Equity Research Note
December 31, 2002

Anton Wahlman / 212.705.0436
awahlman@needhamco.com
Brian Coyne / 212.705.0443
bcoyne@needhamco.com

2003 Broadband Tsunami

Disclosures applicable to these securities:
see "Companies Mentioned" section herein (disclosure explanation at the end of this report)

Summary

We are a lot more excited about broadband deployment and the cable TV industry going into 2003 than we were going into 2002. In 2002, high-speed data deployment had a very good year around the world, but broadband telephony and TV technology were comparatively muted as a result of financial and merger issues amongst companies such as Adelphia, Comcast, Charter and AT&T Broadband. In 2003, we see DOCSIS 2.0, Video On Demand (VOD), IP telephony, WiFi (802.11x) and video over DSL as the major phenomena driving broadband adoption and innovative use. On the U.S. cable operator side, we also see hopes for industry rationalization coming from an IPO of Time Warner Cable and a resolution to the Adelphia bankruptcy. As such, we believe the worst is behind us and that new exciting technologies will be adopted and marketed at a more intensive pace in 2003 compared to 2002. On the telco side, we believe the RBOCs will continue to lose ground against the cable TV companies and against new "guerilla IP telephony" offerings over broadband. However, we believe international telcos, especially in Asia, will be more successful in launching advanced new services such as TV over DSL and IP telephony.

2002: Not A Banner Year

Let us put our 2003 outlook in perspective, by reviewing 2002. To begin, the U.S. cable TV industry had a disastrous year primarily because of one single nasty issue: The Adelphia bankruptcy, which destroyed valuations and capital spending across the industry. Less publicity was given to privately held Diva going out of business, but this VOD server vendor's demise led to substantial delays in VOD marketing by Charter, Insight and AT&T Broadband. Charter also underwent management changes and turned down capital spending significantly in the middle of 2002.

Despite the new financial straitjackets and the Adelphia and Diva debacles, however, the U.S. cable likely ended 2002 with its best cable modem year ever, having come out from under the @Home bankruptcy with a more capable network and improved economics. Digital TV deployment continued at a steady pace at Time Warner, Comcast, AT&T Broadband and Charter, but slowed at Cox as they focus more on cable telephony from Arris (ARRS). Tom Rutledge, fresh from Time Warner to Cablevision, decided that Cablevision's risky SONY digital TV strategy had been enough of a fiasco and switched over to Scientific-Atlanta (SFA) in the second half of the year. Cable telephony had a bad year, primarily as a result of Comcast's harsh rhetoric towards the end of the year. Despite Diva's debacle and Adelphia's year in the dark, VOD was rolled out aggressively by Time Warner in particular, which we believe ended 2002 offering VOD to every single digital set-top box across its 34 cities in the country. Charter, Comcast and Insight also did most of the deployments necessary to conduct effective marketing on a wide scale in 2003.

On the DSL side, the U.S. landscape was as unexciting in 2002 as it was in 2001, but deployments at least held up at a similar level. Japan's DSL took off like a rocket, mostly driven by Yahoo-Softbank. In our opinion, the most exciting DSL move came at Manitoba in Canada, which launched VDSL with ambitious geographic and penetration goals for 2003 and 2004.

2003: Differentiating Broadband

We believe the key theme for 2003 will be product differentiation, emanating from the high-speed data pipe. A majority of Americans can now receive high-speed data, whether DSL or cable modem, paying some $40-$50 per month for a standard offering. Few people argue whether they actually receive 256K, 512K, 1 Mb or higher per second as the downstream bandwidth, and even fewer people pay attention to upstream speeds. With most residential bandwidth now emanating from peer-to-peer services such as Morpheus, Kazaa and equivalent, we believe the ratio of upstream to downstream traffic demands is now approaching par, up from a substantial downstream bias only a couple of years ago. Cable telephony – IP or circuit alike – is also a symmetric service. This is why we believe the symmetric DOCSIS 2.0 standard is going to see a measurable adoption curve already in 2002 on the modem side, and with substantial CMTS deployments going into 2004, benefiting primarily Terayon (TERN). We forecast that we will end 2003 with many cable operators offering 256 Kb/s symmetric offerings for $29 or perhaps even lower, attacking AOL and other dial-up services. We also believe we will see business-class offerings where a business may get as much as a whole 6 MHz channel for over $1,000 per month, yielding 30 Mb/s symmetric service over DOCSIS 2.0. In a shade of grays, we also envision numerous high-end residential, SOHO and business-class offerings between $50 and $1,000 per month for multi-megabit service over DOCSIS 2.0.

