Ascend

Competitive Evaluation Report

Ascend MAX TNT
Vs.
US Robotics Total Control HiPer Access System/Hub

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Version 1.0

Ascend Competitive Marketing Group
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Important Note:
This report is intended to evaluate and compare USR's latest major upgrade to the existing Total Control Hub - the HiPer System - vs. Ascend's MAX TNT.

I. Executive Summary

The purpose of this report is to provide competitive attack strategies based on a detailed analysis of US Robotics (USR, now part of 3Com) and its Total Control HiPer Enterprise Network Hub (USR Total Control).

According to USR, the Total Control line accounted for approximately $400 million in revenues in FY'96. After the acquisition by 3Com, it is clear that the USR Total Control will become the combined company's remote access platform, although integration with the 3Com AccessBuilder line and the 3Com TranscendWare network management system is expected.

In Q2'97, USR Total Control had a 34.5% share of worldwide access concentrator analog ports, and only a 27.9% share of ISDN PRI ports. (Dell'Oro Group, 2/18/97) whereas 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 2/18/97).

Company Weaknesses

- Prior to their acquisition by 3Com, USR was struggling with a flat modem market, and restricted cash flow. The company had invested its future in its proprietary x2 56 Kbps technology. Given their market share of 25% in the analog client modem market, this investment was a serious gamble. After heavy marketing expenses, x2 was not delivered on schedule. Although it is shipping now, USR has met serious challenges from the almost concurrent release of the Rockwell/Lucent chip, and K56flex-compatible products.
- The combined companies' stance on standards, in particular 56 Kbps, is unclear. USR has not agreed to join the Open 56K Forum. Today, the combined companies do not have the market presence to make the proprietary x2 56K technology work. In addition, USR (3Com) has started a legal battle with competitors involving 56K technology patents, further hindering the formation of industry standards.
- The Challenges of the recent merger are enormous in terms of integrating the operations and handling overlaps in the LAN/ATM switching and remote access product lines.
- The combined companies do not have the presence, or the product, to compete in the high-end carrier class access and routing arena (greater than 50% of their combined business is in adapters/modems).
- Neither 3Com nor USR is known for innovation, market leadership or new market creation.

Perceived Company Strengths

- USR has a reputation for aggressive marketing and a strong channel strategy,
- USR has a strong brand name in analog modems; they have managed to achieve mind share with x2.
- USR may be able to capitalize on 3Com's position in the enterprise segment.
- The combined company will be a leader in the NIC market and is expected to be a strong player at the network edge.

Product Analysis

Today, the USR Total Control does not have the density, scalability or flexibility to compete with the MAX TNT™ however during the September/October '97 time-frame USR is expected to begin shipping their new HiPer version of their Total Control .

USR has promised to release this six shelf, high-density Total Control in Q4, 1997 (revised from Summer '97). This product has been promised to support 336 analog modems per shelf, or 2016 per six shelf rack. The HiPer system uses the current USR Total Control Chassis, but requires a completely different set of digital modem cards and a new access router/management card. The new digital modem cards will be based on a multimodem DSP chip. Each digital modem card will support 24 analog calls using two modems per analog line, and one PRI/T1/E1 interface.

Contrary to USR's sponsored testing, and subsequent released reports, the Total Control Hub historically has not met performance standards (though this may change with the new HiPer design), nor can it scale with the MAX

TNT. Under performance testing conducted by the Tolly Group, the USR Total Control's performance in terms of throughput was demonstrated to peak at 16 sessions, and diminish with additional calls.

USR has a serious problem with the routing code that it licenses from Livingston for the Total Control: their agreement with Livingston will end in October 1997. After a suit between the two companies over retention of rights to the software, an out of court settlement requires US Robotics to return the code in October. Recently, USR has announced that it will begin shipping internally developed routing code. At the same time, 3Com has stated that the companies' combined products will integrate using 3Com's TranscendWare management platform. These developments will engender significant uncertainty and require significant administrative/technical support and sales attention in order to maintain the Total Control installed base in Q3/Q4'97. Furthermore, confusion should negatively impact sales of the higher density product as well.

While USR has deployed x2 in its Courier/Sportster modem lines, and the Total Control Hub, it is not achieving promised speeds in the field, and it has not achieved a significant presence in the ISP segment. In addition, there are rumors that the client modem software is still problematic, and not fully deployed at this time. Apparently USR's Megahertz modems have retained a Rockwell chipset, making them incompatible with the USR Total Control.

USR has announced RADSL-capable product for Q2'97, and plans for a hybrid x2/xDSL modem in development with Texas Instruments is planned for release in 1998. In addition, in March 1997, USR introduced an end-to-end cable access system based on the Total Control network platform through its Cable Access Business Unit.

A summary comparison of the key features of the MAX TNT and USR Total Control follows.

Note: for information on the low-density (existing versions) of the USR Total Control hub, please refer to the June'97 Competitive Evaluation Report.

