DECLARATION OF MARIUS SCHWARTZ

Professor of Economics
Georgetown University

In connection with the proposed transaction, SBC intends to file a registration statement, including a proxy statement of AT&T Corp., and other materials with the Securities and Exchange Commission (the "SEC"). Investors are urged to read the registration statement and other materials when they are available because they contain important information. Investors will be able to obtain free copies of the registration statement and proxy statement, when they become available, as well as other filings containing information about SBC and AT&T Corp., without charge, at the SEC's Internet site (www.sec.gov). These documents may also be obtained for free from SBC's Investor Relations web site (www.sbc.com/investor_relations) or by directing a request to SBC Communications Inc., Stockholder Services, 175 E. Houston, San Antonio, Texas 78258. Free copies of AT&T Corp.'s filings may be accessed and downloaded for free at the AT&T Relations Web Site (www.att.com/ir/sec) or by directing a request to AT&T Corp., Investor Relations, One AT&T Way, Bedminster, New Jersey 07921.

SBC, AT&T Corp. and their respective directors and executive officers and other members of management and employees may be deemed to be participants in the solicitation of proxies from AT&T shareholders in respect of the proposed transaction. Information regarding SBC's directors and executive officers is available in SBC's proxy statement for its 2004 annual meeting of stockholders, dated March 11, 2004, and information regarding AT&T Corp.'s directors and executive officers is available in AT&T Corp.'s proxy statement for its 2004 annual meeting of shareholders, dated March 25, 2004. Additional information regarding the interests of such potential participants will be included in the registration and proxy statement and the other relevant documents filed with the SEC when they become available.

Certain matters discussed in this statement, including the appendices attached, are forward-looking statements that involve risks and uncertainties. Forward-looking statements

include, without limitation, the information concerning possible or assumed future revenues and results of operations of SBC and AT&T, projected benefits of the proposed SBC/AT&T merger and possible or assumed developments in the telecommunications industry. Readers are cautioned that the following important factors, in addition to those discussed in this statement and elsewhere in the proxy statement/prospectus to be filed by SBC with the Securities and Exchange Commission, and in the documents incorporated by reference in such proxy statement/prospectus, could affect the future results of SBC and AT&T or the prospects for the merger: (1) the ability to obtain governmental approvals of the merger on the proposed terms and schedule; (2) the failure of AT&T shareholders to approve the merger; (3) the risks that the businesses of SBC and AT&T will not be integrated successfully; (4) the risks that the cost savings and any other synergies from the merger may not be fully realized or may take longer to realize than expected; (5) disruption from the merger making it more difficult to maintain relationships with customers, employees or suppliers; (6) competition and its effect on pricing, costs, spending, third-party relationships and revenues; (7) the risk that Cingular Wireless LLC could fail to achieve, in the amount and within the timeframe expected, the synergies and other benefits expected from its acquisition of AT&T Wireless; (8) final outcomes of various state and federal regulatory proceedings and changes in existing state, federal or foreign laws and regulations and/or enactment of additional regulatory laws and regulations; (9) risks inherent in international operations, including exposure to fluctuations in foreign currency exchange rates and political risk; (10) the impact of new technologies; (11) changes in general economic and market conditions; and (12) changes in the regulatory environment in which SBC and AT&T operate.

The cites to webpages in this document are for information only and are not intended to be active links or to incorporate herein any information on the websites, except the specific information for which the webpages have been cited.

Declaration of Marius Schwartz

I, Marius Schwartz, hereby declare the following:

Biographical Information and Qualifications as an Expert

1. I am a Professor of Economics at Georgetown University. I earned my B.Sc. degree from the London School of Economics with 1st class honors, and Ph.D. from UCLA. My teaching and research specialties are in industrial organization, competition, and regulation. From September 1998 to April 2000, I served at the Antitrust Division of the U.S. Department of Justice (DOJ) as the Economics Director of Enforcement, and for six months also as the Acting Deputy Assistant Attorney General for Economics (chief economist).

2. I have been actively involved in the telecommunications area both as an academic, government official, and private consultant. From April 1995 to June 1996, I served at the President's Council of Economic Advisers as the Senior Economist for industrial organization, working extensively on telecom issues including the 1996 Act. From 1996 to 1997, I was the DOJ's main economic outside expert on Bell entry into long-distance services. In 2000, I prepared to serve as the DOJ's testifying economic expert on Internet backbone issues in the proposed merger between WorldCom and Sprint. I have also consulted for the private sector on significant telecom matters, including international satellite services, international settlement rates, and the FCC's spectrum cap. My curriculum vitae is attached as Appendix 1.

I. Overview

3. The proposed transaction entails, among other things, a combination of Internet-related assets. Three attempted mergers in recent years by MCI (then known as WorldCom) have elicited concerns about the effects on competition in Internet Backbone services. This declaration

examines the likely effect of the current transaction on Internet Backbone (IB) competition, and is organized as follows:

a. Section II recaps the analysis by the reviewing U.S. agencies in the prior mergers: the postulated relevant product and geographic market, and the competitive concerns.

b. Section III demonstrates why this transaction does not raise competitive concerns in the provision of Internet Backbone services.

c. Section IV briefly addresses some of the efficiencies that SBC expects to realize in the provision of Internet-based services as a result of the transaction.

d. Section V provides brief conclusions.

II. DOJ and FCC Competitive Analysis of Past Internet Backbone Mergers

4. In the 1998-2000 time period, the Federal Communications Commission (FCC) and the Department of Justice (DOJ) reviewed three transactions involving attempted acquisitions by WorldCom of Internet backbone assets: WorldCom-MCI, approved in 1998 subject to the divestiture of MCI's backbone (iMCI); WorldCom-Sprint, abandoned in 2000; and WorldCom-Intermedia, approved in late 2000 subject to the divestiture of Intermedia's assets other than Digex (a provider of managed web site hosting). This section discusses the competitive concerns raised by the U.S. agencies, based on my review of their public documents.[1]

[1] The FCC's public analysis is contained mainly in its "Memorandum Opinion and Order," FCC, CC Docket No. 97-211, adopted September 17, 1998 ("FCC WorldCom-MCI Order"). The FCC issued only brief pronouncements in the other two mergers: "Order," FCC, CC Docket 99-333, adopted August 3, 2000 ("FCC WorldCom-Sprint Order") and "Memorandum Opinion and Order," FCC, CC Docket No. 00-206, adopted January 17, 2001 ("FCC Intermedia Order"). The DOJ's analysis can be discerned from U.S. v. WorldCom, Inc. and Sprint Corp., "Complaint," June 26, 2000 ("DOJ Sprint Complaint"), U.S. v. WorldCom, Inc. and Intermedia Communications, Inc., Civil Action No.1:00CV02789, "Complaint," November 17, 2000 ("DOJ Intermedia Complaint"), and the Address by Constance K. Robinson, Director of Operations and Merger Enforcement, Antitrust Division, U.S. Department of Justice, Before the Practicing Law Institute, San Francisco, California, August 23, 1999, "Network Effects in Telecommunications Mergers - MCI WorldCom Merger: Protecting the Future of the Internet" ("Robinson Speech"). (No complaint was filed in WorldCom-MCI because a divestiture agreement had been reached.)

A. The Postulated Tier 1 Internet Backbone Market

5. Internet Backbone Providers ("IBPs") operate the transmission networks to carry traffic over the Internet. The FCC previously defined IBPs as a separate product market:

> we are inclined to agree … that Internet backbone services, which we define to be the transporting and routing of packets between and among ISPs and regional backbone networks, constitutes a separate relevant product market.[2]

6. An IBP's customer (whether an ISP or an end user) typically pays a fee – often based on the volume of traffic and/or the connection size – for a '*transit*' service, whereby the IBP handles the customer's traffic to and from (a) the IBP's other customer as well as (b) any other network with which the IBP has agreed to exchange traffic. Under '*peering*' each network agrees to accept traffic from the other network only to the recipient's customers (not to third networks that are not customers of the recipient). Peering typically means the exchange of such traffic at zero price ('settlement free') in both directions, though there are also instances of '*paid peering*' where only one network pays the other to accept traffic (still destined only to the recipient's customers, as distinct from transit). The physical interconnection to exchange traffic can take place at bilaterally chosen points – '*private peering*' – or at *public* sites managed by third parties (though the financial terms for exchanging traffic are determined by the participating networks).

7. The DOJ further distinguished between what it termed "Tier 1" IBPs, and lower level IBPs ("Tier 2" or "Tier 3"). It defined Tier 1 IBPs based on two attributes: (a) they have high-capacity networks nationwide or internationally and (b) they do not purchase connectivity from (are not customers of) any other network but instead have private peering with all other Tier 1 IBPs on a settlement-free basis. The DOJ concluded that the relevant product market was the provision of

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[2] FCC WorldCom-MCI Order, ¶ 148.

connectivity to Tier 1 IBPs. It viewed the geographic market as the United States. *See* DOJ Sprint Complaint, ¶¶ 27-31.

8. Before discussing the DOJ's competitive concerns with each of the prior mergers, I offer some brief observations on the Tier 1 market definition. An IBP's key fundamental assets are: (a) probably most important, the size and relative significance of its customer base, such as the 'eyeballs' and content providers connected to it, and (b) the capacity and geographic reach of its network facilities. Peering with another network is an indicator that the networks view each other as comparable in some sense, and thus may serve as a proxy of the strength of their underlying assets, but need not be a differentiator in itself. My analysis of the current transaction, however, is not sensitive to the precise market definition adopted, so I do not address whether a bright line can be drawn between Tier 1 and lower level IBPs. Thus, for present purposes I will largely accept the past Tier 1 market definition.

B. The Competitive Concerns

1. "Horizontal" Concern: Loss of a Competitor

9. In the Sprint Complaint, the DOJ noted that:

> The proposed transaction would produce anticompetitive harm in at least two ways. First, it would substantially lessen competition by eliminating Sprint, the second-largest IBP in an already concentrated market, as a competitive constraint on the Internet backbone market.[3]

This traditional 'horizontal concern' appears to have been largely based on the merger's effect on market concentration, e.g., the Sprint acquisition would have increased the Herfindahl-Hirschman index (HHI) for traffic from about 1,850 to 3,000.[4] However, probably because there still remained

[3] DOJ Sprint Complaint, ¶ 34.

[4] *Id.* ¶ 32.

a significant number of major competitors, this horizontal concern did not play center stage in any of the three reviews.

2. "Vertical" Concern: Interconnection Incentives of the Enlarged Network

10. Rather, the main concern in past transactions is encapsulated in the paragraph from the Sprint Complaint immediately following the one quoted above:

> Second, the combined entity ("UUNET/Sprint") will have the incentive and ability to impair the ability of its rivals to compete by, among other things, raising its rivals' costs and/or degrading the quality of its interconnections to its rivals. … Such behavior will likely enhance the market power of the combined firm and ultimately facilitate a "tipping" of the Internet backbone market that will result in a monopoly.

According to the DOJ, when a single network grows to a point at which it *controls a substantial share of the total Internet end user base and* its size *greatly exceeds that of any other network*, network effects may cause a reversal of its previous incentives to achieve efficient interconnection arrangements with its rival networks. In this context, degrading the quality or increasing the price of interconnection with smaller networks can divert customers from them to the largest network.

11. A central requirement under both scenarios – degrading interconnection or raising its price under the threat of degradation – is that the largest network must be sufficiently large that degrading interconnection would be a profitable option. As explained in Section C below, the DOJ's judgment was that each of the three prior mergers threatened to make WorldCom sufficiently large to put it in such a position.

