solution from an industry laggard such as Bay Networks

Given Bay Networks' limited success in the market with this and other remote access products, and the lateness to market with these products, any company considering these products has to be worried about the long term viability of the 5000 platform.

The MAX TNT has a price advantage over the 5000 MSX in ISDN applications. Additionally, the MAX has a proven track record of providing cost-effective solutions—the most complete feature set in the industry at low per port prices for over three years. Ascend has installed more than 30,000 MAX systems, over 2.9 million ISDN PRI ports, and 1.5 million digital modem ports worldwide.

List Pricing (Bundled products)	MAX TNT	5000 MSX w/5399 Modules
Configured Chassis w/analog ports (336)	$210,000	
w/ 10BaseT/100BaseT Ethernet backplane		$155, 250
w/ 10BaseT/ATM backplane		$157,750
Approximate Price/modem port (at 336 digital modem ports)	$625	Approx. $470

List Pricing	MAX TNT	5000 MSX w/5399 Modules
System with 336 ISDN PRI B channels	$62,360 (DS-3 ISDN PRI/box, 672 concurrent sessions)	$85,250 (14 ISDN PRI/box, 672 concurrent sessions)
Price/B-channel:	$183	$254

Scalability/Flexibility

The MAX TNT is a scalable solution that offers densities from 24 to 672 concurrent sessions per MAX TNT shelf (up to 2016 ISDN sessions per 7' or 8' Telco rack).

Bay's System 5000 has been redesigned with a focus of providing moderately priced analog access, or high-priced ISDN access to its users—and is very limited in its flexibility. In contrast, the MAX TNT is designed as a highly flexible yet moderately priced access solution for leased or switched access so as to meet the longer-term needs of network service providers. With cost-effective support for analog, ISDN, Frame Relay and xDSL technologies the MAX TNT is designed as a complete remote networking solution. The integration and flexibility of the MAX TNT saves money with reduced line charges (due to consolidation opportunities of dial-in analog and ISDN, as well as leased Frame Relay circuits and by using more cost effective high-bandwidth circuits such as DS3 lines); reduced configuration, management and support costs; and flexible bandwidth allocation.

MAX TNT	5000 MSX w/5399 Modules
• Up to 672 concurrent analog or ISDN sessions per system • Up to 336 digital modems/shelf • Up to 2016 in a 7 ft Telco rack	• Up to 576 modem/ports per chassis
• Up to 28 T1/E1/ PRIs or one DS3 per system	• Up to 24 T1, T1/PRI, E1 or E1/PRI spans supported per chassis.
• Support for a range of xDSL technologies	• No support for xDSL technologies
• Support for advanced RADIUS software from Ascend Access Control	• Support for only basic RADIUS
• Broad range of expansion modules for all applications	• Limited support of expansion modules—no HSSI support, no T3 support, no multi-port Serial WAN support,no xDSL support, no Frame Relay module (as compared to the MAX TNT Frameline module)—expensive Frame Relay option as part of router module.
• Integrated 10/100 Ethernet in Shelf Controller module, optional 4 or 5-port Ethernet module	• Must purchase full Ethernet module for 10Base-T or 100 Base-T Ethernet support

WAN Connectivity

Customers—enterprise or carrier/ISP—require a multitude of WAN services. The MAX supports the most complete set of WAN connectivity options in the industry.

- The 5000 MSX WAN support is limited to leased T1/E1.
- The 5000 MSX does not support T1/E1 to PRI conversion.
- The 5000 MSX only supports Frame Relay by using a serial port (max. speed 2.048) on the expensive ($12,000+) router module thereby forcing customers into third-party, non-integrated solutions that aren't well managed via the Optivity management software. In contrast, Ascend supports high-density Frame Relay modules, HSSI interfaces and also supports integrated management of 3rd party devices from NavisAccess.
- The 5000 MSX lacks support for unchannelized T1 modules for Frame Relay applications. Ascend has the 10-port Frameline module that is designed for high-speed Frame Relay support.
- The 5000 MSX only support V.35 interfaces on the router module—an unacceptably expensive solution for serial connectivity. Ascend has a 4-port serial module and a single-port HSSI module.

