

# Broadband & Dial-Up Access

August 2002



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## Welcome to eMarketer

Dear Reader:

eMarketer's August 2002 *Broadband & Dial-Up Access* is a comprehensive update of eMarketer's last *Broadband Report*<sup>™</sup> published in April, 2001. This report examines the residential broadband and dial-up internet access markets in 27 countries across four regions. The focus of the report is the development of residential broadband access by particular broadband technologies, the major players in each market and the trends in broadband access costs. The report provides projections and comparative estimates for each country in the following areas:

- internet users
- internet households by access technology
- broadband household projections, 2000 - 2004
- DSL projections, 2000 - 2004
- cable internet projections, 2000 - 2004
- alternative broadband projections, 2000 - 2004
- subscriber numbers for leading broadband access providers in each country
- broadband access costs

and more...

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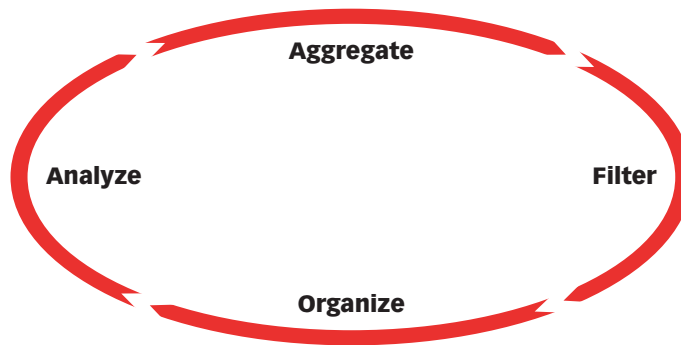
eMarketer’s approach to market research is founded on a philosophy of aggregating data from as many different sources as possible. Why? Because there is no such thing as a perfect research study and no single research source can have all the answers. Moreover, a careful evaluation and weighting of multiple sources will inevitably yield a more accurate picture than any single source could possibly provide.

## The eMarketer Difference

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eMarketer does not conduct primary research. Neither a research firm nor a consultancy, eMarketer has no testing technique to defend, no research bias and no client contracts to protect.

eMarketer prepares each market report using a four-step process of aggregating, filtering, organizing and analyzing data from leading research sources worldwide.



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Using the internet and accessing a library of electronically-filed research reports and studies, the eMarketer research team first aggregates publicly available e-business data from hundreds of global research and consultancy firms. This comparative source information is then filtered and organized into tables, charts and graphs. Finally, eMarketer analysts provide concise and insightful analysis of the facts and figures along with their own estimates and projections. As a result, each set of findings reflects the collected wisdom of numerous research firms and industry analysts.

**“I think eMarketer reports are extremely useful and set the highest standards for high quality, objective compilation of often wildly disparate sources of data. I rely on eMarketer’s research reports as a solid and trusted source.”**

— Professor Donna L. Hoffman, Co-Director, eLab, Vanderbilt University

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## The Benefits of eMarketer's Aggregation Approach

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**Objective:** information is more objective than that provided by any single research source

**Comprehensive:** gathered from the world's leading research firms, consultancies and news organizations

**Authoritative:** quoted in leading news publications, academic studies and government reports

**All in one place:** easy to locate, evaluate and compare

**Readily accessible:** so you can make quick, better-informed business decisions

**Above the hype:** accurate projections that business people can use with confidence

**Time saving:** there's no faster way to find internet and e-business stats, online or off

**Money saving:** more information, for less, than any other source in the world

## "Benchmarking" and Projections

---

Until recently, anyone trying to determine which researcher was most accurate in predicting the future of any particular aspect of the internet did not have a definitive source with which to do this. For instance, over 10 firms predicted e-commerce revenues for the fourth quarter 1998 online holiday shopping season, and yet no single source could be identified after the fact as having the "correct" number. In the Spring of 1999, however, the US Commerce Department finally began measuring e-commerce B2C activity so business people and others could have a benchmark with which they could compare and evaluate projections.

eMarketer has adapted its methodology to recognize that certain government and other respected, impartial sources are beginning to provide reliable numbers that can be consistently tracked over time. Most of these established sources, however, only measure past results; typically, they do not make predictions.