12. A final point noted by DOJ in *Sprint* and *Intermedia* is that WorldCom controlled three of the seven largest and busiest public interconnection sites at which smaller Internet backbones exchange traffic (the MAE sites).[5] The merger – by expanding WorldCom's market share –could increase its incentive to impede rivals' interconnection through under-investing in

[5] DOJ Sprint Complaint, ¶ 25, and DOJ Intermedia Complaint, ¶ 20.

these public facilities, or its ability to impede rivals, by placing additional public facilities under its control (since Sprint controlled another of these major sites).

13. There is no basis for similar concerns in the current transaction. SBC controls only one active public interconnection facility, while AT&T does not control any public interconnection sites. Thus, apart from industry changes that have reduced the competitive significance of these sites,[6] the transaction will not increase the ability of the combined company to impede interconnection among rivals.

C. Indicators of Backbones' Relative Importance Noted in Past Reviews

14. Reviewing agencies have measured IBPs' relative size for purposes of assessing their competitive significance by various metrics.

15. ***WorldCom-MCI.*** In its review, DOJ considered a number of measures.[7] The DOJ concluded that the merger would have combined the facilities, personnel, "and, perhaps most importantly, the customer bases of iMCI and UUNET, the two top backbone providers" and that the combined entity would have been "by far the largest single nationwide backbone … with an overall majority of customers (web sites, ISPs and dedicated access corporate customers)." Each of

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[6] As noted by Telegeography, while the role of public interconnection continues to decline, " … a new breed of hybrid exchanges offering premium interconnection facilities has risen. These sites – managed by companies such as Equinix and PAIX – have attempted to build businesses out of the efficiencies inherent in bringing multiple providers together in a neutral and safe environment. …" Telegeography 2003, "Global Internet Geography." These factors contributed to SBC's exit from the NAP West facility acquired with the Pacific Telesis acquisition.

[7] These include: Total Internet revenue for ISPs connected to the IBP, with and without eliminating double counting and irrelevant revenue; Number of ISPs connected to the IBP; Internet traffic originating, terminating, or otherwise traversing the IBP's network; Number and type of Points of Presence on an IBP's network; Number of circuits connecting customers to the IBP; Number of "routes advertised" (or terminating IP addresses); Density of the network and web of customers; Number, type, and significance of the IBP's customers. *See* Robinson Speech, pages 10-11. DOJ obtained the data for the first two measures from public sources. The other measures apparently came from non-public sources.

the measures studied "exhibited the same pattern. … after the merger, MCI/WorldCom would be the dominant player in the market, and substantially greater than any other player."[8]

16. ***WorldCom-Sprint.*** In this review, the DOJ reported, based on a traffic study conducted in February 2000, shares of "Internet traffic sent to or received from the customers of the 15 largest Internet backbones in the United States."[9] The DOJ also stated that these 15 largest IBPs represented about 95% of all U.S. dedicated Internet access revenues.[10] This traffic study found that WorldCom's UUNET had a share of 37%, more than twice that of Sprint, the next-largest Tier 1 IBP, which had a 16% share, putting the merged firm "in a commanding position vis-à-vis all of their Tier 1 IBP rivals, [with] a majority of all Internet traffic on its own network."[11] The DOJ noted that UUNET alone "is by far the largest Tier 1 IBP by any relevant measure and is already approaching a dominant position in the Internet backbone market."[12]

17. ***WorldCom-Intermedia.*** In its Intermedia Complaint, the DOJ did not report share estimates, but reiterated that the merger would increase WorldCom's "commanding position".[13]

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[8] Robinson Speech, p. 10. For the European Commission's report on traffic shares in Worldcom-MCI *see* "Commission Decision of 8 July 1998," Case No. IV/M.1069 – WorldCom/MCI.

[9] DOJ Sprint Complaint, ¶ 32. The DOJ did not provide details about the methodology of its traffic study, the names of the 15 IBPs, nor the underlying data source.

[10] *Id.* DOJ did not provide the details or source underlying the 95% calculation.

[11] *Id.* ¶ 42.

[12] *Id.* ¶ 32. Reviewing the same merger, the European Commission (EC) reported the following ranges of market shares for the universe of top five IBPs based on *traffic flows*: MCI WorldCom 46-51%; Sprint 10-20%; hence the combined entity 56-71%. For an expanded universe of 17 networks, the EC's calculated ranges were: WorldCom – 32-36%; Sprint 5-15%; and the combined firm 37-51% (30-40% under alternative assumptions described by the EC as "extremely favorable" to the parties). "Commission Decision of 28 June 2000," Case No COMP/M.1741-MCI WorldCom/Sprint, ("EC WorldCom/Sprint Decision") ¶¶ 104-106, 114-116, 123. The EC (but not the DOJ) also reported for the universe of 17 IBPs, , based on confidential information, shares (summarized in Table 1 below) based on two measures of *revenues*. EC WorldCom/Sprint Decision, ¶¶ 118-120, 122-123, 126.

[13] DOJ specifically alleged that: "If the merger is allowed to proceed, UUNET will increase its commanding position vis-à-vis all other IBP rivals. UUNET already carries more than twice the Internet traffic as its nearest rival, Sprint." ((DOJ Intermedia Complaint ¶36); "Ultimately, there is a significant risk that, as a result of the merger, the

18. Table 1 summarizes the position of WorldCom and the potential merged firm in the MCI and Sprint proceedings. (As noted, no share information was reported in Intermedia.)

Table 1
Descriptions of WorldCom's Internet Backbone (IB) Position in Past Merger Reviews

	MCI merger (1998)	**Sprint** merger (2000)
WorldCom / UUNET	**DOJ:** – top IBP (iMCI #2) **EC:** – Traffic share: 30-40% – Revenue share: Total Internet: 35-45% Dedicated access: NA	**DOJ:** – by far largest Tier 1 IBP by any relevant measure – already approaching dominant position – Traffic share: 37% (Sprint #2 at 16%) **EC:** – Traffic share: 32-36% – Revenue share: Total Internet: 40-50% Dedicated access: 25-35%
Merged Firm	**DOJ:** – 40-75% share of Internet connectivity – overall majority of IBP customers – the dominant player and substantially greater than any other, by any measure **EC:** – Traffic share: 42-52% – Revenue share: Total Internet: 45-55% Dedicated access: NA	**DOJ:** – Traffic share: 53% – commanding position v. all Tier 1 rivals **EC:** – Traffic share: 37-51% (30-40% very conservatively) – Revenue share: Total Internet: 45-65% (next rival 10-15%) Dedicated access: 35-45%

III. The Past Concerns Do Not Apply to This Transaction

19. Today, a portrayal of MCI, AT&T, or any other IBP as "approaching a dominant position in the Internet backbone" – and that its merger with a non-leading backbone provider such

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combined entity will be able to 'tip' the Internet backbone services market and raise prices for all dedicated access services."(*Id.* ¶ 37).

as SBC would create "a significant risk that … the combined entity will be able to 'tip' the Internet backbone services market" – simply is not tenable.

A. Concentration Among Tier 1 Backbones Is Much Lower Today than in 2000 and No Single Firm Approaches Dominance

20. There are today at least six Tier 1 IBPs by the DOJ's prior definition — a backbone that pays no other for transit: MCI, AT&T, Sprint, Level 3, Qwest, and Global Crossing. Based on information provided by SBC and AT&T, three additional IBPs – NTT/Verio, Savvis and Cogent – may also meet the Tier 1 definition. SBC is not a Tier 1 IBP by the past DOJ definition: while SBC expects to obtain settlement-free peering fairly soon with several of the Tier 1 IBPs, it does *not* expect to achieve peering status with others, including its current primary provider of paid transit services.[14]

21. The traffic shares reported for past Internet backbone mergers by the DOJ and EC, and the revenue shares reported only by the EC (all summarized in Table 1 above), relied on non-public information. Therefore, for traffic shares I have relied on third party analysis prepared for AT&T by RHK, Inc. for the fourth quarter of 2003; for revenue shares, I have relied on data for 2003, the most recent year compiled by IDC.

22. ***RHK Traffic Data.*** RHK, Inc. prepared its data by surveying the top 7 Internet Backbone Providers, and then supplementing that survey data with its own estimates. A more detailed description of its methodology is provided in Appendix 2. Using the traffic data reported by RHK, the pre-merger shares of Internet Traffic are shown in Table 2, below. Based on these shares, the maximum pre-acquisition HHI would be approximately 773 and the increase in HHI would be 145 points (2 x 12.5 x 5.8), producing a post-merger HHI of only 918.

[14] In addition to the lack of full peering, SBC does not own its entire backbone facilities – it owns routers, but not the fiber.

Table 2 Internet Traffic Shares		
IB Provider	**Share (%)**	**HHI**
AT&T	12.5	156.25
Company B	12	144
Company C	9	81
Company D	8	64
Companies E, F &G	5 (each)	25 x 3
Top 7 Sub Total	61.5	
Others collectively	43.5	
Maximum concentration of "others"		
SBC	5.8[15]	33.64
6 others at	6	36 x 6
1 other at	1.7	2.89
TOTAL	100	772.78

23. Thus, the pre-merger "traffic" HHI today is about 40 percent of the 1,850 level reported by the DOJ in the Sprint Complaint (¶ 32), and the post-merger HHI is less than one-third of the 3,000 level reported for that transaction.

24. Besides the much lower pre- and post-merger concentration levels than in the prior transactions, it is also worth noting that the past few years have witnessed an increase in volatility in the shares of the leading providers. Moreover, the identity of the top-ranked firm has changed twice between January 2003 and May 2004. This increased volatility is further indication of the lack of dominance by any of the main providers today. Contrast this with the EC's statement in WorldCom-Sprint, that WorldCom's market share "has shown a remarkable stability" over the 1998-2000 period.

[15] The 5.8% share for SBC is calculated from the ratio of SBC's traffic to AT&T's traffic using December, 2004 proprietary data provided by the parties.

25. ***IDC Revenue Data***. IDC reports revenues derived from various Internet-related services.[16] Among the revenue measures tracked by IDC are: (a) US Wholesale IP Revenue, which consists of (i) US Wholesale Dial IP Revenue, (ii) US Wholesale Upstream Transit IP Revenue, and (iii) US Wholesale Other IP Revenue; and (b) US Business IP Connectivity, which consists of (i) US Dedicated Internet Access IP Revenue, and (ii) US Remote Access IP Revenue. Of these, the two measures that would appear to reflect most closely Internet backbone functions are US Dedicated Internet Access IP Revenue, and US Wholesale Upstream Transit Revenue. Moreover, focusing on these two categories tends to overstate the position of the parties — inclusion of dial up revenues would raise the share of MCI while lowering the shares of AT&T and SBC. In Table 3, I combine the latest revenue figures, i.e., 2003, provided to the parties by IDC for these two categories, and compute the implied shares.

26. The shares of dedicated Internet access plus wholesale upstream transit revenues shown in Table 3 below demonstrate that – as with traffic data – concentration before and after this transaction would fall well within levels deemed "unconcentrated" that presumptively raise no competitive concerns.

[16] The latest published reports from IDC, providing 2002 revenue data and describing IDC's methodologies, are provided as Appendix 3. IDC has prepared and provided to SBC, but has not yet formally published, 2003 revenue information. With IDC's consent, the parties have used this unpublished information as the source for Table 3.