WAN Connectivity Features	MAX TNT	5000 MSX
Supports leased lines T1/E1	Yes	Yes
Supports channelized T1/E1	Yes	Yes
Supports Switched 384, 1536	Yes	NO
Supports Channelized DS3	Yes	NO
Supports Multirate (i.e., Nx64)	Yes	NO
Supports modem dialout via Telnet	Yes	NO
Supports fax modem dialout	Yes	NO
Supports modem dialout pool	Yes	NO
Supports addition of LAN Modules	Yes	Yes
Supports Frame Relay	Yes	Limited
Supports high-density Unchannelized T1	Yes, Frameline	Limited
Supports Frame Relay UNI and NNI	Yes	UNI only
Supports Serial WAN (V.35/RS449), Frame Relay	Yes	Limited
Supports HSSI with Frame Relay, PPP	Yes	NO
Supports V.110	Yes	Yes
Supports IDSL	Yes	NO
Supports SDSL	Yes	NO
Supports RADSL	Yes	NO

Bandwidth Management and Control

Bandwidth management and control represents the feature set which allows a product to effectively manage the network bandwidth and to support protocols and standards. These combined capabilities determine how efficiently a product manages the LAN/WAN interfaces.

The 5000 MSX does not have the MAX TNT's breadth and depth of bandwidth management features.

The 5000 MSX does not support Multichassis MP/MP+; The MAX features MAX Stack, which maximizes bandwidth availability by enabling multiple MAX WAN access switches to function together as one logical switch for Multilink PPP calls.

The 5000 MSX requires each chassis to be configured as an independent unit, requiring great management and support time.

Bandwidth Management and Control Features	**MAX TNT**	**5000 MSX w/5399 Modules**
Dynamic IP assignment pools	Yes using Network Address Translation (NAT) and spoofing	Yes
Multilink Protocol (MP)	Yes	Yes
Multilink Protocol Plus (MP+)	Yes	NO
Multichassis MP, MP+	Yes	Yes (Multichassis MP only)
ISDN D-Channel Multiplexing (NFAS)	Yes	NO
Dynamic GRE tunneling	Yes	NO
IP/IPX Filtering	Yes	Yes
Dynamic Bandwidth Allocation™ with MP+ and BACP support	Yes	NO
Hardware compression per a very recent announcement (10/30/97)	Yes	Yes

Reliability and Investment Protection

With the transport of mission-critical data, continued unprecedented growth in remote access, and fierce competition between access providers, system reliability and investment protection have become key factors in both Corporate and ISP/carrier decision-making.

By optimizing software-hardware integration, Ascend products have a rich feature set and a high degree of functionality. In terms of software, Ascend has written well over one million lines of code, and remains committed to providing users with the highest standards of service and upgradability. MAX software has a proven track record and has been stable in the field for over three years.

Ascend has demonstrated its commitment to providing leading edge solutions with its innovative IDSL technology and its strategy for MultiDSL™ implementation.

As a pioneering member of the Open 56K Forum, Ascend is committed to supporting an open 56 Kbps standard using the Rockwell/Lucent chipset, which currently represents over 70% of the modem installed base.

- Bay Networks is new to the high-end remote access router market and is missing many of the investment protection features that the Ascend MAX TNT has:
- Ascend's entire business is built around remote access and network service providers and is dedicated to building solutions to this market. In contrast, Bay Networks has a relatively small development effort in remote access and it focused predominantly on the corporate backbone network market.

The future of the Bay 5000 MSX presents a clear risk to any current or potential customer.