Guerilla IP Telephony

We believe 2003 will see a major paradigm shift with respect to voice over broadband. Today, we have been waiting for Time Warner, Comcast, Covad and others to launch voice over IP cable and voice over DSL. In 2003, we believe that we may see companies such as Vonage partnering with cable operators such as Advance/Newhouse (Time Warner Cable Florida systems) that want to deploy telephony but is not interested in much up-front investment. Other operators who are comfortable with CBR (constant bit rate) telephony, but has numerous smaller rural markets, such as Cox, could also be interested in pursuing this path in 2003. At $40 per month Vonage's system provides unlimited telephony to U.S. phone numbers, has better features than regular POTS, and works from places outside the U.S. So far, we had thought of IP telephony primarily as a way to save money, but going forward we also have to consider the feature advantages of IP telephony. *Our message to telcos and cable operators alike is the same in this regard: Your voice offerings will be no stronger than the robustness and attractiveness of your data pipe, because that's where the voice will ride.* This is particularly detrimental for the U.S. RBOCs, because they have no video subscriber base on which to fall back and with which to bundle. The RBOC residential voice situation was a losing battle anyway, as a result of cellular and regular CBR cable telephony, but we believe "guerilla IP telephony" from Vonage and equivalent will be an incremental serious knife through the heart of circuit-switched residential voice. We believe the chief beneficiaries of IP telephony will be the CMTS vendors, including Terayon, Arris, ADC, Motorola, Juniper and Cisco.

Video On Demand: Creating The Demand (Marketing!)

If you were Time Warner Cable, you would now be running out of excuses for not killing Blockbuster and the satellite guys alike, because VOD is here, today, and everywhere across your footprint. Only three obstacles remain for total victory to be declared. First, users must get digital set-tops, and only 35% of customers have one or more of them. We believe 2003 will see the initial planning to swap out all remaining analog set-tops in customer homes over the next few short years. In the future, your TV will have either no set-top at all, or a digital one – but analog set-tops will soon be history. Despite the cheaper entry-level boxes required to making this swap happen in the near future, we believe SFA will be the major beneficiary of this rational leap into a digital-dominated cable TV future. We believe quantity will more than make up for falling ASPs in such a major swap-out.

The second hurdle for VOD victory is content. We believe this will be phased in over the next two years, with movie studios giving cable operators "Blockbuster windows" in exchange for favorable revenue splits as they recognize the efficiencies of this superior distribution model. VOD will also be a good alternative (or complement) to PVR/DVR devices as "regular TV content" likely make up most actual VOD viewing, either for "free" or paid for via monthly subscription inclusion. Comcast and Cox in particular have already started down this path, and we believe the rest of the industry will follow the "free VOD" model on a massive scale in 2003.

The third hurdle regarding VOD success requirements is that service availability and content attractiveness matter little if people don't know about the service to begin with. The cable industry has before itself a major marketing challenge: showing people that they can have full VCR control over the content, often at a small fixed monthly fee, or even for free. This is a service available to tens of millions of subscribers today, and cable had better educate them better than TiVo has done with its PVR/DVR. The dilemma with TiVo is that everyone who has tried it loves it, but the rest of the world has no idea why they would want it. We believe VOD will do better than TiVo, but it will not happen without clever and intensive marketing.