Table 3 Revenue Shares for Internet Backbone Related Functions 2003 Calendar Year ($ Millions)		
Internet Backbone Provider	**IP Backbone Revenue (Wholesale Upstream Transit and Business Dedicated Internet Access)**	**Revenue Share**
AT&T	$ 1,134	15%
MCI (WorldCom)	$ 699	9%
Sprint	$ 600	8%
Verizon	$ 403	5%
BellSouth	$ 400	5%
SBC	$ 396	5%
Level 3	$ 283	4%
Qwest	$ 170	2%
Comcast	$ 166	2%
Savvis	$ 107	1%
XO	$ 99	1%
Verio	$ 92	1%
Equant	$ 92	1%
Internap	$ 81	1%
Cable & Wireless	$ 73	1%
Other	$ 2,896	38%
Total	**$ 7,691**	**100%**
SBC & AT&T Combined	$ 1,531	20%
HHI (Other split equally among 15 additional firms)		568
Change in HHI		152
Source: Unpublished IDC Report, 2004		

27. ***Telegeography AS Connections.*** The number of connections linked to different backbones can be an imperfect proxy for these backbones' relative importance as carriers of traffic or generators of revenue, because connections can vary in their size, number of users and their intensity of utilization. Nevertheless, unless there are strong differences between backbones in their

traffic or revenue per connection, shares of connections can provide at least a rough indication of the relative importance of the customer bases of various IBPs. Even if IBPs do differ greatly in their traffic per connection at a given point in time, provided these differences do not vary greatly over time, one can get a sense of trends in industry structure by examining *changes* in connection shares of over time.

28. Appendix 4 presents data from Telegeography on autonomous system connections for each year 1999-2004.[17] The trends observed from Appendix 4 include:

a. Overall concentration dropped significantly. For example, the ASCs HHI declined as follows: 1,059 in 1999, 919 in 2000, 750 in 2001, 665 in 2002, 602 in 2003, and 452 in 2004. Also, in 1999, the top 5 IBPs accounted for 60% of total ASCs,[18] while in 2004, the top 5 accounted for less than 39%.

b. There have also been significant shifts among the leading firms, as can be seen, for example, in the relative decline of MCI, and the rise of Providers C and E.

29. Taken as a whole, the above evidence on traffic, revenue and connectivity yields the following conclusions:

- No one company can be said to have anything "approaching a dominant position" in the Internet Backbone space.
- The combination of SBC and AT&T will not materially alter the current status quo.

My ensuing conclusions, that none of the past competitive concerns apply to this transaction, follow almost immediately from the above data.

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[17] An Autonomous System (AS) is either a single network or a group of networks controlled by a common administrator on behalf of a single organizational entity (such as a university, business, or an IBP). An AS is assigned a globally unique number, sometimes referred to as an Autonomous System Number, or ASN. The number of "AS connections" refers to the number of other ASs to which a given AS is connected.

[18] Because some of the top 5 in 1999 were out of the top 10 by 2004, it is not possible to compute the 60% number from the data which Telegeography has permitted to be placed on the public record. However, the number has been validated against the full 1999 ASC list.

B. The Transaction Raises No Horizontal Competition Issues

30. As noted earlier, SBC is not a Tier 1 IBP by the past DOJ definition: it lacks settlement-free peering agreements with some of the carriers generally regarded as the major Tier 1 backbones. I do not wish to overstate the significance of SBC's not being a "Tier 1" IBP because, as noted earlier, the competitive analysis of this transaction is not sensitive to the precise product market definition employed. As shown below, SBC also is not a major IBP by any of the DOJ/EC metrics for which data are available. Expanding the product market beyond the traditional "Tier 1" to include SBC would also encompass other backbones, with concentration and the increase in concentration produced by this transaction, both remaining low.

31. It is instructive to contrast the pre-merger concentration levels, and the increases in concentration from the SBC/AT&T transaction, with the levels and increases reported earlier in Table 1 for previous Internet backbone transactions.

a. *Traffic*. As shown in Table 2, based on traffic data today's pre-merger HHI is 773 – about 40 percent of the pre-merger HHI in WorldCom-Sprint; the ΔHHI of 145 produced by the current transaction is one-eighth the size of the HHI increase that would have occurred in WorldCom-Sprint.

b. *Internet Revenue*. Table 3 showed that AT&T's share of Internet revenues derived from upstream transit and dedicated access was 15% in 2003, as estimated by IDC, while SBC's share based on these measures was approximately 5%. The change in the HHI of 152 points would leave the post-merger level below 750.

c. *Autonomous System Connections*. As discussed above and in Appendix 4, AT&T ranks second with 8.4% of ASCs, and SBC ranks 13th with 2.2%. The combined SBC/AT&T share would be 10.6%, and the ΔHHI would be a mere 37 points.

32. Summing up, under any reasonable market definition and measures of backbones' significance, the above information shows that market concentration would rise only modestly

following this merger—and would remain very low by the standards that the DOJ and FTC have used in recent years to challenge horizontal mergers.[19]

C. The Transaction Raises No Vertical Competition Issues

33. Nor is there any basis to fear that the expansion in the combined company's backbone size would put it in such a strong position compared to other IBPs that it could impose adverse interconnection terms on them. As such, there is no " significant risk that, … the combined entity will be able to 'tip' the Internet backbone services market and raise prices for all dedicated access services."[20] SBC and AT&T combined would still be generally comparable in size to other leading IBPs, not two to three times larger, as DOJ alleged UUNET would become. Even under aggressive assumptions about SBC's growth relative to other IBPs – e.g., assuming SBC's share of traffic or revenue were to increase in the next two to three years by 50 percent (from 6% to 9% on traffic, and from 5% to 7.5% on revenue) without a change in AT&T's share – the extrapolated market share of the merged firm would still increase only modestly, and would be well below twenty five percent by either measure. Moreover, the same factors that would contribute to SBC's growth – new internet services (e.g., VoIP) and growth in broadband subscribers – would also contribute to the growth of cable companies. This transaction therefore does not create or enhance a dominant position, as was feared in prior cases.

34. The competitive landscape – and the nature of this particular transaction –are very different from the MCI mergers scrutinized in 1998 and 2000. By any reasonable measures, including those cited by the DOJ and EC, a combined SBC/AT&T would have a much smaller share – likely no more than one-half – of Internet backbone "share" than MCI alone had five years

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[19] See "Merger Challenges Data, Fiscal Years 1999-2003," issued by the Federal Trade Commission and the U.S. Department of Justice, December 18, 2003 <http://www.usdoj.gov/atr/public/201898.htm>

[20] DOJ Intermedia Complaint, ¶ 37.

ago. Since MCI was unable to prevent the growth of competitors at a time when its Internet backbone position was considerably stronger than what SBC/AT&T would now have, I see no plausible basis for believing the merger would create such ability today.

IV. Benefits of Network Integration

35. Based on reviewing the Declaration of Christopher Rice, my understanding is that this transaction will yield significant benefits from integrating the two companies' networks. Focusing specifically on the Internet backbone, the transaction will result in the more direct connection of SBC's broadband customers to AT&T's backbone, reducing the number of "hops" (connections between routers) required to complete a given transmission. Today, each network can have as many as three hops. Thus, even if SBC were to connect directly (i.e., be peered) with AT&T today – instead of reaching AT&T through SBC's transit provider – a packet could still undergo as many as six hops; integration of the networks would, for traffic that originates and terminates on the combined companies' network, reduce the number of hops to at most three – thus reducing delay and thereby improving quality of service (QoS).

36. In addition, integration of the two networks will allow QoS standards to be enforced for on-net traffic. While the enforcement of QoS requirements across interconnected networks is a goal of the industry, appropriate and comprehensive standards are not yet completely available. The combined company will be able to apply common standards internally to make their networks' QoS compatible faster than could occur between separate companies. In turn, the ability to enforce QoS will allow the combined company to enter into tighter service level agreements (SLAs) for customers and applications that require them, e.g., priority business data and high quality IP-video and VoIP.

37. The combined effect of the above factors is to improve service quality generally, and especially to enable the faster deployment of IP-based services that are particularly sensitive to delay and to variation in delay, such as VoIP and videoconferencing.

V. Conclusions

38. For all the reasons discussed above, it is clear that the IBP competitive landscape and this transaction are fundamentally different from the prior reviews. Today, a competitive review cannot credibly start with the premise that a modest expansion of one of the leading IBP's poses a risk to competitors. Based on the evidence that I have examined, the proposed merger of SBC and AT&T would not pose a threat to competition in Internet backbone services.

I declare, under penalty of perjury, that the foregoing is true and correct.

Signature: /s/ Marius Schwartz
Marius Schwartz

Date: February 18, 2005

APPENDICES

Appendix 1

Curriculum Vitae of Professor Marius Schwartz

Appendix 2

RHK Methodology and Selected Tables

Appendix 3

IDC Reports: November 2003 and December 2003

Appendix 4

Telegeography Autonomous System Connection Data: 1999-2004

MARIUS SCHWARTZ

Work: Department of Economics
Georgetown University, ICC 583
37 and O Streets, NW
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Home: 3905 Jocelyn Street, NW
Washington DC 20015
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EDUCATION

University of California, Los Angeles: Ph.D. in Economics, September 1982
University of California, Los Angeles: M.A. in Economics, March 1978
London School of Economics: B.Sc. in Economics (1st Class Honors), August 1976

PROFESSIONAL EXPERIENCE

Georgetown University, Department of Economics

Professor, June 1993–present
Associate Professor, August 1987–May 1993
Assistant Professor, January 1983–July 1987 (part time in Fall 1982)

Excellence in Undergraduate Teaching Award, Economics Department, 2001
Director of Graduate Studies: Spring 1993-Spring 1995

Courses Taught: *Graduate*—Industrial Organization, Microeconomics for executives and policy makers, Macroeconomic Theory I and II, Monetary Policy. *Undergraduate*—Antitrust, Industrial Organization, Mergers & Corporate Control, Microeconomics (Principles, and Intermediate), Topics in Competition and Regulation, International Economics, Macroeconomic Theory.

President's Council of Economic Advisers

Senior Staff Economist, June 1995–May 1996 (part-time consultant April & May 1995, June 1996).

Served as the senior economist responsible for antitrust, regulated industries, and other industrial organization matters. Work included: Telecommunications Act of 1996; competition in international satellite services; competition in the electric utility industry; reforming the patent and trademark office; intellectual property rights; international trade disputes; health care.

U.S. Department of Justice, Antitrust Division

Acting Deputy Assistant Attorney General for Economics, January 1999–June 1999

Economics Director of Enforcement, September 1998–December 1998, July 1999–April 2000

In these positions, I was responsible for overseeing economic analysis at the Antitrust Division of numerous mergers and non-merger matters in various industries, including:

Mergers & Joint Ventures—Ameritech/SBC, Bell Atlantic/GTE, AT&T/BT, Cargill/Continental, Aetna/Prudential, CBS/Viacom.

Monopolization—suit against American Airlines for predatory pricing (pending).

Regulatory—Bell entry into long-distance telecommunications services.

U.S. Department of Justice, Antitrust Division (continued)

Outside Expert

UPM-Raflatac/Bemis-MACtac merger, 2003—testified at trial.

News Corp-DirecTV partial acquisition, 2003.

General Electric/Honewyell merger, 2000-01—prepared to serve as the testifying economic expert.

WorldCom/Sprint merger, 2000—prepared to serve as the testifying economic expert on Internet backbone issues.

Bell entry, 1996–997—served as the DOJ's outside economic expert on Bell company entry into long-distance telecom services long-distance telecommunications services, under section 271 of the Telecom Act, and submitted two affidavits on behalf of DOJ to the Federal Communications Commission..

Economist, January 1983–May 1995 (part time), October 1980–December 1982 (full time).

Expert Testimony

Presented written and oral court testimony in successful challenges of merger and of consent decree.

Mergers

Investigated mergers in several industries and helped to design appropriate relief.

Business Practices

Worked on vertical-restraints cases (tying, exclusive dealing, resale price maintenance, exclusive territorial arrangements) and horizontal-conduct cases (collusion and predation).

Legislation, Congressional Matters, Division Reports

Provided input to Antitrust Division's Merger Guidelines (1992) and Vertical Restraints Guidelines (1984). Helped draft Division comments on various Congressional legislation and responses to inquiries in several areas including price discrimination and dealer termination.