Reliability and Investment Protection Features	MAX TNT	5000 MSX
Proven software, Complete Feature Set	**Yes** owns over one million lines of code. Proven and complete implementation of IP routing. Leader in the market with installed base of over 30,000 of the MAX family units during past four years.	**NO** The new access routing modules (5399) are unproven in large networks over long periods of time. Limited IP routing feature set (no Multicast, OSPF, BGP, etc.).
DSL service(s) offered today: Maximum xDSL ports/unit:	IDSL, SDSL, RADSL up to 228 (IDSL), 240 (SDSL), 90 (RADSL)	None announced
Load-balancing, auto-backup modem modules	Yes	NO
Redundant T3 Support	Yes	NO
Integrated Ethernet LAN support (in Controller)	Yes	NO—Additional Cost
PCMCIA memory expansion slots	Yes	NO

Interoperability

Ascend continues to expand the interoperability of the MAX line, by adding protocol functionality such as IPX, OSPF, Multicast, RIP2 and in the near future, BGP4.

With its 4-year track record and wide national/international installed base, Ascend can also demonstrate worldwide interoperability with standard WAN and routing protocols.

- Bay does not support OSPF
- Bay does not support Multicast
- Bay does not support high-speed DS3 circuits for highest cost efficiencies
- Bay has no plans to support BGP4

Interoperability Features	MAX TNT	5000 MSX
IP, IPX	Yes	Yes
RIP 2 Support	Yes	Yes
OSPF Support	Yes	NO
Multicast Support (IGMP v1 and v2)	Yes	NO
BGP Support	Planned, Q4'97	NO
Guaranteed interoperability with carrier networks in over 36 countries	Yes	unknown
PAP, CHAP	Yes	Yes
PPP, SLIP, C-SLIP	Yes	Yes
DS3 Support	Yes	NO

Network Management

As networks grow in complexity, and network managers are dissatisfied with fragmented management systems and the lack of integrated tools that show "the whole picture", there is a strong demand for network management tools that offer integration, scalability, and class of service functionality across multiple devices. To answer these needs, Ascend's NavisAccess will enhance the MAX family's network management capabilities with support for: full POP management (rather than device management), multi-vendor router/switch support, complete discovery and mapping and QoS reporting.

- Bay does not offer the same level of end-to-end network management; its Optivity network management system is optimized strictly for Bay's own products, with standard generic SNMP management station support for third-party MIBs. In contrast, Ascend's NavisAccess network management software is a complete WAN management solution with full GUI and integrated MIB support for the most common WAN access devices from a multitude of vendors, including Cisco and Ascend.

Network Management Features	NavisAccess	Optivity
Total POP/network management	Yes	NO
Full multi-vendor router/switch control via GUI	Yes	NO
Complete discovery and mapping	Yes	Yes

Security and Virtual Networks

To address security requirements, Corporate and Carrier/ISP customers need to 1) implement firewalls at both central and remote sites, and 2) to build highly secure intranets. The MAX is setting new standards in terms of providing comprehensive security and integrated dynamic firewalls including a complete RADIUS server package with a comprehensive set of extensions (120+), secure VPN, encryption and integrated dynamic firewall capability.

- Bay Networks does not provide extended RADIUS functionality, encryption, or an integrated, dynamic firewall. It has just announced a VPN strategy, but it is unclear as to its availability at this time.

Security and Virtual Network Features	MAX TNT	5000 MSX
Comprehensive set of RADIUS extensions like data filters, call filters, generic filters, etc.	Yes (120+ extensions)	Limited
VPN capability via ATMP, PPTP and L2TP	Yes for over one year	Limited—provided by third party (recently announced)
Secure Dynamic Bandwidth Allocation (bringing additional B-channel securely and fully authenticated)	Yes	NO
PAP, CHAP for PPP	Yes	Yes
Security Dynamics, TACACS, TACACS+, Digital Pathways	Yes	Limited—no TACACS
Integrated dynamic firewall support	Yes	NO

Carrier Network Support

NEBS compliance, a standard used by many telephone companies, is also being used by ISPs and corporate customers to ensure that their vendors meet some of the most rigorous standards within the industry. The MAX TNT has been designed to be fully NEBS-compliant.