Cable's Low-Hanging Fruit: Business Bulk Data

We believe the return on investment for the cable operators can be superior in the business bulk data market. The infrastructure is largely in place, and DOCSIS and other technologies (Xtend from Israel, Advent from Austin, and other technologies) can help squeezing out more bandwidth from the coax plant. The current model of broadcasting some 500 channels is also very inefficient, and we believe at least 200-300 MHz can be liberated with a complete shift to digital set-tops and narrowcast TV. This opens up a gold mine for the cable operators, where each 6 MHz channel could yield thousands of dollars in bulk data access and transport revenue. We believe DOCSIS 2.0 will the chief catalyst for this in 2003, although a variety of other technologies are also likely to be tried, including direct fiber connects to larger businesses and business parks/buildings.

The RBOCs: Rain Today, Rain Tomorrow

The RBOCs today remind us of the British Empire between 1914 and 1978. It is possible to go from being the dominant player to a second-rate organization through a combination of self-destruction and unfortunate external circumstances. The self-destructive part comes from insufficient fiber-optic access network investment, which in turn makes TV services a nonexistent part of the integrated service offering. The unfortunate external circumstances come courtesy of the government's socialist straitjacket, which include taxes, universal service requirements, DSL resale laws, UNE-P and other handicapping obstacles. Unfortunately, we are unable to identify a Maggie Thatcher amongst the RBOCs, and therefore have no hope that 2003 would be a year of fighting back against the cable companies on their TV home turf. We can only hope the RBOCs use 2003 wisely to plan for a massive 2004 upgrade to VDSL or FTTx (fiber to the x, i.e., closer to the user). If we are wrong, and the RBOCs move in 2003, we believe Motorola (MOT)-controlled Next Level Communications (NXTV) the most leveraged play.

International: Sunshine At Asian Telcos

Fortunately for our global perspective, we need not shed too many tears over the U.S. RBOCs refusal to invest in a fiber-optic or VDSL-based residential access network, because other telcos around the world – and Asia in particular – are doing things a lot better, and with less competition from often nonexistent cable TV companies. 2002 was Japan's year in DSL, and Yahoo-Softbank is in our opinion the world's most progressive ISP/CLEC, serving IP telephony to almost half a million subscribers already. We believe 2003 will be China's big year in terms of DSL deployment, and we could end 2003 with over 5m subscribers there.

Structural Evolution Of The U.S. Cable TV Industry

We believe three main things ought to happen in order to enable the U.S. cable industry to simultaneously reverse the customer outflows to satellite, and to complete the victorious battle against the RBOCs. First, the defunct Adelphia entity should be sold, either city-by-city or as a whole, to a well-functioning entity with strong management. Second, the relatively successful Time Warner Cable should do its IPO. Third, Comcast needs to execute quickly and intelligently on upgrading the AT&T Broadband systems while also moving forward with cable telephony earlier as opposed to later.

In our opinion, the likely outcome of these three anticipated developments in 2003 would be to consolidate the U.S. cable industry into four publicly held entities. Time Warner Cable could buy Cablevision, and a combination of the other operators (Cox, Comcast and Charter) would likely chop up Adelphia between themselves. The smaller entities would be Insight, Mediacom and privately held Advance/Newhouse.

Companies Mentioned (prices as of market close on December 30, 2002):

ADC Telecommunications (ADCT, $2.12, NR)
Adelphia Communications (ADELQ.PK, $0.09, NR)
AOL Time Warner Inc. (AOL, $12.41, NR)
ARRIS Group (ARRS, $3.23, Buy. Disclosures related to this security: B, C, D, E, G)
Cablevision Systems Corp. (CVC, $16.10, NR)
Charter Communications (CHTR, $1.10, NR)
Cisco Systems (CSCO, $12.97, Buy. Disclosures related to this security: B, G)
Comcast Corp. (CMCSK, $22.63, NR)
Covad Communications (COVD.OB, $0.96, NR)
Cox Communications (COX, $28.03, NR)
Insight Communications (ICCI, $12.10, NR)
Juniper Networks (JNPR, $6.72, Hold. Disclosures related to this security: B, G)
Manitoba Telecom Services (TO: MBT, C$35.59, NR)
Mediacom Communications (MCCC, $8.67, NR)
Motorola Inc. (MOT, $8.68, Buy. Disclosures related to this security: B)
Next Level Communications (NXTV, $0.82, Hold. Disclosures related to this security: B, E, G)
Scientific-Atlanta (SFA, $11.63, Buy. Disclosures related to this security: B, E)
Sony Corp. (NYSE: SNE, US$41.21, NR)
Terayon Communication Systems (TERN, $2.22, Buy. Disclosures related to this security: B, E, G)
Yahoo Inc. (YHOO, $16.48, NR)