Cooperation with Foreign Competition Authorities

Interacted with competition officials from several countries and agencies, and commented on various documents covering subjects such as predatory pricing, price discrimination, distribution systems, sole import distributorships, joint R&D, and the interaction between trade and competition policies.

Other Professional Experience

Consultant in private antitrust and regulatory matters — details and references available on request.

Management Group Associate, Economic Studies Program, American Institute for Contemporary German Studies, Washington DC, October 1997-2000.

OECD: Lecturer in Seminar on Vertical Restraints for competition officials from Czech Republic, Hungary, Poland, and Slovakia in Cracow, Poland, November 20-22, 1995.

ILADES: Participated in designing and teaching a short course in industrial organization to policy makers and executives in Santiago, Chile, June 1994.

Pew Freedom Fellows Program: Taught short course in microeconomics to twenty Fellows from transition economies, annually, January 1993–1999. (Fellows hold middle-level or upper-level positions in government and private business.)

Center for Economic Development, Slovakia: Academic Advisory Board.

World Bank: Consultant.

Abt Associates/USAID: Advised Government of Zimbabwe in Harare on formulating antitrust law, summer 1993 (consultant to Abt, work funded by USAID's Implementing Policy Change Project).

LANGUAGES

French, Hebrew, Romanian (speak and read Hebrew fluently; proficient in French and Romanian).

HONORS

U.S. Department of Justice, Antitrust Division: Special Achievement Awards
Brookings Institution: Research Fellow, 1979-80
University of California, Los Angeles: Earhart Fellowship, 1977-78
University of California, Los Angeles: Regents Fellowship, 1976-77
London School of Economics: Premchand Prize in Monetary Economics, 1976.

PUBLICATIONS

Refereed Journals

"Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity: Reply," *American Economic Review,* vol. 94 (June 2004): 802–803 (with R. Preston McAfee).

"International Telecom Settlements: Gaming Incentives, Carrier Alliances, and Pareto-Superior Reform," *Journal of Industrial Economics*, vol. 49 (September 2001): 335-377 (with David Malueg).

"The Economic Logic for Conditioning Bell Entry into Long Distance on the Prior Opening of Local Markets," *Journal of Regulatory Economics (Practitioners' Section),* vol. 18, no. 3 (2000): 247-288.

"A Quality-Signaling Rationale for Aftermarket Tying," *Antitrust Law Journal,* vol. 64 (Winter 1996): 387-404 (with Gregory J. Werden).

"The Non-Existence of Pairwise-Proof Equilibrium," *Economics Letters*, vol. 49 (1995): 251-259 (with R. Preston McAfee).

"Equity as a Call Option on Assets: Some Tests for Failed Banks," *Economics Letters*, vol. 48 (1995): 389-397 (with Behzad Diba and Chia-Hsiang Guo).

"Parallel Imports, Demand Dispersion, and International Price Discrimination" *Journal of International Economics,* vol. 37 (November 1994): 167-195 (with David Malueg).

"Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity, and Uniformity," *American Economic Review,* vol. 84 (March 1994): 210–230 (with R. Preston McAfee).

"Preemptive Investment, Toehold Entry, and the Mimicking Principle," *RAND Journal of Economics,* vol. 22 (Spring 1991): 1–13 (with David Malueg).

"Patent Protection through Discriminatory Exclusion of Imports," *Review of Industrial Organization,* vol. 6, no. 3 (1991): 231–246.

"Third–Degree Price Discrimination and Output: Generalizing a Welfare Result," *American Economic Review,* vol. 80 (December 1990): 1259-1262.
Reprinted in *Readings in Microeconomic Theory*, Manfredi La Manna Ed., Dryden Press, 1997.

"Investments in Oligopoly: Welfare Effects and Tests for Predation," *Oxford Economic Papers,* vol. 41 (October 1989): 698-719.

"Entry Deterrence Externalities and Relative Firm Size," *International Journal of Industrial Organization,* vol. 6 (June 1988): 181-197 (with Michael Baumann).

"The Competitive Effects of Vertical Agreements: Comment," *American Economic Review,* vol. 77 (December 1987): 1063-1068.

"The Nature and Scope of Contestability Theory," *Oxford Economic Papers,* vol. 38 Supplement (November 1986): 37-57.
This issue of the journal was published in parallel as *Strategic Behavior and Industrial Competition,* Morris et al. Eds., Oxford University Press, 1986.

"The Perverse Effects of the Robinson-Patman Act," *Antitrust Bulletin,* vol. 31 (Fall 1986): 733-757.

"Divisionalization and Entry Deterrence," *Quarterly Journal of Economics,* vol. 101 (May 1986): 307-321 (with Earl Thompson).

"*Illinois Brick* and the Deterrence of Antitrust Violations," *Hastings Law Journal,* vol. 35 (March 1984): 629–668 (with Gregory Werden).

"Contestable Markets: An Uprising in the Theory of Industry Structure: Comment," *American Economic Review,* vol. 73 (June 1983): 488-490 (with Robert Reynolds).

Monographs, Book Chapters, and Other Publications

"Monopsony Concerns in Merger Review," (with Susan M. Davies), American Bar Association Antitrust Section, Clayton Act Committee Newsletter, vol. II, no. 1, Winter 2002
<http://www.abanet.org/antitrust/committees/computer/clayton/winter02.pdf>

"Conditioning the Bells' Entry Into Long Distance: Anticompetitive Regulation or Promoting Competition?," in Giuliano Amato and Laraine L. Laudati, Eds., *The Anticompetitive Impact of Regulation*, Edward Elgar, 2001.

"Competitor Cooperation and Exclusion in Communications Industries," in H. Davis and R. Dick, Eds., *E-Commerce Antitrust & Trade Practices: Practical Strategies for Doing Business on the Web*, Practising Law Institute, New York, 2001.

"Buyer Power Concerns and the *Aetna-Prudential* Merger," Address presented at 5th Annual Health Care Antitrust Forum, Northwestern University School of Law, October 20, 1999, posted on web site of Antitrust Division, Department of Justice: http://www.usdoj.gov/atr/public/speeches/3924.htm

Discussant Comments on papers by Andrew Joskow, by Daniel Rubinfeld, and by Janusz Ordover and Margaret Guerin-Calvert, *Review of Industrial Organization*, Vol. 16 (March 2000): 219-223.

Discussant Comments on papers by Patrick Rey and Ralph Winter and by Robert Anderson et al., in Robert D. Anderson and Nancy T. Gallini, Eds., *Competition Policy and Intellectual Property Rights in the Knowledge-Based Economy*, Calgary: University of Calgary Press, 1998.

"Telecommunications Reform in the United States: Promises and Pitfalls," in Paul J.J. Welfens and George Yarrow, Eds., *Telecommunications and Energy in Systemic Transformation*, Heidelberg and New York: Springer, 1997.

"Protecting Intellectual Property by Excluding Infringing Imports: An Economist's View of Section 337 of the U.S. Tariff Act," *Patent World,* Issue 25 (September 1990): 29-35.

Review Essay of: Jean Tirole, The Theory of Industrial Organization, MIT Press, 1988. *Managerial and Decision Economics,* Vol. 11 (May 1990): 131-139.

Book Review of: J. Stiglitz and F. Mathewson eds., New Developments in the Analysis of Market Structure, MIT Press, 1988. *Journal of Economic Literature,* Vol. 36 (March 1988): 133-135.

"Vertical Restraints," published in German by *Forschungsinstitut fur Wirtschaftsverfassung und Wettbewer* by E.V. Koln, Heft 5, 1984.

REGULATORY FILINGS, DISCUSSION PAPERS AND WORK IN PROGRESS

"Should Antitrust Assess Buyer Market Power Differently than Seller Market Power?" presented at DOJ/FTC Workshop on Merger Enforcement, Washington DC, February 2004 < http://www.ftc.gov/bc/mergerenforce/presentations/index.html>

"Interconnection Incentives of a Large Network Facing Multiple Rivals," (with David Malueg), Georgetown University, Department of Economics Working Paper 03-01, January 2003 <http://econ.georgetown.edu/workingpapers/>

"The National Television Ownership Cap and Localism," paper submitted with Comments of NAB and NASA to FCC in *2002 Biennial Regulatory Review - Review of the Commission's Broadcast Ownership Rules and Other Rules*, FCC 02-249, Notice of Proposed Rulemaking (rel. Sep. 23, 2002), January 2, 2003 (with Daniel R. Vincent).

"Same Price, Cash or Card: Vertical Control in Payment Networks" (with Daniel Vincent), Georgetown University, Department of Economics Working Paper 02-01, February 2002, <http://econ.georgetown.edu/workingpapers/>

"Interconnection Incentives of a Large Network," (with David Malueg), Georgetown University, Department of Economics Working Paper 01-05, revised January 2002 <http://econ.georgetown.edu/workingpapers/>

"Exclusive Dealing, Product Differentiation, and Rent Extraction," in progress (with Serge Moresi and Francis O'Toole).

"Are Spectrum Limits Needed to Preserve Competition?" paper submitted on behalf of CTIA to FCC in *2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services,* WT Docket No. 01-14, Notice of Proposed Rulemaking (rel. Jan. 23, 2001), April 13, 2001 (with John Gale).

"The Appropriateness of Nondiscriminatory Access Regulation for Interactive Television," paper submitted on behalf of NCTA to FCC in *Nondiscrimination in the Distribution of Interactive Television Services Over Cable,* CS Docket No. 01-7, Notice of Inquiry (rel. Jan. 18, 2001), March 19, 2001 (with John Gale).

"Intelsat Restructuring and Comsat's Non-Dominance: Reply to Dr. Owen and Professor Waverman," paper filed on behalf of Comsat Corporation with the FCC*, In the Matter of Comsat Corporation Petition for Forbearance from Dominant Carrier Regulation and for Reclassification As a Non-Dominant Carrier*, ("Comsat's Forbearance Petition") File No. 60-SAT-ISP-97, March 1998.

"Competition in International Satellite Services: Wither INTELSAT Restructuring?" paper filed on behalf of Comsat with the FCC in Comsat's Forbearance Petition, November 1997.

"Competitive Concerns with Gaming of the International Settlements Process under Asymmetric Liberalization of International Telecommunications and Above-Cost Settlement Rates," Affidavit submitted on behalf of AT&T to FCC, in proceedings on *Rules and Policies on Foreign Participation in the U.S. Telecommunications Market*, IB 97-142, November 18, 1997.

"The 'Open Local Market Standard' for Authorizing BOC InterLATA Entry: Reply to BOC Criticisms," Supplemental Affidavit submitted on behalf of U.S. DOJ to FCC, along with DOJ's evaluation of following BOC application(s): BellSouth in South Carolina, November 4, 1997 and in Louisiana, December 10, 1997. <www.usdoj.gov/atr/statements/1281.htm>

"Competitive Implications of Bell Operating Company Entry into Long-Distance Telecommunications Services," Affidavit submitted on behalf of U.S. Department of Justice (DOJ) to FCC, along with DOJ's evaluations of following BOC applications: SBC in Oklahoma, May 16, 1997; Ameritech in Michigan, June 25, 1997; and BellSouth in South Carolina, November 4, 1997 and in Louisiana, December 10, 1997. <www.usdoj.gov/atr/statements/Affiwp60.htm>

"Towards Competition in International Satellite Services: Rethinking the Role of INTELSAT," paper distributed at OECD Ad Hoc Meeting of Experts on Competition in Satellite Services, Paris, June 1995 (with Joseph E. Stiglitz and Eric Wolff).

"Competitive Markets in Generation: Economic Theory and Public Policy," paper presented at conference on "Electric Utility Restructuring: Whither Competition?" organized by International Association for Energy Economics Los Angeles Chapter, and Micronomics Inc., Los Angeles, May 1995.

"Option Values of Deposit Insurance and Market Values of Net Worth: Some Evidence for U.S. Banks," mimeo, December, 1992 (with Behzad Diba and Chia-Hsiang Guo).