Similarly, global certifications are standard requirements for international customers. The Ascend MAX products have been certified by carriers in over 36 countries.

Many users require support for signaling conversion, multiple carrier switch signaling and global network certifications. Ascend supports these features in the MAX product line to make services more flexible and ubiquitous via a single point of access. This is one of the major advantages of the MAX TNT when a customer considers international deployment.

- The Bay System 5000 MSX does not support signaling conversions at this time.

Carrier Network Support Features	MAX TNT	5000 MSX
NEBS compliance	Yes	No
Global certification (over 36 countries)	Yes	unknown
Cellular service interface (MNP10EC Support)	Yes	NO
Multiple carrier switched network signaling	Yes	NO
Redundant T3 support	Yes	NO
Redundant, hot-swappable power supplies	Yes	NO
Hot-swappable expansion modules	Yes	NO
Load sharing across modem modules and HDLC access modules	Yes	NO

Summary: Cost of Ownership

Cost of ownership is a key metric for end users. It takes into consideration the configuration and support costs, the long-term cost of bandwidth and access lines, the price per port each technology (ISDN, analog, Frame Relay, xDSL), how much integration of other data services on the uplink and downlink the product provides (efficiencies gained on monthly service costs can result in quick payback on the MAX TNT), features offered, ongoing support capability, and provision for future upgrades as needs and technology scale. Ascend continues to set new industry standards with the MAX TNT by offering a moderate to low per port price compared to other leading remote access concentrator vendors while providing the most comprehensive feature set in the industry.

The Bay System 5000 MSX system, while offering a lower per port cost than the TNT in analog applications, has low value for the price as compared to the MAX TNT for the following reasons:

- Limited scalability/flexibility
  - — Lacking many integration opportunities—DS3 for bandwidth purchase economies, Frame Relay for data integration economies
- Limited, expensive Frame Relay support
- Limited bandwidth management; no Multilink Protocol Plus or Multichassis MP/MP+/BACP support
- Questionable investment protection
  - — An old chassis, designed over 4 years ago
  - — Lack of xDSL support
- Limited IP protocol support—Basic IP only, no Multicast, OSPF or BGP
- Bay-focused Network management, rather than the WAN, multi-vendor focus of the Ascend Navis Access software
- Minimal security capability
  - — Not as comprehensive a RADIUS solution
  - — No integrated dynamic firewall
  - — No integrated encryption

MAX TNT	5000 MSX
A moderate per port price for analog sessions. A lower total cost of ownership and dramatically lower cost for ISDN both in the short and long term.	Dramatically higher per port costs for ISDN, lower costs for analog (but with many fewer features and higher total cost of ownership).

4 Performance Analysis

In early October Bay Networks came out with a misleading performance analysis comparing the Ascend MAX TNT against the System 5000 MSX with 5399 RAC modules. The test, conducted in August of 1997, used the older Ascend Modem modules (non-DSP) with older operating software—the 1.2Ap Version. Ascend contracted with the same organization (The Tolly Group) to retest the MAX TNT and Bay System 5000 MSX with a much greater number of clients and with the newer Ascend modems and operating software. As can be seen from the results below using compressed text files, the MAX TNT clearly outperforms the Bay Networks System 5000 MSX, especially in large network environments. For more details and test results with other file types please refer to the Tolly Summary Report "Ascend MAX TNT Remote Access Concentrator Performance and Scalability", published in November 1997 (The Tolly Group Document #7309).