Summary Comparison of Ascend MAX TNT's Advantages Over USR Total Control

Key Customer Requirements	Ascend MAX TNT	USR HiPer Total Control
Clear product strategy, Strong track record of user/installation success	• 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 leverages Ascend's access router software development used in over 30,000 MAX family installations worldwide. • Worldwide marketshare: 62.2% of the PRI access concentrator sales • 50.6% of all analog access concentrator ports	While USR is clearly scaling their Total Control Product line to greater densities, the product strategy has a number of serious gaps for enterprise-level applications: • Lack of field-tested routing software • Lack of DS3 support • Lack multi-chassis support • Lack of load balancing across modems/chassis • Lack of high-speed uplink module for xDSL applications (e.g. HSSI) • To support new HiPer modem cards, a new HiPer Router module must be purchased – obsoleting NetServer router module that was introduced just over a year ago.
Scalability/Flexibility	• Up to 672 concurrent analog or ISDN sessions per system • Up to 336 digital modems/shelf • 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 • Broad range of expansion modules for all applications • Total Telco rack density potential– 2016 modems/7ft. rack	• Up to 336/420 modem/ports per chassis • Up to 14 T1, T1 PRI, E1 or E1 PRI spans supported per chassis • Limited support for xDSL technologies (lacks IDSL, SDSL support) • Limited scalability – supports only up to 32 RADSL ports per chassis • Limited support of expansion modules – No HSSI support, no T3 support, no direct analog modem support, no multiport Serial WAN Support, no IDSL, SDSL Support, no Frame Relay module (as compared to the TNT FrameLine™ module.)
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.	• No distributed processing/route caching – all routing done by router module thereby adding delay into the system

WAN Connectivity	Full range of WAN connectivity options: • Redundant DS-3 support • T1/E1/PRI • High Speed Serial - HSSI, • Serial WAN - V.35, RS-449 • Frame Relay UNI/NNI Support • Support for 4032 Frame Relay PVCs	• No Switched 384/1536 support • No Multirate, Nx64 support • No DS-3 • No HSSI
LAN Connectivity	Integrated 10/100 Ethernet in Controller Module, Optional 5 port 10/100 Ethernet multisegment LAN module	Two-port 10/100 Ethernet module
Bandwidth Management and Control	Comprehensive set of features including Multilink PPP (MP), Multiprotocol Plus™ (MP+), Multichassis MP and MP+	Limited bandwidth management and control . No dynamic B-channel aggregation within the chassis or between multiple chassis
Investment Protection	• Market proven, in-house code development • MAX TNT software based on MAX 4000 software – which has over a 3 year track record in over 30,000 installations. • Market proven ISDN expertise • Member of Open 56K Forum-supports K56flex • PCMCIA expansion slots for memory cards • IDSL support • SDSL, RADSL support • Multiple LAN support	• Routing functionality relies on new, unproven code developed recently by USR • Entirely new product (modules) so highly likely to be problematic • USR has no track record in development of routing software • USR has a limited ISDN track record • No PCMCIA Expansion Slots • Proprietary 56K technology • RADSL-CAP support promised
Routing Interoperability	IP, IPX, OSPF, RIP2, IP Multicast	IP only
Network Management	Support across product families and multivendor equipment- device grouping NavisAccess™ - manage entire POP's equipment from single terminal	High cost single device management
Security and VPN capability	Comprehensive security options including : • RADIUS extensions (120+), • TACACS/TACACS+ Support • Token-based Security support • Calling Line ID (CLID) Support • Integrated dynamic firewall option • VPN support for over one year with ATMP, PPTP • Commitment to L2TP, L2F, • Support for IPSec encryption announced in Ascend Access Control software option	• Limited security • Limited RADIUS support • No TACACS/TACACS+ Support • No Token-bases security support • No CLID Support • No integrated firewall software • VPN capability just announced • No IPSec or any encryption support
Carrier Network Support	Important carrier-class features : • Support for redundant T3 connectivity	Limited carrier network support: • Redundant, load-sharing

	• NEBS compliance • Redundant, hot-swappable power supplies • Distributed 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	power supplies • NEBS compliance

II. Description of the USR Total Control

Product Description

An overview of the USR Total Control:

- Modular 16-slot system for integrating analog, ISDN over T1/E1/PRI, Additional support for RADSL
- Currently support for up to 336 modems, and 14 T1/PRIs
- With new DSP-based modem cards promised for Q3/Q4'97, will support 336 analog and/or ISDN calls; a potential 2016 ports would comprise a Telco rack (7" Rack)
- Modular four bus midplane architecture: network management bus, Time Division Multiplexing™ bus, packet bus, and general purpose bus (unused at this time)
- 10Base-T Ethernet support now, with 100Base-T promised in future release
- LAN-to-LAN Ethernet support for IP
- Supports integrated analog/ISDN
- Supports proprietary x2 56 Kbps technology
- Support for RADSL-CAP promised for Q2'97 (currently checking on status)
- Supports two Ethernet/Token Ring NICs and two serial interfaces
- Current HiPer System List Prices (US$):

Part Number	Product	Price
00-2455-0	Chassis	$6,600
00-2106-0	HyperAccess router (Router, management, dual Ethernet)	$9,995
00-2092-0	24-Port DSP module (supports ISDN, analog and T1/PRI)	$ 11,500

SKU#	**Description**
002106-0	HiPer access router card set (Ethernet) Base system with on-board dual 10/100 Mbps Ethernet interface, 64 MB memory (expandable to 256 MB), 4 MB flash memory.
002092-0	24-Port/T1 HiPer DSP card set 24-port HiPer DSP Network Application Card (NAC) and T1/T1-PRI Network Interface Card (NIC) set.
001826-0	24-Port/T1 HiPer DSP NIC for spares use; to be used in conjunction with the 24-port/T1 HiPer DSP NAC.