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Today, eMarketer formulates its Essential E-Business Numbers by first identifying the most established, reputable source for a given sector being measured and then adopting that organization's figures as *benchmarks* for the historical/current period. For instance, eMarketer's US internet user figures will be based on a combination of the most recent data from the US Census Bureau and the International Telecommunication Union. Using this data as the benchmark for 2000 and 2001, eMarketer will make projections for subsequent years based on the following factors:

- a comparative analysis of user growth rates compiled from other research firms
- additional benchmark data from internet rating firms, e.g., Nielsen//NetRatings and Jupiter Media Metrix, which use panels to measure internet user activity on a weekly and monthly basis
- an analysis of broader economic, cultural and technological trends in the US

Similarly, US e-commerce revenues are being "benchmarked" using historical data from the US Department of Commerce, and broadband household and penetration rate forecasts are being built off baseline data from the Organization for Economic Cooperation and Development (OECD).

Through this benchmarking process, eMarketer will be holding itself – and our projections – accountable.

**“When I need the latest trends and stats on e-business, I turn to eMarketer. eMarketer cuts through the hype and turns an overabundance of data into concise information that is sound and dependable.”**

— Mark Selleck, Business Unit Executive, DISU e-business Solutions, IBM



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Nearly every government in the developing world now has a broadband policy designed to drive broadband availability and adoption. High-speed internet is seen as a potential catalyst to drive the telecommunications sector out of the doldrums it has been experiencing for nearly 18 months and, on a wider scale, as a driver for economic growth. With the liberalization of telecommunications markets around the world, telecommunications markets formerly closed to national and international competition are becoming more open. This has caused a significant amount of volatility, but it has also created an environment where competition is able to occur between different providers and between different telecommunications technologies.

In 2002, high-speed internet is essentially about Digital Subscriber Line (DSL) competing against cable internet. By 2004, however, a variety of alternative broadband technologies that incorporate wireless, optical fiber, Ethernet and even powerline technology will become more widely available and will offer new opportunities to both telecom providers and consumers alike.

eMarketer has examined 27 countries across 4 global regions to assess the current state of play of high-speed internet. Country, regional and global projections are provided, and projections by broadband technology for each country are also included.

eMarketer's household projections are based on data from the Organization for Economic Cooperation and Development (OECD), which assessed the status of broadband in OECD countries as of the June, 2001. In addition to this, recent government data from national telecommunication agencies was examined, as were published financial reports from every leading broadband provider among the 27 countries examined. Comparative estimates from leading research firms are also included so readers can assess eMarketer's projections against others.

The following chart outlines the current internet and broadband status of the 27 countries examined in this report. The table shows the number of internet users, the total number of households, the percentage of households that are online and the percentage of households with broadband access, at the end of 2001.

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### Internet Users, Online Households and Broadband Households in Selected Countries Worldwide, End of 2001 (in millions and as a % of total households)

	Internet users (1)	Total households (2)	Online households (as a % of total households) (3)	Broadband households (as a % of total households) (3)
Argentina	3.0	10.0	11.0%	1.3%
Australia	7.2	7.3	52.1%	2.0%
Austria	2.6	3.5	46.4%	7.0%
Belgium	2.9	4.2	32.7%	10.1%
Brazil	8.0	45.0	7.5%	0.7%
Canada	13.5	11.7	55.6%	19.7%
China	33.7	350.0	6.2%	0.1%
Denmark	2.4	2.4	59.0%	7.8%
Finland	2.2	2.4	51.0%	4.1%
France	15.7	24.5	30.4%	2.5%
Germany	30.0	38.0	39.1%	5.4%
Hong Kong	3.1	2.1	59.1%	26.0%
India	7.0	181.0	0.6%	0.0%
Italy	16.0	21.4	34.0%	1.4%
Japan	57.9	44.6	48.2%	5.8%
Mexico	3.6	23.0	8.4%	0.6%
Netherlands	5.3	6.8	61.7%	8.1%
Norway	2.7	2.0	60.3%	4.2%
Portugal	3.6	3.3	28.5%	2.5%
Singapore	2.5	1.2	55.0%	11.7%
South Korea	24.4	14.5	57.0%	51.7%
Spain	7.4	12.5	28.5%	3.0%
Sweden	4.6	4.1	62.1%	13.4%
Switzerland	2.9	3.1	48.7%	3.3%
Taiwan	7.8	6.2	42.0%	18.2%
UK	24.0	22.4	49.0%	1.3%
US	142.8	107.8	52.3%	10.4%