Summary of Tolly Group TNT Vs. Bay 5000 MSX Test Results (compressed text)

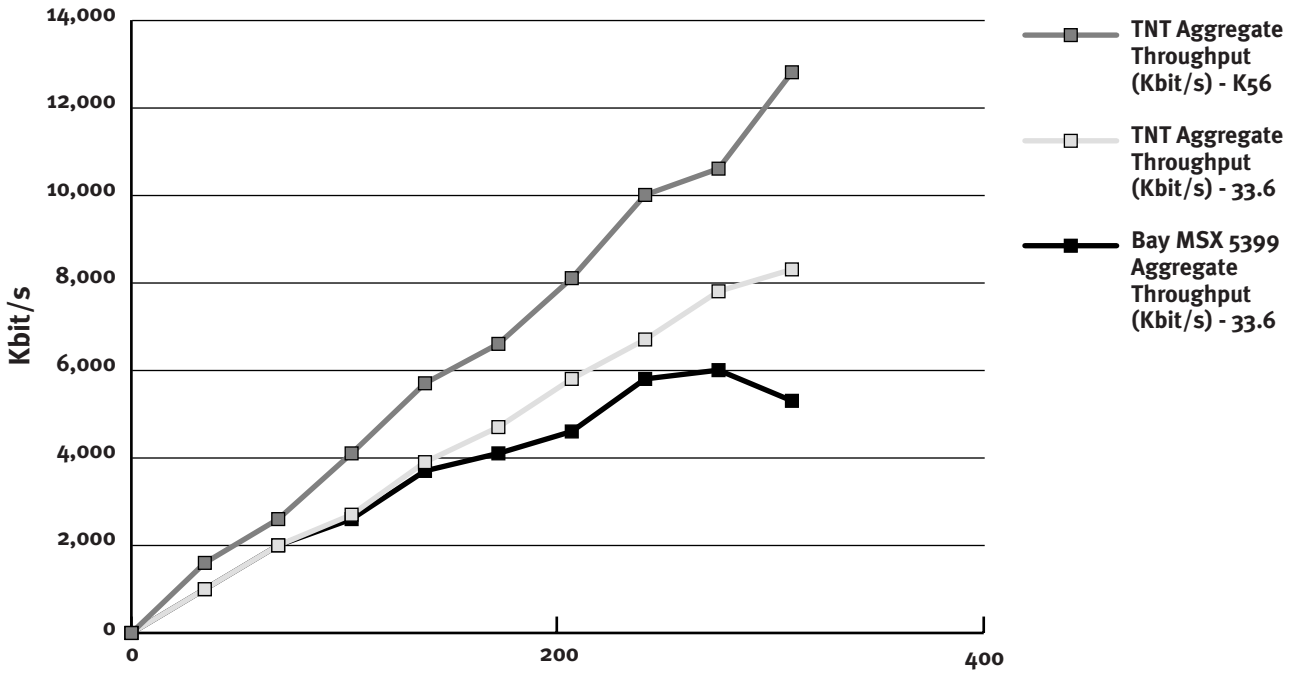

Figure 3 — MAX TNT outperforms Bay

56K , 33.6 clients (MAX TNT), 33.6K clients (BAY MSX)
Source: The Tolly Group, Preliminary, October 1997