"Do Sunk Costs Discourage or Encourage Collusion?" U.S. Department of Justice, Antitrust Division, EPO Discussion Paper 85-10 (September 1985).

"Signalling Equilibria Based on Sensible Beliefs: Limit Pricing Under Incomplete Information," U.S. Department of Justice, Antitrust Division, EPO Discussion Paper 84-4 (May 1984) (with Maxim Engers).

OTHER SCHOLARLY ACTIVITIES

Seminars Presented

Bellcore
Bureau of Competition Policy, Industry Canada
California State University, Hayward
Center for Strategic and International Studies
Columbia University
ENSAE, Paris
Federal Reserve Bank of Philadelphia
Georgetown University
George Washington University
U.S. International Trade Commission
Johns Hopkins University
New York University – Economics Department
New York University – Stern School of Business
Pennsylvania State University
Simon Fraser University
Tel Aviv University Law School
Tulane University
University of Alberta
University of British Columbia
University of Calgary
University of California, Davis
University of California, Los Angeles
University of Colorado, Boulder
University of Illinois
University of Maryland
University of Montreal
University of Pennsylvania
University of Toronto
University of Virginia
U.S. Department of Justice
U.S. Federal Communications Commission
U.S. Federal Trade Commission

Conferences: Speaker, Discussant or Panelist

- Institut d'Economie Industrielle, "The Economics of Electronic Communication Markets," Toulouse, October 2004
- DOJ/FTC Merger Enforcement Workshop, Washington DC, February 2004
- DOJ/FTC Hearings on Health Care and Competition Law and Policy, Washington DC, April 2003
- International Industrial Organization Conference, Boston, April 2003
- "Integration, Investment and Innovation: Future Directions for the Telecommunications Industry," Georgetown University McDonough School of Business, February 2003
- "The Regulation of Information Platforms," University of Colorado School of Law, Boulder, January 2002
- Phoenix Center for Advanced Legal & Economic Public Policy Studies, U.S. Telecoms Symposium, Washington DC, July 2001
- Practising Law Institute, "Antitrust and Trade Practices Issues in Cyberspace" New York, March 2001
- 28th Annual Telecommunications Policy Research Conference, Washington DC, September 2000

- Schwab Capital Markets LP, Washington Research Group, "Telecom, Internet and Ecommerce Conference," Washington DC, September 2000
- "Experiences with Telecommunications Deregulation," semi-annual meetings organized by AEI-Brookings Joint Center for Regulatory Studies and Centre for European Policy Studies, Washington DC, April 2000
- "Telecommunications After Bell Entry," Conference at University of Colorado School of Law, Boulder, April 2000
- 48th Annual Antitrust Spring Meeting, American Bar Association Section of Antitrust Law, Washington DC, April 2000
- Telecom-IT Americas '99 Conference, Institute of the Americas, La Jolla, November 1999
- 5th Annual Health Care Antitrust Forum, Northwestern University School of Law, Chicago, October 1999
- "Regulatory Reform in Japan, Mexico, the Netherlands and the United States," OECD, Paris, March 1999
- Federal Communications Bar Association Competition Committee, Symposium, Washington DC, January 1999
- Conference on Current Topics in Merger and Antitrust Enforcement, Charles River Associates, Washington DC, December 1998
- Conference on Anticompetitive Regulation, Robert Schuman Centre of the European University Institute, Florence, September 1999
- 47th Annual Antitrust Spring Meeting, American Bar Association Section of Antitrust Law, Washington DC, April 1999
- 25th Annual Telecommunications Policy Research Conference, Washington DC, September 1997
- Telecommunications seminar series, Canadian Bureau of Competition, Ottawa, September 1997
- Competition Policy Workshop, The World Bank, June 1997
- Economics of Interconnection Forum, Federal Communications Commission, Washington DC, May 1996
- Authors' Symposium on Competition Policy and Intellectual Property Rights, Canadian Bureau of Competition, Aylmer, Quebec, May 1996
- Electric Generation Association, Annual Meetings, West Palm Beach, April 1996
- "Wheeling & Dealing: Opportunities and Challenges in the New Electric Industry," conference sponsored by the Center for Regulatory Studies, Illinois State University and the Institute of Government and Public Affairs, University of Illinois-Urbana, Chicago, April 1996
- "New Social and Economic Approaches to a Multimedia World," OECD Symposium, Tokyo, March 1996
- "Telecommunications and Energy Regulation in Transition Economies," Center for Economic Development, Bratislava, October 1995
- "Electric Utility Restructuring: Whither Competition?" organized by International Association for Energy Economics Los Angeles Chapter, and Micronomics Inc., Los Angeles, May 1995.
- "New Learning on Barriers to Entry in Competition Policy," Canadian Bureau of Competition, Ottawa, March 1995
- Southeastern Economic Theory Meetings, Charlottesville, October 1994
- EARIE Conference, Tel Aviv, September 1993
- Midwest International Economics Meetings, Pittsburgh, October 1992
- Latin American Econometric Society, Mexico City, September 1992
- Conference on Industrial Organization, Carleton University, Ottawa, July 1991
- Workshop on Strategic and Dynamic Aspects of International Trade, SUNY at Stony Brook, July 1991
- AEI Conference on "Innovation, Intellectual Property and World Competition," Washington DC, September 1990
- EARIE Conference, Lisbon, September 1990
- Conference on "International Trade and Technology," Brussels and London, November 1989
- EARIE Conference, Budapest, August 1989
- Conference on Strategy and Market Structure, Dundee University, Dundee, August 1988
- Conference on "Firm Ownership and Competition," Graduate School of Business, Stanford University, June 1987
- EARIE Conference, Berlin, August 1986
- AEA Annual Meetings, Dallas, December 1984

Referee for Professional Journals

American Economic Review
Canadian Journal of Economics
Economica
Economic Journal
Economics Letters
European Economic Review
European Journal of Political Economy
International Economic Review
International Journal of Industrial Organization
Journal of Business
Journal of Business Economics
Journal of Economic Dynamics and Control
Journal of Economic Education
Journal of Economic Theory
Journal of Economics and Management Strategy
Journal of Industrial Economics
Journal of International Economics
Journal of Law & Economics
Journal of Political Economy
Managerial and Decision Economics
Quarterly Journal of Economics
Quarterly Review of Economics and Business
RAND Journal of Economics
Review of Industrial Organization
Review of International Economics
Scandinavian Journal of Economics
Southern Economic Journal

Outside Evaluator—Research Proposals and Tenure & Promotion Cases

National Science Foundation
Small Business Administration
Duke University
INSEAD
Northwestern University School of Law
University of Calgary
University of Michigan
University of Virginia

RHK

Telecommunications Industry Analysis

Internet Traffic Analysis

Muayyad Al-Chalabi

Director, Executive Strategic Program

February 17, 2005

Methodology

- Data Collection
  - 5 major carriers (Interviews and data)
  - Detailed AT&T peering and customer data
- Traffic Analysis
  - Estimate total Internet Traffic
  - Allocate market share
    - Peering data (AT&T and others)
    - % of total traffic
- Revenue Analysis
  - Private communications
  - Public data
  - AT&T revenue breakdown
- Validate results with public data

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Definitions

$$AccessCapacity = \sum_{i}^{N} (NumAccessLinks \times TransmissionRate)_i$$

$$BackboneCapacity = \sum_i BackboneLinks \times TransmissionRate$$

$$OfferedMonthlyLoad = AverageDailyLoad \times 30$$

$$CarriedMonthlyLoad = \sum_i AverageDailyTraffic_i \times 30$$

$$OfferedPeakLoad = \sum_i AccessLinksPeakLoad$$

$$CarriedPeakLoad = \sum_i BackboneLinksPeakLoad$$

$$\text{PeeringTraffic} = \text{Traffic Exchanged through Peering Points}$$

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RHK
CHARTING THE TELECOM FUTURE

Metrics

- Access Capacity – Gigabits per seconds
- Backbone Capacity – Gigabit per Second
- Offered Monthly Load - Petabytes
- Offered Peak Load - Gigabits per Second
- Revenue per Access Gigabit - $/Gbit
- Revenue per Monthly Petabyte

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MARKET ANALYSIS

U.S. Business IP Connectivity Forecast and Analysis, 2003–2007

Steven Harris

IDC OPINION

While scandal, fraud, and errors have dogged much of the telecom industry and affect this business IP connectivity forecast, the overall market segment will hold up reasonably well throughout the forecast period as economic conditions improve, budgets loosen, and pent-up demand is released. Highlights are as follows:

- Overall business IP connectivity spending will increase by a 3.3% compound annual growth rate (CAGR), with faster growth expected in the next few years as companies catch up and satisfy pent-up demand for greater bandwidth and connectivity for sites and remote users.
- Price declines will continue unabated as carriers compete for business spending. Newly reconstituted carriers will reenter the market, and all carriers are targeting the business IP segment for growth.
- The growth of IP VPNs will help propel business connectivity spending. While IP VPN services are included in IDC's value-added services segment, the underlying connectivity needed to deploy an IP VPN will support business connectivity spending.

Filing Information: November 2003, IDC #30449, Volume: 1, Tab: Markets

IN THIS STUDY

Methodology

This study reflects IDC's ongoing research into Internet services markets. The research is based on public and proprietary sources of information and is used to generate the forecasts and market share analysis in this study. Forecasts are based on historical growth, insight from IDC's consulting experience, IDC's business markets and consumer markets primary research (e.g., the annual *WAN Manager Survey*), and discussions with service providers and equipment manufacturers.

IDC relies on its discussions with service providers for this study, and each year the providers' ability and willingness to participate in the survey varies. In addition, IDC relies on carriers to provide accurate information and adjusts estimates as necessary when it believes such information is not credible.

Wherever possible, actual revenue and subscriber counts are used. IDC estimated and projected for certain time periods based on trends in the previous quarters and the previous year.

IDC took actual revenue from the universe of ISPs and made estimates of which percentages of overall IP revenue applied to each market segment. Reported numbers were used whenever possible, and IDC estimated where necessary. For almost every carrier, estimates were used in the segment breakout totals.

The totals were added for each market segment, and an estimate was made of the "other" category, which includes roughly 7,000 additional ISPs in the United States. Most of these ISPs are small local providers with little revenue, and many in this group derive a fairly substantial portion of their revenue from consulting and professional services, which are excluded from this analysis and forecast.

Other categories of revenue excluded from this study include dark fiber sales, private lines, hardware and software sales by carriers, local loops except where noted, Web merchandise sales, and all non-IP services, including switched voice and traditional data services, such as frame relay and ATM.

Definitions

What Is an ISP?

An ISP is an operator that provides direct access to the Internet and a business for which core revenue is based on the billable use of a network transport facility that it either owns or contracts from a network provider.

The ISP usually also provides a core group of Internet utilities and services, such as email, a portal or start page, Web page hosting, and other items of interest to its subscribers or customers. Users reach their ISP by either dialing up a computer modem with a phone line or using a dedicated line that is installed by the provider.

Internet Access

Internet access is defined as a dial-up or dedicated connection to the World Wide Web or the Internet. This definition excludes services provided by companies that use IP technology but are not ISPs or do not provide Internet access and transport services (e.g., IBM and Yahoo!).

Internet access can be broken down into two general realms of connectivity methods: dial-up and dedicated service. All access methods and speeds fall within one of these two groups:

- **Dial-up access.** This method involves using a modem to convert digital signals into analog signals to allow them to traverse the public telephone system and make a connection to the Internet. The dial-up user connects to a modem bank on the ISP's network — or to a contracted network provider — and is thereby connected to the Internet.