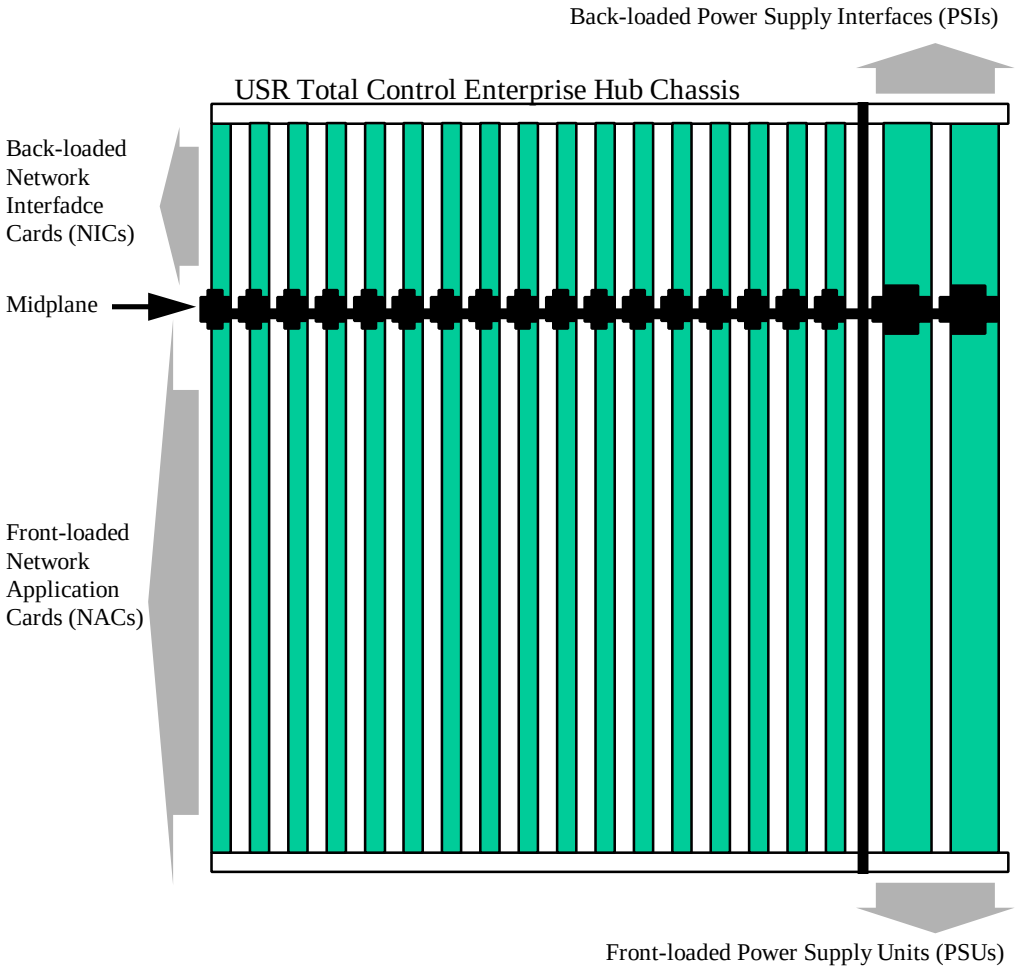

Figure 1: USR Total Control Enterprise Hub Chassis

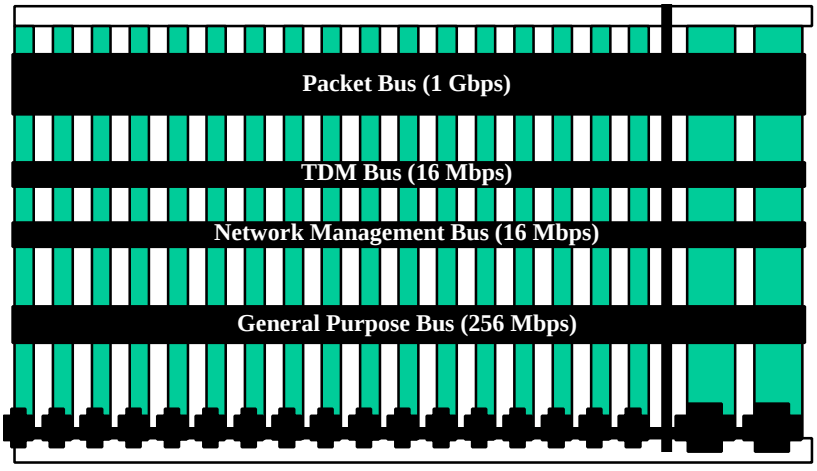

Figure 2: USR Total Control Enterprise Hub Midplane

III. Detailed Analysis of the USR Total Control

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 cost of ownership – low per port prices, 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 time-tested routing software that was initially developed over three years ago. The USR Total Control lags behind Ascend in both analog port market share (27.9% vs 50.6%) and ISDN PRI port share (27.9% vs. 62.2%). 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. In contrast USR, with its new "HiPer" Total Control access system is coming out with entirely new routing software because of a fall-out with the provider of their previous routing software. This means that USR is getting into a new business – the routing software development business – from a company that has never been in the business of developing IP routing software. 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, and as such it is a "bet your company" proposition to rely on untested, or new routing code. Developing high-quality, complete routing code takes many years to develop and fully test. It is an extremely high risk strategy for any company to rely upon new routing code, especially from a company that has never developed routing code – such as is the case with the new routing code in the HiPer Access Router card set.

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. When USR follows through with announced plans to introduce a high-density, six shelf Total Control unit. (At least 9 months after the MAX TNT introduction), the MAX line will still provide more functionality in terms of expansion module options, bandwidth and network management, media and protocol support, and security.

The following section provides an in-depth analysis of how the USR Total Control compares to the MAX TNT:

Price (MLP- US$)

The USR Total Control price per modem port and ISDN B-channel is high compared to the MAX TNT.