Source: (1) International Telecommunication Union (ITU), June 2002; (2) OECD data or relevant government census bureau, 2001; (3) eMarketer estimates, June 2002

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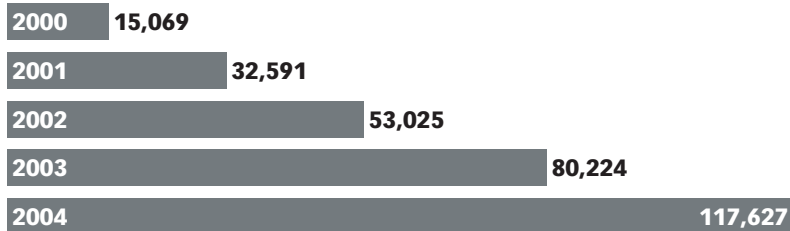
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## Broadband Households Worldwide

There will be over 117 million broadband households worldwide in 2004, up from 32.5 million at the end of 2001, according to eMarketer's analysis.

### Broadband Households Worldwide, 2000-2004 (in thousands)



Source: eMarketer, June 2002

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North America currently leads the world in absolute numbers of broadband households at 13.5 million at the end of 2001, followed by Asia-Pacific with 12.6 million, Europe with 5.9 million and Latin America with 562,000.

### Broadband Households Worldwide, by Region, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
North America	7,600	13,500	20,385	28,585	38,002
Asia-Pacific	5,825	12,565	20,125	30,931	49,607
Europe	1,505	5,964	11,341	18,690	26,810
Latin America	139	562	1,174	2,018	3,208
<b>Total</b>	<b>15,069</b>	<b>32,591</b>	<b>53,025</b>	<b>80,224</b>	<b>117,627</b>

Source: eMarketer, June 2002

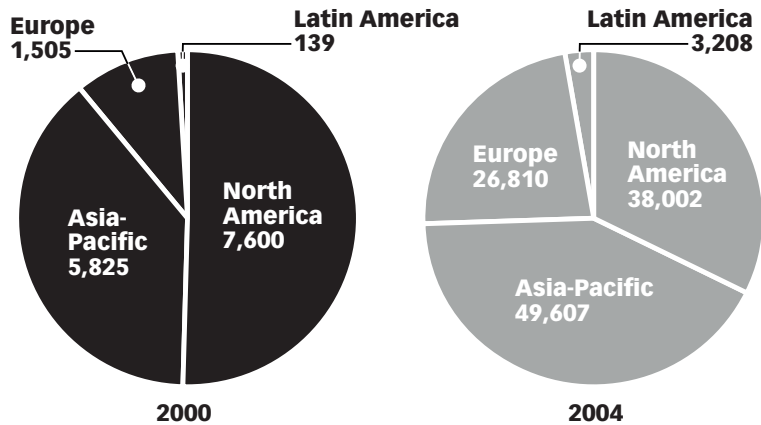
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By 2004, however, the Asia-Pacific region will contain more broadband subscribers than North America and Latin America combined at nearly 50 million.

**Broadband Households Worldwide, by Region, 2000 & 2004 (in thousands)**



Note: 2000 total:15,069; 2004 total:117,627  
 Source: eMarketer, June 2002

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The clear global leader in terms of broadband penetration of households is South Korea, with 52% of all households having a broadband connection at the end of 2001. Next is Hong Kong, followed by Canada and Taiwan. Sweden is the leading broadband country in Europe and the United States comes in 7<sup>th</sup>. Within the top 10 leading broadband countries, the Asia-Pacific region contains 4 countries, Europe 4 countries and Canada and the United States are within the top 10.

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Some of the countries with high internet penetrations but very low broadband penetrations include the United Kingdom which ranks last in Europe and 22<sup>nd</sup> globally and Australia ranked 20<sup>th</sup> globally. While these countries have a sophisticated fixed-line telephony infrastructure and populations that have embraced the internet, broadband networks are only now becoming widely available.