- **Dedicated access.** This method involves a connection established for and dedicated to the primary purpose of enabling Internet access. Thus, fractional T1, full T1, T3, and Optical Carrier (OCx) at speeds ranging from OC3 to OC48 or more connections constitute dedicated access speeds. In addition, digital subscriber line (DSL) and cable modems are always-on connections. For this reason, DSL and cable are considered dedicated access methods by IDC.

Business Access Services

Business IP access involves mostly dedicated connections to the Internet for corporate sites and dial-up access for remote corporate users, such as road warriors and business travelers. All Internet services provided for business users or paid for by businesses are included in this market segment.

Business-Oriented ISPs

Business-oriented ISPs concentrate on offering Internet-related services to U.S. businesses. Such services typically include dial-up Internet access for business remote users, dedicated and dial access for business locations, and a wide variety of value-added services for the business sector. Services such as consulting and network aggregation make up a large part of the revenue for these ISPs.

IDC includes in this segment ISPs such as XO Communications and Internap.

Regional/Local ISPs

Most local and regional ISPs do not have their own networks and confine their coverage to areas smaller than the entire United States. Many ISPs in this category provide software applications development as well as consulting in systems design, Internet marketing strategies, and Internet advertising creation and placement.

There are over 7,000 regional and local ISPs in the United States, with some evidence suggesting many thousands more.

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SITUATION OVERVIEW

The business Internet access market took a hit in 2001 and 2002, although the decline is largely illusory. The litany of accounting errors, omissions, and fraud are well known, and these have impacted IDC's business IP forecast.

While the overall market declined officially from 2001 to 2002, IDC believes this is mostly a result of inaccurate financial reporting in past time periods and not a real decline. However, economic conditions, spending freezes on business investment, and price competition certainly reduced real demand for business IP connectivity to some extent.

The overall market for business IP connectivity was $8.4 billion in 2002. Dedicated Internet access, including broadband connections, represented $6.5 billion of that total, and remote access represented the remaining $1.9 billion.

2002 Market Share by ISP

Table 1 shows the market shares of carriers for the overall business IP connectivity market, which combines dedicated Internet access and remote access. MCI (formerly WorldCom) still leads the market, although at much reduced levels from 2001.

IDC estimates that MCI's business IP connectivity revenue declined by $1.2 billion between year-end 2001 and year-end 2002. Bankruptcy has no doubt played a large role, although accounting scandals at the company do not appear to have impacted revenue reporting, which is the basis for the market share ranking.

AT&T is a close second in Table 1. One surprise to many readers may be AOL, ranked number 4 for business IP revenue. IDC counts all revenue attributable to businesses in the business IP segment. Some businesses use AOL as their dial-up or broadband ISP, and some end users have AOL accounts that are either paid for by their employer or other business or that the employer reimburses the employee for access.

All of the above transactions are included in the business IP segment and not in the consumer segment, hence AOL's appearance on the business IP market share list. All four RBOCs are making inroads in the business access marketplace and are included on IDC's top 10 list, partly through their dominance of DSL services, which is still largely a business access method.

Telecommuters and corporate offices are often connected via DSL as an alternative to T1 and fractional T1 connections. In addition, RBOCs are often default telecommunications service providers for many businesses in their territories, especially small and medium-sized enterprises (SMEs). Hence, the RBOCs are making progress in this segment.

Tables 2 and 3 show the market shares for dedicated Internet access and remote access business IP connectivity. MCI's revenue is concentrated more than most in the remote access space, whereas AT&T is the number 1 provider for dedicated connectivity.

TABLE 1

U.S. Business IP Connectivity Revenue by ISP, 2002

Rank	ISP	Revenue ($M)	Share (%)
1	MCI (WorldCom)	1,453.8	17.4
2	AT&T	1,012.5	12.1
3	Sprint	433.9	5.2
4	AOL	381.5	4.6
5	Genuity	266.4	3.2
6	Verizon	243.6	2.9
7	SBC	239.0	2.9
8	Qwest	234.4	2.8
9	BellSouth	220.8	2.6
10	XO	189.0	2.3
	Subtotal	4,675.0	55.8
	Other	3,699.4	44.2
	Total	8,374.4	100.0

Source: IDC, 2003

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TABLE 2

U.S. Dedicated Internet Access IP Revenue by ISP, 2002

Rank	ISP	Revenue ($M)	Share (%)
1	AT&T	961.9	14.9
2	MCI (WorldCom)	750.2	11.6
3	Sprint	412.2	6.4
4	Genuity	239.7	3.7
5	Verizon	236.3	3.7
6	Qwest	227.4	3.5
7	BellSouth	218.6	3.4
8	SBC	217.5	3.4
9	XO	179.6	2.8
10	Savvis	153.2	2.4
	Subtotal	3,596.7	55.7
	Other	2,865.8	44.3
	Total	6,462.4	100.0

Source: IDC, 2003

TABLE 3

U.S. Remote Access IP Revenue by ISP, 2002

Rank	ISP	Revenue ($M)	Share (%)
1	MCI (WorldCom)	703.6	36.8
2	AOL	381.5	20.0
3	EarthLink	51.0	2.7
4	AT&T	50.6	2.6
5	iPass	34.0	1.8
6	Genuity	26.6	1.4
7	Sprint	21.7	1.1
8	SBC	21.5	1.1
9	Infonet	20.4	1.1
10	Equant	10.2	0.5
	Subtotal	1,321.1	69.1
	Other	590.9	30.9
	Total	1,912.0	100.0

Source: IDC, 2003

FUTURE OUTLOOK

Forecast and Assumptions

Going forward, the business IP connectivity segment will increase from $8.4 billion in 2002 to $9.8 billion in 2007, resulting in a CAGR of 3.3% (see Tables 4 and 5).

The business access market is propelled by remote access for corporate employees and connectivity for company sites.

Remote access may involve Internet roaming for employees who are traveling, employees who are taking work home at night or on weekends and accessing the Internet or the corporate LAN via an Internet connection, or telecommuters who work primarily, or often, at home.

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TABLE 4

Key Forecast Assumptions for the U.S. Business IP Connectivity Market, 2003–2007

Market Force	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Macroeconomics				
GDP growth	U.S. economic growth will continue to recover slowly. IDC anticipates U.S. GDP growth of 2% in 2003. In 2004, IDC anticipates U.S. GDP growth of 3.3%.	**High.** The telecom services market benefits directly from economic growth. As companies add additional sites, they spend more on telecom.	↑	★★★★☆
Constrained capital budgets	In near term, due to economic downturn, U.S. companies have constrained capital expenditure budgets that may prevent them from moving to alternative technologies.	**Moderate.** Companies with limited capital expenditure budgets are unlikely to pursue a major overhaul of their networking strategy because of the costs of new hardware and training.	↑	★★★☆☆
Technology/service developments				
Price pressure	Price declines continue for IP connectivity and services.	**High.** Declining prices directly impact IP market sizing.	↓	★★★★★
Growth from existing customers	IP connectivity is nearly ubiquitous. Growth comes primarily from greater bandwidth purchases, which continue, but at a slower rate.	**Moderate.** The greater the demand for more bandwidth, the greater the market for IP services; so a slowing in bandwidth demand impacts the market size.	↓	★★★★☆
Market characteristics				
Installed base	IP connectivity is nearly ubiquitous. The potential market grows, but at a slower rate as saturation begins.	**Moderate.** New IP services, such as IP VPNs, will continue to prop up IP connectivity and other IP services and drive the demand for greater bandwidth.	↑	★★★★☆
Evolutionary or revolutionary	Growth of IP will remain evolutionary.	**Moderate.** IP VPNs will continue to drive IP connectivity growth.	↑	★★★★☆

TABLE 4

Key Forecast Assumptions for the U.S. Business IP Connectivity Market, 2003–2007

Market Force	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
DSL deployments	DSL will continue to grow as an IP connectivity method.	**Moderate.** T1 and slower speeds will continue to be negatively impacted by greater DSL penetration, with resulting lower prices, and will negatively impact the IP market in revenue terms. This negative impact is tempered by potentially greater market opportunities.	↓	★★★★☆
Renewed carrier instability	The rapid return of many previously bankrupt carriers to the market and the resulting intense competition will continue to drive price declines and ultimately lead to unsustainable market conditions. In the latter years of the forecast, a renewed shakeout of IP carriers will occur.	**High.** Bankruptcies will likely result in the eventual exit of some carriers after a second bankruptcy filing. Customers will scramble for stability, and the market may recover to sustainable pricing over time.	↓	★★☆☆☆
Market ecosystem				
Price declines	IP pricing continues to decline at roughly 10% per year.	**High.** Price declines directly impact market size.	↓	★★★★★
Consumption				
Primary buyers	All companies of all sizes have a need for IP connectivity and Internet access.	**Moderate.** The market is largely saturated except for greater bandwidth requirements.	↔	★★★☆☆
Dedicated access demand	Demand for connectivity services continues to grow, with new sites and greater bandwidth.	**Moderate.** Price declines for connectivity largely offset the growth in demand, although not completely.	↑	★★★★☆
Remote employees	Demand for remote access services for employees continues to grow, with more companies offering remote access and giving more employees such access.	**Moderate.** Price declines will offset much — but not all — of this growth in demand, and price declines are less steep than for dedicated connectivity for sites.	↑	★★★★☆

Legend: ★☆☆☆☆ very low, ★★☆☆☆ low, ★★★☆☆ moderate, ★★★★☆ high, ★★★★★ very high

Source: IDC, 2003

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TABLE 5

U.S. Business IP Connectivity Revenue by Segment, 2002–2007 ($M)

	2002	2003	2004	2005	2006	2007	2002–2007 CAGR (%)
Dedicated Internet access	6,462.4	6,572.6	6,940.6	7,244.6	7,521.0	7,669.3	3.5
Growth (%)	NA	1.7	5.6	4.4	3.8	2.0	
Remote access	1,912.0	1,969.4	2,028.5	2,083.2	2,133.2	2,178.0	2.6
Growth (%)	NA	3.0	3.0	2.7	2.4	2.1	
Total	8,374.4	8,541.9	8,969.0	9,327.8	9,654.3	9,847.4	3.3
Growth (%)	NA	2.0	5.0	4.0	3.5	2.0	

Note: See Table 4 for key forecast assumptions.

Source: IDC, 2003

Remote access may be obtained via a dial-up connection or a broadband connection on the road. The market for remote access connectivity will increase from $1.9 billion in 2002 to $2.2 billion in 2007, representing a CAGR of 2.6%.

Dedicated access connects corporate sites, and the bandwidth requirements are generally increasing for businesses. Although there is evidence that the recession in the United States has caused telecom budgets to rise more slowly than planned or to be frozen, the trend is for greater telecom spending — an ever greater proportion of which is devoted to Internet and IP services. The market for dedicated Internet access will increase from $6.5 billion in 2002 to $7.7 billion in 2007, for a CAGR of 3.5%.

Price declines, bundling of Internet services with other telecom products, such as voice or data, and the bankruptcy of many ISPs are hampering growth of the business access market. However, these negative factors are outweighed by increasing connectivity and bandwidth requirements as well as the migration of other WAN technologies to IP.

ESSENTIAL GUIDANCE

Service providers face difficult challenges in the business IP space over the next few years. Market demand continues to grow, as businesses buy additional IP connectivity and services for corporate sites and for remote employees. However, price declines will hamper revenue growth. Price declines are a function of continued excessive competition in the market:

Most bankrupt carriers are returning to the market with balance sheets clear of debt, and all carriers are focused on IP as a growth segment and therefore are pushing hard in this market. In addition, the necessity of pleasing Wall Street is causing carriers to focus on revenue growth, even if steep discounts are needed to woo customers from other carriers. The business IP connectivity segment is — and will remain — very competitive.