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) (US)	MAX TNT	USR HiPer Total Control
Fully configured system for maximum analog ports	$403,500	$368,445
Price/modem port	$600	$548

List Pricing (US)	MAX TNT	USR HiPer Total Control
Fully configured system for maximum ISDN PRI B channels	$82,150 (DS-3 ISDN PRI/box, 672 concurrent sessions)	$368,445 (14 ISDN PRI/box, 672 concurrent sessions)
Price/B-channel:	$122	$548

Scalability/Flexibility

The MAX TNT is a scalable solution that offers densities from 12 to 672 concurrent sessions per MAX TNT shelf (up to 4032 ISDN sessions per Telco rack).

- USR's Total Control HiPer Hub has been designed 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. With cost-effective support for analog, ISDN, Frame Relay, and xDSL technologies, the MAX TNT is designed as your complete remote networking solution. The integration and flexibility of the MAX TNT saves you money in reduced line charges (due to consolidation opportunities of dial-in analog and ISDN, as well as leased Frame Relay circuits), reduced management costs, and flexible bandwidth allocation.
- Until its Q4 release of the HiPer Total Control modules, the USR Total Control remains unable to handle more than 48 analog modems today. In addition, one channel per PRI is dedicated to management, leaving a total capacity of only 23 concurrent digital sessions per PRI.
- A higher density modem card is promised for Q4 '97 (Originally scheduled for Q2'97) that will enable 336 modems/box. But, given the problems USR had with releasing its x2 modems on schedule, even this release date may not be met.

MAX TNT	USR Total Control Hub HiPer
• Up to 672 concurrent analog or ISDN sessions per system • Up to 336 digital modems/shelf	• Up to 336/420 modem/ports per chassis
• Up to 28 T1/E1/ PRIs or one DS3 per system	• Up to 14 T1, T1-PRI, E1 or E1-PRI spans supported per chassis.
• Support for range of xDSL Technologies	• Limited support for xDSL technologies (lacks IDSL support)
• Support for high density xDSL technologies, from 6 to 32 per card) • Total of 224 ports IDSL, 90 ports RADSL	• Support for low density (2 ports per module) xDSL, • Limited Scalability - supports only up to 32 RADSL ports per chassis
Support for advanced RADIUS software from Ascend (Ascend Access Control)	• Support for only basic RADIUS
Comprehensive SNMP management support	Significantly less comprehensive SNMP Management

Broad range of expansion modules for all applications	Limited support of expansion modules – no HSSI support, no T3 support, no analog modem support, no multiport Serial WAN Support, no IDSL Support, no cost-effective Frame Relay module (as compared to the MAX TNT FrameLine module)
Optional 5-port 10/100 Ethernet Module	Two Ethernet Ports (10/100)

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.

- USR Total Control's WAN support is limited to leased T1/E1
- USR Total control does not support T1/E1 to PRI conversion

WAN Connectivity Features	MAX TNT	HiPer Total Control Hub
Supports Switched 56 (2&4 wire)	**Yes**	**NO**
Supports leased lines T1/E1	**Yes**	**Yes**
Supports channelized T1/E1	**Yes**	**Yes**
Supports Switched 384, 1536	**Yes**	**NO**
Supports channelized DS-3	**Yes**	**NO**
Supports Multirate (i.e., Nx64)	**Yes**	**NO**
Supports modem dialout via Telnet	**Yes**	**NO**
Supports fax modem dialout	**Yes**	**Yes**
Supports modem dialout pool	**Yes**	**NO**
Supports addition of LAN modules	**Yes**	**NO**
Supports Frame Relay	**Yes**	**Yes**
Supports High density unchannelized T1	**Yes, FrameLine**	**NO**
Supports Frame Relay UNI and NNI	**Yes**	**NO**
Supports Serial WAN (V.35/RS449), Frame Relay	**Yes**	**Yes**
Supports HSSI with Frame Relay, PPP	**Yes**	**NO**
Supports V.110	**Yes**	**Yes**
Supports IDSL	**Yes**	**NO**
Supports SDSL	**Yes**	**NO**
Supports RADSL	**Yes**	**Yes**

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.

- USR Total Control does not have the MAX's breadth and depth of bandwidth management features.
- USR Total Control 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.

Bandwidth Management and Control Features	MAX TNT	HiPer Total Control Hub
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**	**NO**
ISDN D-Channel Multiplexing (NFAS)	**Yes**	**Yes**
Dynamic GRE tunneling	**Yes**	**NO**
IP/IPX Filtering	**Yes**	**NO - IP only**
Dynamic Bandwidth Allocation™ with MP+ and BACP support	**Yes**	**NO**
Hardware compression (Stac Compression Chips)	**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 1 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.

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- USR has only recently begun to write its own routing code, it has historically licensed from Livingston; an out of court settlement ends their licensing agreement in October, 1997. All the new HiPer Total Control Hubs and specifically the routing code in the new HiPer Access Router Card Set is new routing code that has never been proven in the field and which is lacking many important IP routing features.

    ⇒ USR will be unable to do field upgrades to its installed base after September, 1997. Although USR will begin to ship its internally developed code, it is not clear as how and when they will upgrade their installed base. *If* they do succeed in releasing router code in this limited time frame, these changes still present a significant risk to USR's installed base, and will take a year or more to become "field tested".
    ⇒ New customers and the entire USR installed base will have to be rolled into new, unproven software.
    ⇒ The USR products will all be integrated into 3Com's TranscendWare management platform sometime in the future.