### **Broadband Penetration for Selected Countries Worldwide, End of 2001 (as a % of total households)**

1. South Korea	51.7%
2. Hong Kong	26.0%
3. Canada	19.7%
4. Taiwan	18.2%
5. Sweden	13.4%
6. Singapore	11.7%
7. US	10.4%
8. Belgium	10.1%
9. Netherlands	8.1%
10. Denmark	7.8%
11. Austria	7.0%
12. Japan	5.8%
13. Germany	5.4%
14. Norway	4.2%
15. Finland	4.1%
16. Switzerland	3.3%
17. Spain	3.0%
18. Portugal	2.5%
19. France	2.5%
20. Australia	2.0%
21. Italy	1.4%
22. UK	1.3%
23. Argentina	1.3%
24. Brazil	0.7%
25. Mexico	0.6%
26. China	0.1%
27. India	0.0%

*Note: Rounded to one decimal place*

*Source: eMarketer, June 2002*

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By 2004, eMarketer forecasts that South Korea will maintain its top spot, but Taiwan will move up to 2nd and the United States will fall back to 10<sup>th</sup> in terms of broadband penetration of households.

### **Broadband Penetration for Selected Countries Worldwide, 2004 (as a % of total households)**

1. South Korea	82.8%
2. Taiwan	80.8%
3. Canada	64.1%
4. Hong Kong	53.1%
5. Singapore	40.5%
6. Sweden	33.0%
7. Norway	31.6%
8. Denmark	30.3%
9. Switzerland	28.7%
10. US	28.3%
11. Japan	27.9%
12. Belgium	26.9%
13. Netherlands	25.8%
14. Finland	25.0%
15. Austria	21.9%
16. Germany	21.2%
17. France	17.5%
18. Spain	17.2%
19. Portugal	14.2%
20. Australia	12.9%
21. UK	9.6%
22. Italy	9.1%
23. China	4.9%
24. Brazil	4.5%
25. Argentina	4.4%
26. Mexico	3.3%
27. India	0.3%

*Source: eMarketer, June 2002*

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## Broadband Technology

In terms of broadband technology, cable internet households dominated broadband globally in 2000 as a result of North America's early adoption in this area. By the end of 2001, there were 16.5 million DSL households worldwide against 15 million cable internet households, according to eMarketer. At the end of 2001, nowhere in the world except Sweden and to a lesser extent China and Italy, did alternative broadband technologies such as fixed wireless, fiber, Ethernet, or satellite garner many subscribers. eMarketer estimates a little over 1 million households in this sector.

### Broadband Households Worldwide, by Technology, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
DSL	6,780	16,553	28,148	43,430	60,882
Cable	8,038	14,986	21,991	29,864	39,580
Other*	251	1,052	2,886	6,930	17,225
<b>Total</b>	<b>15,069</b>	<b>32,591</b>	<b>53,025</b>	<b>80,224</b>	<b>117,627</b>

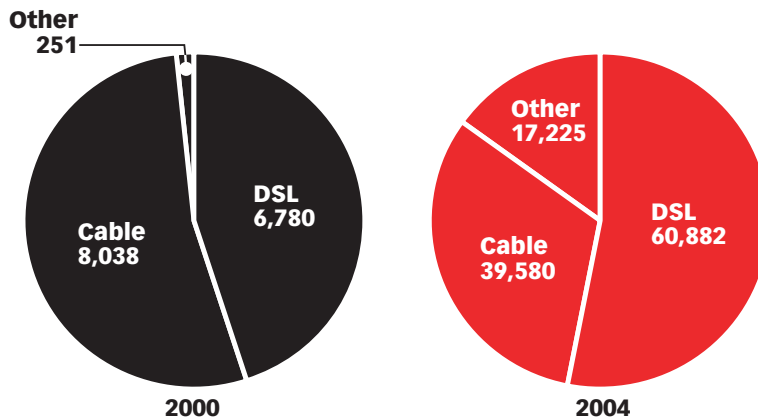
Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, June 2002

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As DSL becomes more widely available, DSL households will number over 60 million in 2004 compared to cable internet households at 40 million. Alternative broadband technologies – particularly fiber solutions – will grow especially strongly in places like Sweden, China, Japan, Italy and South Korea. eMarketer forecasts over 17 million households will use alternative broadband technologies by 2004.

### Broadband Households Worldwide, by Technology, 2000 & 2004 (in thousands)



Note: 2000 total: 15,069; 2004 total: 117,627  
 Source: eMarketer, June 2002

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Cable internet and DSL services are developing at different speeds in different countries. Some countries, such as the United States and the Netherlands, have a particularly high cable penetration and cable internet services have grown quickly. In other countries, such as Germany and Italy, where there is little cable infrastructure suitable for internet, DSL services dominate. A characteristic of the leading broadband countries in the world is that there is both a well developed DSL and cable internet market.