5 Selling Against the Bay 5000 MSX

A. Ascend MAX TNT Competitive Advantages—"The Silver Bullets"

- **Over 50 times greater Remote Access concentrator port sales than Bay** In the most recent market share numbers from Del'Oro Research, Ascend had a 50.6% market share while USR 23.6 %, Cisco 11.9%, 3Com 1.6%, **Bay .8%,** and "others" with 11.5% of the ports sold. Does any company really want to build their company around products from a company that is a minor player in the industry? Most ISPs prefer to partner with an Industry leader, a company focused on providing complete remote access solutions. Ascend has a history of leadership in the Industry and intends to maintain that leadership. Bay has been a laggard in the industry and the remote access market is just one area in which they are trying to sell an old product (the System 5000 with the standard backplane).
- **The MAX TNT has a lower total cost of ownership than the Bay approach.** Bay's approach of repackaging an old chassis with a new digital modem module results in a difficult to manage and configure product, with a high long-term cost of ownership. Lack of T3 support, lack of module redundancy, and lack of access line flexibility quickly result in a higher total cost of ownership for the Bay product in the typical high-capacity network service provider application.
- **The MAX TNT has the proven scalable performance that large networks need:** With support for high-throughput that scales to large 250+ client networks, the MAX TNT is ideal for the large data concentration networks in any network service provider's networks. In fact 85 of the world's 100 largest ISPs are now relying upon MAX TNT because of this. In contrast, the Bay System 5000 MSX with 5399 RAC modules suffers from severe performance degradation as call connection load is increased. The 5000 MSX also has considerably lower throughput than the aggregate throughput of the MAX TNT (See the Tolly test report, or Section four of this document for more details).
- **High degree of scalability and flexibility:** The world of Internet access is quickly moving beyond just analog access—to ISDN and DSL technologies. Ascend is the leader in providing scalable and flexible access concentrator solutions and provides a clear and already available growth path to these higher speed networking technologies. The MAX TNT provides scalable and flexible configurations from 48 to 672 modems, up to 28 T1/E1s/ PRIs, or one T3 connection—covering a wide array of customer needs and providing the greatest economies of scale in bandwidth purchases. Only Ascend offers the full range of analog, ISDN and xDSL access solutions in a single product.
- **Field proven, feature-rich routing software —** Ascend has been in the market with its access solutions for almost four years and has very feature-rich, field proven routing software. Features like IP Multicast support (IGMP V1 & V2), OSPF, dynamic firewall protection option, and in the near future, BGP. Not only is the Bay System unproven in large networks, but it lacks many of the features that Ascend users take for granted.
- **High-density modem integration and mixed analog/ISDN sessions with Pay as you go Approach:** Ascend's MAX TNT offers incremental support for either ISDN or analog support; buy only the support you need, when you need it. In contrast Bay has integrated ISDN and analog support in a single, expensive module—when you buy analog support you pay for both ISDN and analog support whether you are using both or not.
- **Most comprehensive set of security features** including fully integrated, dynamic firewall capability, VPN, encryption, and extended RADIUS dictionary (over 120 enhancements) all integrated into the Ascend MAX TNT and Access Control RADIUS solution. In contrast Bay addresses the security needs of a large network with a hodgepodge of third-party devices that aren't integrated into the System 5000 platform and will require additional training and support efforts.
- **Guaranteed interoperability** with a wide number of modem manufacturers and carrier networks including carriers in over 36 countries. Field proven in 85 of the 100 world's largest ISPs.
- **Simple yet powerful and comprehensive management —** with NavisAccess you can manage all your remote networking resources—including third-party routers and switches—from a single powerful management station. With Bay, you can manage Bay equipment well, but have just the generic SNMP management tools for non-Bay equipment; forcing you to use multiple management solutions, or try to use those difficult generic SNMP management features.

- **Low to moderate price/high value** in terms of features and functionality
- **Support for all WAN access protocols**—Switched 56, DDS 56, T1/FT1, E1, ISDN BRI and PRI, DS-3 and Frame Relay
- **Multilink Protocol Plus((MP+) and Multichassis MP/MP+ support:** With the introduction of MAX Stack, a feature which maximizes bandwidth availability by enabling multiple MAX WAN access switches to function together as one logical switch for MP, MP+ and BACP calls, Ascend has clearly established itself as the only remote access vendor that provides comprehensive bandwidth management features. For example, a single incoming MP call that requests greater bandwidth is given additional unused channels anywhere in the stack. MAX Stack reduces the complexity and increases the simplicity of provisioning access to multiple central site WAN access switches
- **Open 56K support using the K56flex technology** that is compatible with over 70% of the installed modem base
- **High-density MultiDSL strategy and product availability** that allows for flexibility and migration options as xDSL services evolve. The MAX product line supports IDSL, SDSL, RADSL-CAP and RADSL-DMT.