    The future of the Total Control software presents a clear risk to any current or potential customer

- USR manufactures its own chipsets – which represent less than 25% of the overall modem market. USR's recent introduction of a proprietary x2 56 Kbps technology threatens the future interoperability of both USR's client side modems, and their Total Control units.
    ⇒ At present, the only way USR analog modem speeds will increase beyond V.34 is if a USR modem is employed at both the client site and the access point.
    ⇒ Since x2 failed to meet its release date in January 1997, and began shipping in March 1997, it has not garnered the momentum or first-to-market advantage USR had expected.
- USR has promised an RADSL-CAP product but it is not available at this time.

Reliability and Investment Protection Features	**MAX TNT**	**HiPer Total Control**
Proven software, complete feature set	**Yes** owns over 1 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	**NO** New routing code developed by USR, a company inexperienced in the complexities of IP routing software development. Limited IP routing feature set (no Multicast, OSPF, BGP,

	during past 4 years.	etc.). Unproven - no current users other than beta sites.
56K strategy	Supports using K56flex, compatible with 70% of the modem installed base	Proprietary 56K technology will not interoperate 70% of the installed modem market; x2 will not transfer into USR's Megahertz modem line
DSL service(s) offered today	IDSL, SDSL, RADSL	RADSL-CAP promised - not released
Maximum ports/unit	Up to 228 (IDSL), 240 (SDSL), 90 (RADSL)	32 (RADSL)
Multiple LAN support	Yes	NO
PCMCIA 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, BGP.

With its 4 year track record and wide national/international installed base, Ascend can also demonstrate worldwide modem interoperability.

- USR does not support IPX, or OSPF in its new HiPer Access Router Card Set
- USR has no plans to support BGP
- USR does not support Multicast

Interoperability Features	**MAX TNT**	**USR Total Control**
IP, IPX	**Yes**	***NO-IPX***
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 a number of carrier networks in over 36 countries	**Yes**	***unknown***
PAP, CHAP	**Yes**	**Yes**
PPP, SLIP, C-SLIP	**Yes**	**Yes**

Network Management

As networks grow in complexity, and network managers are dissatisfied with fragmented management systems and the lack of integrated tools that can 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), multivendor router/switch support, complete discovery and mapping, and QoS reporting.

- USR Total Control does not offer end-to-end network management; its TotalControl Manager is a simple, costly, single device management platform.

Network Management Features	MAX TNT	HiPer Total Control Hub
Total POP/Network management	**Yes**	**NO**
Multivendor router/switch control	**Yes**	**NO**
Complete discovery and mapping	**Yes**	**NO**
Quality of Service reporting	**Yes**	**NO**

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.

- USR Total Control does not meet the minimum standards for comprehensive security – Total Control 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	HiPer Total Control Hub
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 (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**	**NO**
Integrated Dynamic Firewall support	**Yes**	**NO**
IPSec Encryption and Authentication Support	**Yes (planned)**	**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 USR Total Control does not support signaling conversions at this time

Carrier Network Support Features	MAX TNT	HiPer Total Control
NEBS compliance	**Yes**	**Yes**
Global certification (over 36 countries)	**Yes**	*unknown*
Cellular service interface	**Yes**	**Yes**
Multiple carrier switched network signaling	**Yes**	**Yes**
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 price per port, how much integration of other data services (Frame Relay, ISDN, analog) 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 the low per port price compared to other leading remote access concentrator vendors while providing the most comprehensive feature set in the industry.

The USR Total Control HiPer system 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
- No Frame Relay support
- Limited bandwidth management; no Multilink Protocol Plus or Multichassis MP/MP+/BACP support
- Questionable investment protection
  - First generation, feature poor IP routing software
  - Delayed, limited xDSL support
  - Proprietary 56K with limited interoperability in the installed base
- Limited protocol support – IP only currently
- Single device network management
- Minimal security capability
  - No comprehensive RADIUS
  - No integrated/dynamic firewall
  - No encryption

MAX TNT	USR Total Control
• Low per port price for both analog and dramatically lower cost for ISDN	• Dramatically higher per port costs for ISDN, approx. equal costs for analog (but with many fewer features).

IV. Performance Analysis

As soon as the new USR HiPer systems are available an independent test will be conducted to determine the actual performance capabilities of the USR HiPer Access Total Control product and how it compares to the MAX TNT.

For the most recent testing performed comparing the USR Total Control system vs. The MAX 4048 please refer to the Tolly group evaluation that was published in June, 1997.

V. Selling Against the USR Total Control

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

- **High degree of scalability and flexibility**: Ascend is the leader in providing scalable and flexible access concentrator solutions. 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 range of xDSL access solutions, including IDSL, SDSL (also referred to as SHDSL or simply HDSL), and RADSL.
- **Poven, robust, routing software**: Ascend's MAX line of products has had its own IP routing software field tested and debugged during over 4 years of development and over 3 years of field testing at over 30,000 installations worldwide. With its new "HiPer" Total Control Router card, USR is only now entering the IP central site routing market with its own internally developed software. Does any company really want to risk their mission critical network traffic to an upstart in the IP routing market with no trackrecord or experience in developing IP routing software? Most companies will place their bets with a proven leader in that market segment, a leader such as Ascend.
- **Feature-rich routing software** - Ascend has very feature-rich 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 USR routing code unproven it lacks many of the features that Ascend users take for granted.
- **Low cost per port** - Ascend's ISDN cost per port is almost 75% lower than the USR Total Control HiPer. It has many more features with approximate price parity in high density analog applications.
- **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 USR has integrated ISDN and analog support in a single, expensive module. 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).
- **Guaranteed interoperability** with a wide number of modem manufacturers and carrier networks including carriers in over 36 countries.
- **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.
- **Proven track record and investment protection**: Ascend has the largest installed base of integrated access switches, with over a 76% market share, and has been shipping high density access concentrators for over three years. Customers can be assured of investment protection because of Ascend's commitment to developing scalable, compatible and high performance platform solutions
- **Low price/high value** in terms of features and functionality
- **Superior network security** - Only Ascend MAX TNT supports the security that the Enterprise and NSPs require: dynamic firewall, VPN tunneling and encryption, Token-based security, CLID based security, PAP and CHAP.
- **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.
- **IP Multicast support**
- **Field tested VPN support**
- **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 -- USR Total Control