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## DSL

The following chart ranks the leading countries by DSL penetration of households. The top three countries in terms of overall broadband penetration remain the same, but the country that leaps into the top 10 in DSL penetration of total households is Germany. The US ranks 7<sup>th</sup> in overall broadband penetration, but only 10<sup>th</sup> globally in DSL penetration.

### DSL Penetration for Selected Countries Worldwide, End of 2001 (as a % of total households)

1. South Korea	32.1%
2. Hong Kong	14.8%
3. Taiwan	14.7%
4. Canada	7.7%
5. Belgium	6.0%
6. Germany	5.3%
7. Sweden	4.7%
8. Singapore	4.4%
9. Denmark	4.3%
10. US	3.8%
11. Austria	2.9%
12. Japan	2.8%
13. Spain	2.4%
14. Finland	2.3%
15. Norway	2.2%
16. Netherlands	1.8%
17. France	1.6%
18. Italy	1.2%
19. Switzerland	1.2%
20. Argentina	0.7%
21. Australia	0.5%
22. Brazil	0.4%
23. UK	0.3%
24. Portugal	0.1%
25. China	0.0%
26. Mexico	0.0%
27. India	0.0%

*Note: Rounded to one decimal place*

*Source: eMarketer, June 2002*

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## Cable Internet

Looking at cable internet penetration at the end of 2001, South Korea, Hong Kong and Canada remain in the top three spots, although Canada leapt over Hong Kong to take 2<sup>nd</sup> place. The United states comes in 6<sup>th</sup> in terms of cable internet penetration but Taiwan, who ranks 4<sup>th</sup> overall, slips out of the top 10.

### Cable Internet Penetration for Selected Countries Worldwide, End of 2001 (as a % of total households)

1. South Korea	19.4%
2. Canada	12.0%
3. Hong Kong	8.1%
4. Singapore	7.0%
5. Netherlands	6.3%
6. US	6.3%
7. Sweden	4.1%
8. Belgium	4.1%
9. Austria	4.1%
10. Denmark	3.5%
11. Taiwan	3.5%
12. Japan	2.9%
13. Portugal	2.4%
14. Switzerland	2.1%
15. Norway	1.9%
16. Finland	1.9%
17. Australia	1.5%
18. UK	1.0%
19. France	0.8%
20. Mexico	0.6%
21. Argentina	0.6%
22. Spain	0.6%
23. Brazil	0.2%
24. Germany	0.1%
25. India	0.0%
26. China	0.0%
27. Italy	0.0%

*Note: Rounded to one decimal place*

*Source: eMarketer, June 2002*

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At the end of 2001, North America was the regional leader in terms of number of broadband households, with 13.5 million. Cable internet services currently dominate the North American broadband sector with 8.2 million household subscribers at the end of 2001, compared with 5 million DSL subscribers. Both Canada and the United States are in the top 10 countries globally based on broadband penetration of households. Canada currently ranks 3<sup>rd</sup> with nearly 20% of all Canadian households having a broadband connection. The US, in contrast, has a penetration rate half that number.

### North America Broadband Snapshot, End of 2001 (in thousands and household penetration)

	DSL	Cable	Other*	Total	Household penetration	Regional rank	Global rank**
Canada	900	1,400	0	2,300	19.66%	1	3
US	4,100	6,800	300	11,200	10.39%	2	7
<b>Total</b>	<b>5,000</b>	<b>8,200</b>	<b>300</b>	<b>13,500</b>			

Note: \*Other includes, fixed wireless, satellite, fiber, Ethernet and powerline technology; \*\*Global rank of 27 countries examined  
Source: eMarketer, June 2002

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North American broadband households will number 38 million in 2004, up five-fold from 7.6 million in 2000.

### Broadband Households in North America, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Canada	1,400	2,300	3,600	5,300	7,500
US	6,200	11,200	16,800	23,285	30,502
<b>Total</b>	<b>7,600</b>	<b>13,500</b>	<b>20,400</b>	<b>28,585</b>	<b>38,002</b>

Source: eMarketer, June 2002

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## A. Canada

### Summary

Canada is ranked 3rd globally and is only surpassed by South Korea and Hong Kong in terms of broadband penetration of households. A pro-active government, competition among different broadband networks and affordable broadband access have all driven rapid broadband adoption in Canada.