	% of companies under coverage with this rating	% for which Investment Banking services have been provided for the past 12 months
Strong Buy	14%	4%
Buy	56	10
Hold	28	3
Sell	0	0
Restricted	2	2

Needham & Company, Inc. (the Firm) employs a rating system based on the following four ratings:

Strong Buy: A security, which at the time the rating is instituted, indicates an expectation of a total return of at least 50% over the next 12-18 months.

Buy: A security, which at the time the rating is instituted, indicates an expectation of a total return between 20% and 50% over the next 12-18 months.

Hold: A security, which at the time the rating is instituted, indicates an expectation of a total return of +/- 20% over the next 12-18 months.

Sell: A security, which at the time the rating is instituted, indicates an expectation that the price will depreciate by more than 20% over the next 12-18 months.

For disclosure purposes (in accordance with NASD requirements), we note that our Strong Buy and Buy ratings most closely correspond to a “Buy” recommendation. When combined, 70% of companies under coverage would have a “Buy” rating and 14% have had investment banking services provided within the past 12 months; Hold mostly correspond to a “Hold / Neutral” recommendation; while our Sell rating closely corresponds to the Sell recommendation required by the NASD.

Our rating system attempts to incorporate industry, company and/or overall market risk and volatility. Consequently, at any given point in time, our investment rating on a stock and its implied price appreciation may not correspond to the stated 12-18-month price target. For valuation methods used to determine our price targets and risks related to our price targets, please contact your Needham & Co. salesperson for a copy of the most recent research report on the company you are interested in.

Stock price charts and rating histories for companies under coverage and discussed in this report are available at www.needhamco.com. You may also request this information by writing to: Needham & Co., 445 Park Ave, 15th Floor (Attn: Compliance/Research), New York, NY 10022.

The following disclosures may apply to the securities discussed in this research report:

“A” The research analyst and/ or research associate (or household member) maintain a position in the covered company.

“B” The research analyst and research associate have received compensation based upon various factors including quality of research, investor client feedback, and the Firm’s overall revenues, which may include investment banking revenues.

“C” The Firm has managed or co-managed a public offering of securities for the subject company in the past 12 months.

“D” The Firm has received compensation for investment banking services from the subject company in the past 12 months.

“E” The Firm expects to receive or intends to seek compensation for investment banking services from the subject company in the next three months.

“F” The analyst or a member of the analyst's household serves as officer, director or advisory board member of the covered company.

“G” The Firm, at the time of publication, makes a market in the subject company.

“H” The Firm and/or its affiliates beneficially own 1% or more of any class of common equity securities of the subject company.

Needham & Company, Inc. is an NASD member and a member of SIPC. This report is for information purposes only and does not constitute a solicitation or an offer to buy or sell any securities mentioned herein. While the information contained herein has been obtained from sources believed reliable, we do not represent that it is accurate and it should not be relied upon as such. Any opinions expressed herein reflect our judgment at this date and are subject to change from time to time. The securities discussed in this report may not be suitable for all investors. Investors must make their own investment decisions based on their specific financial situations and investment objectives. The value of and income from your investment may vary because of changes in interest rates, changes in the price of securities or other indexes in the securities market, changes in the financial and operational conditions of the companies and other factors. Investors should be aware that the market price of the securities discussed in this report may be volatile. Due to industry, company and overall market risk and volatility, at the securities’ current price, our investment rating may not correspond to the stated price target. This firm and/or its directors, affiliates, officers, employees or members of their immediate families may have a long or short position in the securities mentioned in the report or in options, futures or other derivative instruments based thereon. Additional information on the securities mentioned is available on request.
© Copyright 2002 Needham & Company, Inc.