Businesses can expect price declines that will largely offset their increased bandwidth needs. They can add more sites to their WANs or they can offer Internet access to more sites and deploy remote access solutions to traveling employees or telecommuters with a decreasing cost per megabit. Business users are well advised to sign short-term contracts with carriers, since pricing will decline and maximum leverage can be used to wrestle additional price cuts from the current IP carrier at the end of the contract period.

LEARN MORE

Related Research

- *U.S. Internet Service Provider Forecast, 2003–2007* (IDC #30408, November 2003)
- *AT&T's MPLS Common Data Network* (IDC #30163, September 2003)
- *MPLS Guide for Network Executives* (IDC #29649, June 2003)
- *U.S. Business Internet Access Market Forecast and Analysis, 2002–2007* (IDC #29378, May 2003)

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Published Under Services: ISP Markets

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MARKET ANALYSIS

U.S. Wholesale IP Forecast and Analysis, 2003–2007

Steven Harris

IDC OPINION

Recent scandals have affected wholesale IP more than they have most segments of the overall telecommunications market. Dark fiber swaps and other accounting irregularities have dogged wholesale IP far more than they have other segments of the market. In addition, price competition is heating up rather than dissipating. Highlights are as follows:

- Highlights is a misnomer. While some carriers with laser focuses on wholesale IP services may yet do well in this market subsegment, most carriers will be disappointed.
- The wholesale IP market will decline throughout the forecast period.
- Price competition will get more intense as more carriers enter or reenter the market. Over time, unused fiber in the ground will create increasing pressure on carriers to reduce prices further. This will intensify as carriers try to recoup investments.
- However, demand for IP services continues to increase. The market decline for wholesale IP is a result of competitive pricing pressure and not the lack of demand.

Filing Information: December 2003, IDC #30467, Volume: 1, Tab: Markets

IN THIS STUDY

Methodology

This IDC study reflects IDC's ongoing research on Internet services markets. The research is based on public and proprietary sources of information and is used to generate the forecasts and market share analysis in this study. Forecasts are based on historical growth, insight from IDC's consulting experience, IDC's business markets and consumer markets primary research (e.g., the annual *U.S. WAN Manager Survey* and *U.S. Residential Telecommunications Survey*), and discussions with service providers and equipment manufacturers.

IDC relied on discussions with service providers for this study, and each year the providers' abilities and willingness to participate in the survey varies. In addition, IDC relies on carriers to provide accurate information and adjusts estimates as necessary when it believes such information is not credible.

Wherever possible, actual revenue and subscriber counts are used. IDC estimated and projected data for certain time periods based on trends in the previous quarters and the previous year.

IDC took actual revenue from the universe of Internet service providers (ISPs) and estimated the percentages of overall IP revenue that applied to each market segment. Reported numbers were used whenever possible, and IDC estimated where necessary. For almost every carrier, estimates were used in the segment breakout totals.

The totals were added for each market segment, and an estimate was made for the "other" category, which includes roughly 7,000 additional ISPs in the United States. Most of these ISPs are small local providers with little revenue, and many in this group derive a fairly substantial portion of their revenue from consulting and professional services, which are excluded from this analysis and forecast. Very few of these providers have large wholesale operations, however.

Other categories of revenue excluded from this study include dark fiber sales, private lines, hardware and software sales by carriers, local loops (except where noted), Web merchandise sales, and all non-IP services, including switched voice and traditional data services, such as frame relay and asynchronous transfer mode (ATM).

All other IP services are included. Wholesale IP includes any service that is IP based and that one provider sells to another provider for resale to the end user. All such private-label services must be grouped into IDC's wholesale segment in order to deduct wholesale from the total IP market to avoid double counting.

Definitions

What is an ISP?

An ISP is an operator that provides direct access to the Internet and a business for which core revenue is based on the billable use of a network transport facility, either

owned by it or contracted for it from a network provider. The ISP also usually provides a core group of Internet utilities and services, such as email, a portal or start page, Web-page hosting, and other items of interest to its subscribers or customers. Users reach their ISPs by either dialing up a computer modem with a phone line or using a dedicated line installed by the provider.

Internet Access

Internet access is defined as a dial-up or dedicated connection to the World Wide Web or the Internet. This definition excludes services provided by companies that use IP technology but are not ISPs or do not provide Internet access and transport services (e.g., IBM and Yahoo!).

Types of Access

Internet access can be broken down into two general realms of connectivity methods: dial-up and dedicated service. All access methods and speeds fall within one of these two groups:

- **Dial-up access.** This method involves using a modem to convert digital signals into analog signals to allow them to traverse the public telephone system and make a connection to the Internet. The dial-up user connects to a modem bank on the ISP's network — or to a contracted network provider — and is thereby connected to the Internet.

- **Dedicated access.** This method involves a connection established for and dedicated to the primary purpose of enabling Internet access. Thus, fractional T1, full T1, T3, and Optical Carrier (OCx) at speeds ranging from OC3 to OC48 or more connections constitute dedicated access speeds. In addition, digital subscriber line (DSL) and cable modems are always-on connections. For this reason, DSL and cable are considered dedicated access methods by IDC.

Wholesale Services

Wholesale Internet access involves the reselling of Internet access, both dedicated and dial-up. Large ISPs and IP carriers will sell either dial-up capacity (e.g., modem banks) or dedicated transit circuits to other ISPs and telcos to be resold to their end users. The most common form of dial-up wholesale service involves a consumer-oriented ISP or virtual Internet service provider (VISP) using the points of presence (POPs) and network of the wholesale provider to connect their subscribers to the Internet. Transit or dedicated wholesaling usually involves ISPs' purchases of upstream capacity from their POPs to an Internet backbone via a transit link from a wholesale ISP. Wholesale customers will aggregate their traffic and send it on to the backbone provider.

The wholesale segment also includes other IP services sold on a private-label basis through ISPs. In the case of VISP services, these include portal sites and customer service support. IP VPN services sold through a private-label agreement are also wholesale services to the carrier that produces the services that are resold.

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Backbones

A backbone carrier is defined by IDC as having the following characteristics:

- Owns — or has agreements for fiber strands on an indefeasible right to use (IRU) basis — an IP network
- Carries a significant portion of IP traffic for other carriers

Carriers that transport only their own customers' traffic will not be considered backbone carriers according to IDC's definition. Backbone implies being a component and integral part of the "public Internet," which, in turn, implies the carriage of wholesale traffic. Wholesale customers may include other ISPs, regional Bell operating companies (RBOCs), cable television companies, and a variety of other network operators entering the ISP business. However, backbone providers also may provide retail services directly to businesses and consumers.

Peering

Peering is the process of exchanging traffic from one network to another over a connection that is provided with no monetary exchange between the carriers. Essentially, there are two kinds of peering: public and private. Public peering is the exchange of traffic by multiple ISPs over shared facilities managed by a central entity, which is usually a third party. Private peering is the exchange of traffic between two carriers through a direct connection.

The exchange of traffic from one carrier to another with one party paying the other for this service is termed upstream transit and is considered by IDC to involve a wholesale transit transaction and a customer, not a peering relationship or a peer. Peering implies that the two networks are equal, which in this case generally means that the traffic balance (the amount of traffic sent to the other's network and received from the other's network) is roughly equal and is in sufficient volume to justify a private connection between the two with no payment for the service. There are significant costs involved with private peering but no fees change hands for the exchange of traffic over a peering connection.

Regional/Local ISPs

Most local and regional ISPs do not have their own networks and confine their coverage to areas smaller than the entire United States. Many ISPs in this category provide software applications development and consulting in systems design, Internet marketing strategies, and Internet advertising creation and placement.

There are over 7,000 regional and local ISPs in the United States, with some evidence suggesting many thousands more.

Note: All numbers in this document may not be exact due to rounding.

SITUATION OVERVIEW

Pricing pressure, bankruptcies, and accounting concerns all depress the wholesale market.

However, almost no consumer ISPs own their own networks, and, therefore, they contract with wholesale providers for wholesale dial or managed modem services to connect their customers to the carriers' backbone networks. Those ISPs that have their own modems in their own POPs need a wholesale carrier to connect those POPs to the backbone networks. Thus, demand for managed modem services and upstream transit services remains strong. The supply side is depressing the wholesale market.

2002 Market Share by ISP

Table 1 shows the market shares for total wholesale IP in the United States. MCI (WorldCom) is still the largest wholesale IP provider by far. MCI wholesale IP business has weathered the bankruptcy considerably better than its business IP product lines.

TABLE 1

U.S. Wholesale IP Revenue by ISP, 2002

Rank	ISP	Revenue ($M)	Share (%)
1	MCI (WorldCom)	1,389.3	26.8
2	Level 3	533.1	10.3
3	Sprint	524.7	10.1
4	Genuity	472.0	9.1
5	Covad	326.7	6.3
6	Verizon	285.2	5.5
7	AT&T	253.1	4.9
8	BellSouth	247.8	4.8
9	SBC	211.0	4.1
10	Qwest	202.1	3.9
	Top 10 subtotal	4,445.0	85.9
	Other	730.2	14.1
	Total	5,175.3	100.0

Source: IDC, 2003

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All the top carriers in Table 1 are there largely as a result of their contracts with America Online (AOL), which is by far the largest consumer ISP in the United States. By virtue of these contracts, AOL creates the leaders in the wholesale IP segment.

Of note is that Genuity is listed separately from Level 3. The purchase of Genuity by Level 3 occurred in February 2003 and, thus, is listed separately for the 2002 market shares.

The market shares for wholesale dial (also known as managed modem services) mirror the market shares for total wholesale IP, again largely thanks to AOL and its huge base of subscribers. Table 2 has the rankings.

TABLE 2

U.S. Wholesale Dial IP Revenue by ISP, 2002

Rank	ISP	Revenue ($M)	Share (%)
1	MCI (WorldCom)	1,180.9	45.6
2	Level 3	431.8	16.7
3	Sprint	262.3	10.1
4	Genuity	259.6	10.0
5	ICG	184.6	7.1
6	Qwest	80.8	3.1
7	AT&T	75.9	2.9
8	StarNet	31.0	1.2
9	Verizon	28.5	1.1
10	Allegiance	24.8	1.0
	Top 10 subtotal	2,560.4	98.9
	Other	29.7	1.1
	Total	2,590.0	100.0

Source: IDC, 2003

Table 3 shows the market shares for upstream transit IP services, or connecting another ISP's POPs or headend location to the provider's Internet backbone. There is considerable variation from the previous two market share tables.

TABLE 3

U.S. Wholesale Upstream Transit IP Revenue by ISP, 2002

Rank	ISP	Revenue ($M)	Share (%)
1	Sprint	251.8	15.7
2	Genuity	188.8	11.7
3	MCI (WorldCom)	180.6	11.2
4	BellSouth	123.9	7.7
5	Verizon	114.1	7.1
6	AT&T	101.3	6.3
7	Level 3	96.0	6.0
8	SBC	95.0	5.9
9	Covad	65.3	4.1
10	Cable & Wireless	64.0	4.0
	Top 10 subtotal	1,280.7	79.7
	Other	326.6	20.3
	Total	1,607.3	100.0

Source: IDC, 2003

Table 4 has the final wholesale breakout, for "other" wholesale IP services. Again, "other" services are any IP services resold by another provider, mostly composed of DSL, as well as private-label IP VPNs and Web hosting. As can be seen in Table 4, all the major DSL providers are listed. Covad resells DSL to other providers, and most of the RBOCs sell a large number of DSL lines on a wholesale basis to ISPs such as EarthLink or MegaPath.