B. Summary of Major Weaknesses — Bay Networks 5000 MSX

- **Bay's questionable longevity in the remote access market;** that allows for flexibility and migration options as xDSL services evolve. The MAX product line supports IDSL, SDSL, RADSL-CAP and RADSL-DMT.
- **5000 MSX optimized for analog technology, with severely limited growth path;** the Bay 5000 MSX does not allow for flexibility and migration options such as xDSL and DS3 circuits. The MAX product line supports DS3, IDSL, SDSL, RADSL-CAP and RADSL-DMT.
- **High total cost of ownership due to:**
  - Difficulty in configuration and management
  - Lack of support for bandwidth efficient modules/features such as DS3 support and NFAS
  - Lack of flexibility requires additional equipment purchases
  - Lack of rich feature set requires purchase of third-party equipment (e.g. VPN solution, or Frame Relay)
- **Poor performance:** Tests by independent labs indicate that the Bay Networks System 5000 MSX has questionable performance in the one area where it is supposed to be optimized for—large, dial-in networks.
- **Lack of many important features and growth options:** The degree to which the 5000 MSX system lacks in many important features indicates the degree to which Bay is lacking commitment in this market. With no support for DS3, Frame Relay, HSSI, xDSL, OSPF, NFAS, Multicast, OSPF, etc. the product doesn't come close to addressing the longer term needs of the growing ISP.

Other limitations

- ***Not scalable:*** while units can be "stacked" to provide over 2300 concurrent users, there is no bonding of B-channels between multiple chassis. This means that as customers try to add channels to ISDN sessions they may not be able to, largely eliminating the benefits that caused them to purchase ISDN in the first place. This also means that because multiple System 5000 MSX chassis' are not managed as a single unit. Therefore, considerably more management overhead would be required for the 5000 MSX than would be needed for the MAX TNT of equivalent capacity.
- ***Limited security:*** no integrated dynamic firewall capability or encryption, limited RADIUS
- ***No track record with high-end access switches —*** Bay has only limited ISP experience. Ascend dominates the access concentrator market with over 62.2% share of the ISDN PRI ports, and over 50.6% of analog ports (Dell'Oro Group, 2/18/97).
- ***Inadequate bandwidth management and control —*** No MP+ or Multichassis MP/MP+, no support for ISDN D-channel multiplexing, dynamic GRE tunneling or dynamic B-channel allocation
- ***Limited interoperability —*** no OSPF support
- ***No multimedia integration support —*** no IP Multicast (IGMP v1 and v2)

C. Responses to Bay's Attacks on the MAX

Bay's Attack on the MAX	Ascend Counter-Attack/Position
"It doesn't support both X2 and K56Flex modem standards like the Bay5000 MSX/5399 does."	A meeting to establish the new standard for 56K modems is scheduled in January by the ITU and after that point there will probably be a single standard that everyone will have to comply with so the minor benefit that having X2 and K56Flex offers is soon to be gone. Recent PC Magazine tests (see below) favored the K56Flex anyway and PC Magazine (and most other magazines) have recommended customers first check with the type of modems that a person's ISP uses BEFORE purchasing a modem—so customers are aware of the problem and will adapt to what their ISP has purchased. Additionally: "There's no official estimate of how many phone lines are not 56K-capable. An informal census at PC Magazine puts the number between 25 and 40 percent."* "None of the Major online service providers are yet offering 56K support. Nationwide online services such as AOL and CompuServe are conducting field trials of both modem types, but neither has rolled out 56K on a nationwide basis."* "Performance advantage goes to K56Flex modems: —That edge widened to anywhere from 7 to 10 percent on noisier lines." *From Oct. 21, 1997 Issue of PC Magazine
"The Bay 5399 had better throughput performance than the MAX TNT in a Tolly Lab evaluation ."	**The test is invalid.** The modems they used were an old design already phased out by Ascend, and the MAX TNT they tested on had old software that has been significantly improved since then. The newer modem modules and new software revisions (Version 1.3 and higher) have eliminated any performance issues and in fact the MAX TNT now significantly outperforms the Bay System 5000 MSX.
"Bay 5000 MSX has greater capacity than the MAX TNT."	The Bay 5000 MSX has slightly greater theoretical capacity. In a 7 or 8 ft Telco Rack the Ascend MAX TNT can support 2016 ports and the 5000 MSX can support approx. 2300. However, with DS3 support the Ascend MAX TNT can much more cost effectively provide the bandwidth for a high capacity POP. Also, given Bay's performance problem when the number of dial-in users increase, it is doubtful that the System 5000 MSX would provide acceptable performance in fully loaded conditions.
"Bay is gaining market share in the ISP."	Bay Networks still has very little market share. In contrast, Ascend has the largest installed base of remote access concentrator systems (over 30,000 of the MAX family systems installed worldwide and over 62% of ISDN PRI ports) and has been the leader in the remote access concentrator market for over 3 years. Ascend pioneered many of the leading ISDN and hybrid remote access technologies and continues to provide state of the art products that meet the most demanding needs of customers worldwide. Ascend's MAX TNT concentrators have been installed in 85 of the world's 100 leading ISPs.