High Level of Router Code Uncertainty and feature Poverty: USR's newly developed router code will not be field tested for at least one year and will be well behind Ascend's feature-rich routing code for several years at a minimum. At the same time, 3Com has promised to integrate all USR/3Com products onto the TranscendWare management platform. *There is a significant risk and uncertainty associated with these changes* - they affect USR's installed base, as well as potential new sales. The change represents a huge task that will severely tax engineering, sales, and support capabilities.

It is important to emphasize this significant unknown : the future of the code for the Total Control Hub presents a clear risk to any current or potential customer - an opportunity for Ascend to win in competitive selling situations.

Interoperability: USR's stance on 56K – its significant investment in a proprietary technology and refusal to join the Open 56K Forum – weakens the ability for x2 modems to actually connect at speeds approaching 56K today or in the near future. The Total Control is similarly limited as to its interoperability with over 70% of the ISP's client market.

To further complicate the issue, USR/3Com has suggested that they now have patents on portions of the 56 Kbps modem technology through a consultant that worked for them. USR/3Com is now seeking licensing revenue from other manufacturers.

Perhaps this move signals 3Com's disappointment with x2 sales. Dell'Oro Group market reports show that in terms of upgrades, 3Com/USR shipped about= 290,000 56K ports in Q1 and Q2'97, accounting for about $6 million in upgrade revenues (Dell'Oro reports Ascend shipped approximately 275,000 56K port upgrades in Q2'97 alone). However, in terms of new product sales, 3Com/USR is lagging behind Ascend; Ascend shipped over 100K more new analog (DSP) ports in Q2'97, garnering over $28 million more in related revenues than 3Com/USR. In other words, USR's x2 marketing blitz did not succeed in pulling through the desired increase in access concentrator sales.

Ascend's official position regarding the Townshend patents:
1) Ascend does not believe that the Townshend patents, if and when they are issued, will be fundamental to 56K technology. The Townshend patent claims are quite broad and many companies and universities have worked on this technology for many years. In fact, Lucent Technology has had 3 patents issued in this area.

2) Ascend is surprised that given 3Com's belief in the importance of 56K technology that the 3Com-Townshend working relationship was kept so quiet during the standard making process. On one hand 3Com says that it wants a standard, but it is obvious that they haven't been open about their relationship with Townshend because as the press release points out, Townshend has been a consultant for 3Com for a number of years. So, in good faith to the industry, Ascend believes that 3Com should publicly reveal what components of the draft standards are based upon the Townshend technology. Then the standards process participants will know what they are getting into.

3) Ascend believes that 3Com's announcement is a tactic to delay the TIA and ITU standards making process. Ascend will continue to push the industry toward a timely and unified 56K standard.

USR has not released any testing results to demonstrate any performance advantage of the x2 technology.

Other limitations:
- *Not scalable*: While units can be "stacked" to provide up to 2016 concurrent sessions (or more in future releases), there is no bonding of B-channels between multiple chassis.
- *Lower density*:
  ⇒ maximum of 48-336 analog modems/box vs. 12 -672 for the MAX family

- *Limited security*: no dynamic firewall capability or encryption, limited RADIUS
- *No track record with high-end access switches* - limited ISP experience: In Q4'96 USR had only a 27.9% share of total ISDN PRI ports, and less than 30% of analog ports. 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).
- *Incomplete WAN access service support* - cannot support Switched 56 or ISDN BRI
- *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 or RIP2 support
- *No multimedia integration support*- no IP Multicast (IGMP v1 and v2)

C. Responses to USR's Attacks on the MAX

USR's Attack on the MAX	Ascend Counter-Attack/Position
"*The USR Total Control can compete with the MAX and MAX TNT, and USR will introduce a high density concentrator in late summer."*	Ascend has been providing scalable and modular WAN access systems for over 3 years. The MAX line provides scalable and flexible configurations from 8 to 72 modems (up to 672 with the high-end MAX TNT system) and up to 28 T1/E1 or PRI connections thus covering a wide array of customer needs. USR is late to market with its high-density platform, which still is not announced, much less field proven.
"USR was first to market with 56 Kbps technology that is software upgradable, and thus lower cost to implement."	Ascend's MAX platform is built to be scalable, modular and "future-ready". Ascend supports open standards, and helped pioneer the Open 56K forum. The MAX supports Rockwell/Lucent's new K56flex chipset Rockwell/Lucent chips represent over 70% of today's installed modem base. Ascend's 56 Kbps speed[1] is achieved by means of a unique hierarchical Digital Signal Processor (DSP) architecture that sends calls all the way through the central site in pure digital format. The long-term viability of the Series56™ Digital Modems is assured through a software-based upgrade method that allows ongoing compliance with 56K standards.
"USR is gaining momentum in the ISP/Carrier segment."	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 shipping remote access concentrator products for 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 products have been installed in a majority of the 40 largest ISPs in the world.