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TABLE 4

U.S. Wholesale Other IP Revenue by ISP, 2002

Rank	ISP	Revenue ($M)	Share (%)
1	Covad	261.4	26.7
2	Verizon	142.6	14.6
3	SBC	116.1	11.9
4	BellSouth	99.1	10.1
5	AT&T	75.9	7.8
6	Qwest	64.7	6.6
7	MCI (WorldCom)	27.8	2.8
8	Genuity	23.6	2.4
9	New Edge Networks	20.7	2.1
10	Metromedia Fiber Network	20.3	2.1
	Top 10 subtotal	852.1	87.1
	Other	125.8	12.9
	Total	977.9	100.0

Source: IDC, 2003

FUTURE OUTLOOK

Forecast and Assumptions

IDC's forecast for wholesale services in 2001 was largely correct, despite the accounting gyrations in the market since then. However, several wholesale providers have gone out of business or declared bankruptcy. Many have slashed prices to gain business in an attempt to avert failure, but they have dragged the pricing of the overall market down with them. OC-level upstream transit pricing is declining rapidly.

AOL renegotiated its contracts with the major wholesale carriers in the United States and continues to receive large price reductions. As the largest consumer ISP, this effect has been enough to have a noticeable impact on the wholesale segment. In addition, AOL set the stage for other consumer ISPs to renegotiate their own contracts, and the result has had a sizeable effect for wholesale dial providers. Assumptions used to produce the 2002 wholesale IP forecast can be found in Table 5.

TABLE 5

Key Forecast Assumptions for the U.S. Wholesale IP Market, 2003–2007

Market Force	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Macroeconomics				
GDP growth	U.S. economic growth will continue to recover slowly. IDC anticipates U.S. GDP growth of 2% in 2003. IDC anticipates 2004 U.S. GDP growth of 3.3%.	**High.** The telecom services market benefits directly from economic growth. As companies add additional sites, they spend more on telecom.	↑	★★★★☆
Constrained capital budgets	In the near term, because of the economic downturn, U.S. companies will have constrained capital expenditure (capex) budgets, which might prevent them from moving to alternative technologies.	**Moderate.** Companies with limited capex budgets are unlikely to pursue a major overhaul of their networking strategy because of the costs of new hardware and training.	↑	★★★☆☆
Technology/service developments				
Price pressure	Price declines will continue for IP connectivity and services.	**High.** Declining prices will directly affect IP market sizing.	↓	★★★★★
Growth from existing customers	IP connectivity will be nearly ubiquitous, and growth will come primarily from greater bandwidth purchases, which continue at a slower rate.	**Moderate.** The greater the demand is for more bandwidth, the greater the market for IP services will be, so a slowing in bandwidth demand affects the market size.	↓	★★★★☆
Market characteristics				
Installed base	IP connectivity will be nearly ubiquitous and the potential market will grow at a slower rate as saturation begins.	**Moderate.** New IP services, such as IP VPNs, will continue to prop up IP connectivity and other IP services and drive greater bandwidth.	↑	★★★★☆
Evolutionary or revolutionary	Growth of IP will remain evolutionary.	**Moderate.** IP VPNs will continue to drive IP connectivity growth.	↑	★★★★☆
DSL deployments	DSL will continue to grow as an IP connectivity method.	**Moderate.** T1 and slower speeds will continue to be negatively affected by greater DSL penetration, with the result being lower prices, which will negatively affect the IP market in terms of revenue. This negative impact is tempered by potential greater market opportunities.	↓	★★★★☆

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TABLE 5

Key Forecast Assumptions for the U.S. Wholesale IP Market, 2003–2007

Market Force	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Renewed carrier instability	The rapid return of many previously bankrupt carriers to the market and the resulting intense competition will continue to drive price declines and will ultimately lead to unsustainable market conditions. In the latter years of the forecast, a renewed shakeout of IP carriers will occur.	**High.** Bankruptcies will likely result in the eventual exit of some carriers after a second bankruptcy filing. Customers will scramble for stability, and the market might recover to sustainable pricing over time.	↓	★★☆☆☆
Market ecosystem				
Price declines	IP pricing will continue to decline at roughly 10% per year.	**High.** Price declines directly affect market size.	↓	★★★★★
Consumption				
Primary buyers	All companies of all sizes will have a need for IP connectivity and Internet access.	**Moderate.** The market is largely saturated, except for greater bandwidth requirements.	↔	★★★☆☆
Wholesale dial/managed modem	Dial users will continue to decline, though remote business users will increase slightly.	**High.** Price declines in conjunction with a net decrease in the number of dial users will negatively affect the market for wholesale dial/managed modem services.	↓	★★★★★
Upstream transit	Demand for greater bandwidth at the edge with broadband connections and high-speed dedicated lines will increase traffic, yet price declines will more than offset this effect.	**Moderate.** Price declines will offset much, but not all, of this growth in demand.	↓	★★★★☆
Other wholesale	Demand for other IP services sold by carriers on a private-label basis will increase, especially for services such as IP VPNs. "Other" includes all IP services resold by another carrier under their own name.	**Moderate.** Price declines will not offset the greater demand for private-label IP services and the increasing use of wholesale channels by many carriers.	↑	★★★★☆

Legend: ★☆☆☆☆ very low, ★★☆☆☆ low, ★★★☆☆ moderate, ★★★★☆ high, ★★★★★ very high

Source: IDC, 2003

Table 6 shows the wholesale IP forecast through 2007. The market in 2002 was $5.2 billion and will decline to $4.4 billion in 2007 for a CAGR of -3.0%.

The wholesale subsegments show a wide range of growth rates. Wholesale dial/managed modem services will suffer the most, as seen in Table 6. Price declines, led by AOL contract discounts, very active competition among wholesale carriers, and a decrease in total consumer dial users will all conspire to reduce the size of the wholesale dial market. Wholesale dial services will decline from $2.6 billion in 2002 to $1.8 billion in 2007 for a CAGR of -7.2%.

TABLE 6

U.S. Wholesale IP Revenue by Segment, 2002–2007 ($M)

	2002	2003	2004	2005	2006	2007	2002–2007 CAGR (%)
Dial	2,590	2,486	2,362	2,173	1,978	1,780	-7.2
Growth (%)	NA	-4.0	-5.0	-8.0	-9.0	-10.0	
Upstream transit	1,607	1,575	1,544	1,497	1,445	1,373	-3.1
Growth (%)	NA	-2.0	-2.0	-3.0	-3.5	-5.0	
Other	978	1,027	1,109	1,187	1,246	1,283	5.6
Growth (%)	NA	5.0	8.0	7.0	5.0	3.0	
Total	5,175	5,088	5,015	4,857	4,668	4,436	-3.0
Growth (%)	NA	-1.7	-1.4	-3.1	-3.9	-5.0	

Note: See Table 5 for key forecast assumptions.

Source: IDC, 2003

Upstream transit will decline, but at a slower pace. Upstream transit will benefit from increased traffic, especially from broadband POPs and aggregation points, though price declines will reduce the total market size. Upstream transit revenue will decrease from $1.6 billion in 2002 to $1.4 billion in 2007 for a CAGR of -3.1%.

"Other" wholesale IP services will benefit from increased broadband usage and traffic, as well as the business-user demand for IP VPNs and other IP services. The "other" market will be the sole growth subsegment within wholesale services, growing from $978 million in 2002 to $1.3 billion in 2007 for a CAGR of 5.6%.

Wholesale IP will decline due to price competition, not lack of demand. By the end of the forecast period, IDC expects that price declines will have proceeded to a point at which several carriers will have financial difficulties and will expect a renewed shakeout in the IP carrier segment. Wholesale will suffer the most from this development, and the wholesale IP forecast reflects this accelerating decline.

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ESSENTIAL GUIDANCE

Service providers face difficult challenges in the wholesale IP space over the next few years. Market demand continues to grow as businesses and consumers buy additional IP connectivity and services. However, price declines will hamper revenue growth. Price declines are a function of continued excessive competition in the market.

Most bankrupt carriers are returning to the market with balance sheets clear of debt, and all carriers are focused on IP as a growth segment and, therefore, are pushing hard in this market. In addition, the necessity of pleasing Wall Street is causing carriers to focus on revenue growth, even if steep discounts are needed to woo customers from other carriers. The wholesale IP connectivity segment is — and will remain — very competitive, and those carriers focused on wholesale are likely to do better than those with both retail and wholesale channels.

ISPs and other carriers that buy capacity and services from wholesale carriers can expect price declines that will offset their increased bandwidth needs. Users of wholesale IP services are well advised to sign short-term contracts with carriers since pricing will decline and maximum leverage can be used to wrestle additional price cuts from the current IP carrier at the end of the contract period. However, a significant risk of additional bankruptcies and service disruption is likely by the end of the forecast period, and ISPs using wholesale services should prepare for this eventuality by instituting business continuity plans.

LEARN MORE

Related Research

- *U.S. Business IP Connectivity Forecast and Analysis, 2003–2007* (IDC #30449, November 2003)
- *U.S. Internet Service Provider Forecast, 2003–2007* (IDC #30408, November 2003)
- *AT&T's MPLS Common Data Network* (IDC #30163, September 2003)
- *MPLS Guide for Network Executives* (IDC #29649, June 2003)
- *U.S. Business Internet Access Forecast and Analysis, 2002–2007* (IDC #29378, May 2003)

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APPENDIX 4

Top 13 Internet Providers by Autonomous System Rank, 1999-2004

Provider	2004 Rank	1999	% Share	2000	% Share	2001	% Share	2002	% Share	2003	% Share	2004	% Share	2004 % Share (Among Top 13)	Change 2002-2003	Change 2003-2004
		Number of AS Connections														
MCI	1	1528	25	2242	22	3129	20	3212	18	3276	15	3034	13	22	2%	-7%
AT&T	2	362	6	694	7	1197	8	1423	8	2052	10	1966	8	14	44%	-4%
Provider A	3	649	10	1036	10	1417	9	1603	9	2333	11	1842	8	13	46%	-21%
Provider B	4	332	5	658	7	1048	7	1009	6	1388	6	1167	5	8	37%	-16%
Provider C	5	88	1	418	4	644	4	973	6	1007	5	1074	5	8	4%	7%
Provider D	7	133	2	210	2	296	2	270	2	275	1	664	3	5	2%	141%
Provider E	6	45	1	211	2	362	2	437	2	554	3	668	3	5	27%	21%
Provider F	8	277	4	379	4	445	3	475	3	553	3	636	3	5	17%	15%
Provider G	9	90	1	217	2	432	3	551	3	601	3	616	3	4	9%	3%
Provider H	10	75	1	207	2	547	4	569	3	488	2	590	3	4	-14%	21%
Provider I	11	60	1	105	1	202	1	196	1	323	1	544	2	4	65%	68%
Provider J	12	12	0	45	0	520	3	411	2	457	2	530	2	4	11%	16%
SBC	13	57	1	90	1	155	1	243	1	337	2	514	2	4	38%	53%
Others 14 - 50	14 - 50	2483	40	3503	35	5212	33	6237	35	7944	37	9497	41		27%	20%
Total ASCs / *HHI*		6190	*1,059*	10015	*919*	15605	*750*	17609	*665*	21589	*602*	23341	*452*			
Change in HHI with AT&T-SBC			11		12		15		22		30		37			

HHI with only 13 firms (shares of each of top 13 are adjusted such that total share adds to 100%)	1,139
Change in HHI with AT&T-SBC	105

Source: Number of AS Connections from TeleGeography; Share and HHI Calculations Added
Top 50 Internet Providers by Autonomous System Rank, 1999-2004, Copyright 2004/2005 PriMetrica,Inc. All Rights Resreved.
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Notes: Connections is equal to the total number of autonomous systems (ASs) directly connected to a provider as of June of year listed. Where a provider operates multiple ASs, the totals for each AS are aggregated while eliminating duplicated connections between the provider's ASs. Historical numbers represent that companies current operated ASs, excluding the recent purchase of Cable and Wireless's U.S. AS by Savvis (represented only in the 2004 numbers)
Publication: Global Internet Geography 2005
Source: TeleGeography research and University of Oregon Route Views Project
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