A. Attack Strategies

Major Bay Networks Weaknesses

- **Channel uncertainty about Bay Networks represents an opportunity for Ascend.**
  VARs are currently very unhappy with Bay Networks as revealed in the recent review in VAR Business magazine (See VAR Business, October 15, 1997—Available on the Web at http://www.techweb.cmp.com). Ascend must reinforce its excellence in technical and sales support, the GET FLEX program, product reliability, consistency, and market leadership.

  Bay is not known for innovation or creating markets, and is currently suffering from slow product rollouts. There is also confusion about Bay's future direction in new access technologies such as DSL and Ascend can use this time of uncertainty to further emphasize its leadership position as a provider of emerging high-speed technologies and networking solutions.

- **Bay has no technology and "system-level" track record in Remote Access**
  The networking industry is warming up to the trend toward a single vendor providing fully integrated networking solutions from LAN-to-WAN. Although this trend is likely to continue for a while, it is important to realize that technological advantage will almost always prevail. In other words, customers are unlikely to assign tremendous value to a "single vendor proposal' if the vendor's equipment does not fully satisfy all critical customer needs and/or does not incorporate the most advanced technology. Ascend has consistently demonstrated that it can provide high value solutions that meet the critical needs of customers now and in the future. Bay has integrated remote access into an aging product line; the System 5000. Success in the remote access market will take a lot more dedication than this and given Bay's confused lack of focus it is unlikely it will develop this dedication.

Worldwide and North American Headquarters
One Ascend Plaza
1701 Harbor Bay Parkway
Alameda, CA 94502, United States
Tel: 510.769.6001
Fax: 510.747.2300
E-mail: info@ascend.com
Toll Free: 800.621.9578
Fax Server: 415.688.4343
Web Site: http://www.ascend.com

European Headquarters
Aspen House
Barley Way
Ancells Business Park
Fleet
Hampshire GU13 8UT, United Kingdom
Tel: +44 1252.360000
Fax: +44 1252.360001

Japan Headquarters
Level 19 Shinjuku Daiichi-Seimei Bldg.
2-7-1 Nishi-Shinjuku
Shinjuku-ku, Tokyo 163-07, Japan
Tel: +81.3.5325.7397
Fax: +81.3.5325.7399
Web Site: http://www.ascend.co.jp

Asia-Pacific Headquarters
Suite 1908, Bank of America Tower
12 Harcourt Road
Hong Kong
Tel: +852.2844.7600
Fax: +852.2810.0298

Latin, South America and the Caribbean Headquarters
One Ascend Plaza
1701 Harbor Bay Parkway
Alameda, CA 94502, United States
Tel: 510.769.6001
Fax: 510.747.2669

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