[1] Current FCC restrictions, line conditions and other external factors will reduce data transmission rates and may reduce they significantly.

"USR is gaining market share in the ISP."	In fact, Ascend took analog port market share away from USR in the second half of 1996 – USR lost over 15% share. At the same time, Ascend has maintained its dominance in ISDN with over a 76% market share in access concentrator ISDN PRI ports. (Dell'Oro Group, 2/18/97)
The MAX TNT has performance issues according to an independent study	An study in which the older code (version 1.2A) showed revealed some performance issues however this study also used the old (non Series56, DSP-based) modems. The newer modem modules and new software revisions (version 1.3 and higher) have eliminated any performance issues.

VI. Selling Against US Robotics and 3Com

A. Company Analysis *Before and After* the 3Com Acquisition

Company Overview - USR Before the 3Com Acquisition:

Prior to the announced acquisition by 3Com, USR's Days Sales Outstanding (DSO) had been increasing – implying that modems were not moving off retailers' shelves. Evidently, despite revenues of over $2.3 billion in FY'96, US Robotics had a only $18.7 million in the bank signaling a cash flow problem. USR's president announced that the company's future revenue was dependent ISPs and consumers' acceptance of x2 . Analysts and investors took this statement to mean that USR's main business, modems, was flat and USR had put all of its future success on its new, still-unproved x2 technology.

Overall USR Strategy Prior to 3Com Acquisition:

USR's strategy was to leverage its strength in dial-up modem technology, customer-driven design, marketing, and distribution channels to expand into a wide variety of network access products targeted at all key access points.

Strategic initiatives included:

- Invest in proprietary x2 56K modem technology
- Invest in wireless, switching, xDSL and cable modem technologies
- Build market share in served markets
- Broaden market base to address all levels of communication from dial-up modem segment to communications centers and network service providers
- Expand distribution channels for network systems products
- Expand international sales force, sales offices and distribution channels
- Pursue additional strategic alliances and acquisitions
- Emphasize R&D to control key technologies:
  - be first to market
  - be the low cost provider

USR Product Lines/Target Markets Prior to 3Com Acquisition:

Product Line	Positioning/Target Markets
Network Systems Products	
Total Control Hubs	High-density platform for LAN/WAN integration targeted at enterprise central sites or service provider POPs
EdgeServer	Front-end integration of servers and other communication devices for remote LAN users to access to multiple file servers
TotalControl NetServer	Multiport access for small networks and SOHOs
Courier desktop modems	Software upgradable analog modems for "advanced" consumers, home offices, and corporate desktops
TotalSwitch LAN switch Hub	Segment or replace shared networks
TotalControl Modem pools	Affordable integrated modem pool for small offices or branch offices
Personal Communications Products	
Mobile Communications	Cellular capable Megahertz modems and PC cards
Handheld Product	Pilot Organizer palm-size personal communication device
Telephony Products	ConferenceLink full duplex conference speakerphones and digital phones
Sportster* and DataBurst modems	Analog and ISDN modems/fax modems for consumers and home offices (*USR's largest selling product)

USR Sales/Distribution Strategy Prior to 3Com Acquisition:
Leverage brand recognition in dial-up modem market to expand into other network access segments. Exploit modem users' upgrade cycle by supplying timely product enhancements at low cost (high margin).

Increase sales/distribution presence abroad (increased international sales force by 20% in 4Q 1996). Add offices in Pacific Rim countries.

High selling related expenses for x2 introduction will impact revenues in the first half of 1997. Many company objectives rely on market acceptance of x2

USR Financial Performance Prior to 3Com Acquisition:
US Robotics revenues grew 122% in FY'96, to just under $2 billion; growth in the most recent quarter ended March 30, 1997 was 7% over the previous quarter. The company attributes its Q1'97 growth to an 80% increase in unit sales in its PC related product lines - not their network systems business. In their press release, the company indicates that it has committed resources to increasing international sales in the networking systems business group. Network Systems Products accounted for 26% of revenue for the quarter ended March 30, 1997.

USR Market Penetration to Date:
- Majority of business is in Corporate (non-ISP/Carrier) market
- Low international penetration (22% of total revenues in FY'96, 33% of revenue for Q2'97

USR Market Share Indicators:
Based on the latest Dell'Oro Group worldwide port shipment data for Q4'96, USR has a 28% share of the Access Concentrator market in terms of analog ports, but only a 5% share of ISDN PRI ports. In the Access Server segment, the USR share was 6%.

USR Major Competitors:

Network Systems Business: Ascend/Cascade, Lucent, Cisco, Shiva, Bay Networks

- In their quest to diversify away from the personal modem market into network access, Ascend and Cisco are USR's major obstacles; in the corporate enterprise market, Cisco, 3Com and Shiva have the penetration and brand recognition to be prime competitors.

Desktop Modem Business: Hayes, Zoom, Best Data, Cardinal, Diam, Boca Research, Motorola

- Since the majority (80% or more) of USR revenues are based on its PC-related modems, fax modems, and phones, the majority of their competitive focus has been on protecting this business.

Handheld Business: Casio, Hewlett-Packard, Pscon

USR After the Acquisition

The new 3Com will have revenues estimated at over $5 billion; while they will supply diverse networking products- including network adapters, desktop modems, PC Card modems, workgroup switching, shared media hubs, and remote-access products - *50% of their combined revenue will be generated by adapters and modems.*

3Com has announced that the new company will be drop the USR brand name, and organize around customer segments rather than product/technology segments. The enterprise systems business unit will sell hubs, switches, routers and network management software; the carrier systems business unit will sell remote access equipment to service providers, and the client access business unit will sell the USR LAN/WAN client-side access products and 3Com adapter cards across all customer segments.

In terms of remote access, at news conferences on the day of the announcement, 3Com's CEO stated that Total Control will be the "dominant platform" and the AccessBuilder 8000 will disappear.

B. Attack Strategies

Major 3Com/USR Weaknesses

- **The combined companies do not have the presence, or the product, to compete in the high-end carrier class access and routing arena (50% of their business is in adapters/modems).** In Ascend's strongest market segment, access concentrators, both companies lost significant share in 1996. 3Com lost 14% (falling from 15.4% to 1.6%) in analog port share, and USR lost 16% in analog and 3% in ISDN port share. Although the Total Control Hub will survive the fallout, 3Com isn't bringing any ISP/Carrier presence or technical innovation to the table to improve upon dragging performance. Neither company has high-end products or technology to be a real threat for Ascend's MAX TNT and GRF™ product lines

- **Channel uncertainty also represents an opportunity for Ascend**.
  VARs are wondering what will happen to their discount structure and what will be the impact on technical and sales support. Ascend must reinforce its excellence in technical and sales support, the GET FLEX program, product reliability, consistency, and market leadership. Since neither 3Com nor USR is known for innovation or creating markets, and undoubtedly organizational change will slow new products, Ascend can use this time of uncertainty to further emphasize its leadership position as a provider of emerging high speed technologies and networking solutions. Even now (in Fall of 1997) this issue remains - we expect it to continue to be an issue through the first half of 1998.

- **x2 is a gamble**
  Many believe that x2 helped drain USR's cash, and has not been poorly managed since its announcement. In March/April '97, x2 upgrades applied to recently purchased Courier and Sportster modems and Total Control products (x2 can not be imported into the Megahertz modem at this time - it still uses a Rockwell chipset). There are reports that x2 client software is still problematic. Performance at 56K is not possible. Under the best line conditions, the modems support speeds up to 48-53K downstream, but the interoperability with the ISP/modem installed base remains a key issue going forward.

  In addition to the technical issues there are many legal issues with the x2 approach. In fact Ascend believes that 3Com's announcement is a tactic to delay the TIA and ITU standards making process. Ascend will continue to push the industry toward a timely and unified 56K standard.

  Open 56K forum member companies like Ascend that support Rockwell/Lucent's K56flex chipset began shipping client and digital modem cards almost concurrent with the USR actual product release. These products are compatible with over 70% of the installed modem base, and will present an open path toward implementing the standard, when it is reached.

  Ascend is the only vendor that has a strategy in place for ISDN, 56K, and MultiDSL; this is a competitive advantage as it represents investment-protection for both Carrier/ISPs and corporate POPs.

- **The new 3Com has no technology and "system-level" track record to provide a seamless single vendor solution**
  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.

Ascend Responses to Perceived USR Strengths and Marketing Claims

USR Claims	Ascend Response
"Expertise with dial-up modems translates to an expertise in analog-to-digital, and digital-to-analog signal conversion and high speed data transmission."	Ascend writes its own code, and has been the leader in hybrid ISDN/analog access for over three years. Ascend will change the face of the digital modem market with its monumental GET FLEX upgrade program for over 1.5 million digital ports.
"Commitment to own/control core technology" makes USR fast to market with low cost, high margin products."	USR does not own its Total Control code – it has been licensing router code from Livingston. Only recently has it begun to develop its own core routing software technology – its like a car company that has never manufactured its own engine.
"Brand recognition in the dial-up market will propel sales in other remote access segments."	The USR brand name is being dropped! Ascend has a proven track record in access concentrators and has been shipping flexible, scalable product for over 3 years. Ascend has shipped over 2.9 million ports to ISPs .
"USR can build revenues by exploiting the user's "trade-up" cycle - providing timely upgrades and enhanced functionality and speed at higher prices."	USR has been successful at following this path in the client modem market; now, by introducing proprietary 56K technology that will **not** interoperate with over 70% of the market, USR is jeopardizing the trust of the marketplace.
"USR has a strong customer base in the corporate remote access market - in Fortune 1000, universities, financial, and government institutions."	Ascend's scalable MAX line is represented in 34 of the top 40 ISPs worldwide and over 76% of ISDN PRI access ports; as corporate networks require scalable, flexible, secure network access, the new Ascend MAX 20XX and 40XX products provide the depth and breadth required at a low cost.
"USR Total Control has over 1 million installed ports"	Ascend has installed over 3.6 million ports, and over 2.0 million digital modems worldwide.

Appendix A: USR Financial/Marketing Snapshot Prior to 3Com Acquisition

Category	Number/Description
Revenue (Growth%)	$1,977.5 million (122%) FY'96;
Net Income Before Interest and Taxes (Growth %)	$301.9 million (177%) FY'96;
Gross Margin (%)	42% FY'96;
R&D expense (as % of Revenues)	$109.4 million (5.6%) FY'96
Sales and Marketing expense (as % of Revenues)	$271.6 million (13.7%) FY'96
Employees	~6,300 1,230 in sales and marketing
Offices	Worldwide
Type of products	Remote access; LAN hubs, servers, switches; palmtop computers; wireless devices; telephony devices
Customer base	Consumers, Fortune 1000; financial, educational and government sectors
Distribution	2 tier, VAR, Retail, Direct, and OEM
Recent Acquisitions	8/96: Scorpio Communications, to extend ATM switching past the Ethernet LAN to Corporate backbone and WAN access 2/96: AmberWave, a vendor of workgroup LAN switches to provide low-cost LAN switching products for corporate customers