### Canada Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
900	1,400	0	2,300	19.66%	1	3

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 2 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

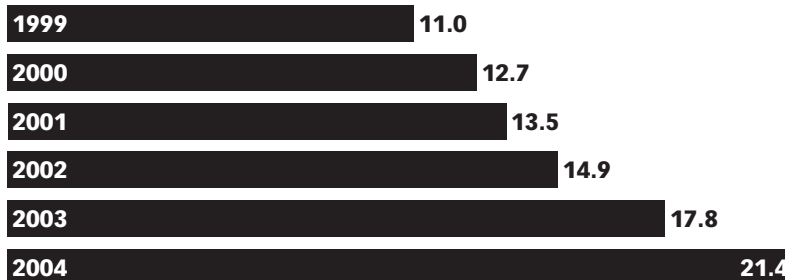
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### Internet Users

The International Telecommunication Union reports Canada had 13.5 million internet users in 2001. eMarketer expects this to grow to over 21 million by 2004.

### Internet Users in Canada, 1999-2004 (in millions)



*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
 Source: eMarketer, May 2002

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## Internet Households

eMarketer estimates 55.6% of Canadian households were online at the end of 2001. Of these online households, 4.2 million accessed the internet with a dial-up connection and 2.3 million did so with broadband.

### Internet Households in Canada, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	4,200	35.9%
DSL	900	7.7%
Cable	1,400	12.0%
Other	0	0.0%
<b>Total broadband households</b>	<b>2,300</b>	<b>19.7%</b>
<b>Total online households</b>	<b>6,500</b>	<b>55.6%</b>

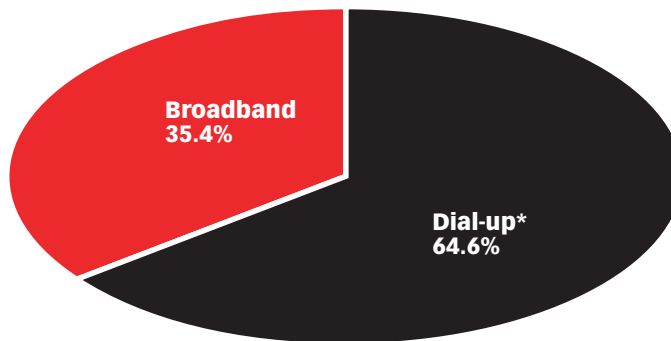
Note: \*based on 11.7 million households; \*\*includes ISDN  
Source: eMarketer, April 2002

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Within 12 to 18 months there will be more Canadian households online using broadband than dial-up according to eMarketer. At the end of 2001, broadband made up 35% of all online households.

### Percent of Canadian Online Households, Dial-Up and Broadband, End of 2001



Note: \*Includes ISDN  
Source: eMarketer, June 2002

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A recent study by the NFO CFgroup shows that as of April 2002, 46% of online households were using broadband.

### Percent of Online Households in Canada with High-Speed Connections, July 2001 & April 2002



Source: NFO CFgroup, May 2002

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## Dial-Up

### **“Dial-up isn’t dead yet: Two-thirds of internet users stick to the old standby.”**

– Mark Evans, *Financial Post* – Canada Nov 19, 2001

Despite having one of the highest broadband penetrations in the world, more Canadians are still accessing the internet through dial-up than a high-speed connection. Toronto-based Convergence Consulting Group suggests that dial-up will continue to be attractive to many, particularly those in rural and regional areas where high-speed access is not available or is too expensive. As in other countries around the world, broadband is still considerably more expensive than dial-up, and few people can justify the outlay if their primary internet activities are casual web surfing and e-mail. One of the fastest growing ISPs in Canada is AOL Canada, which has seen its dial-up subscriber base double to 400,000 in the year ending 2001, according to Convergence Consulting Group. eMarketer forecasts that, by 2003, there will be more broadband households in Canada than dial-up.

### **“What I am looking for is mostly sports, news and e-mail. I’m not really concerned about how fast I get there.”**

– Ky Shim, *Canadian casual internet user*, 2001

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## Broadband Access

eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.

Widespread cable internet and DSL across metropolitan Canada, combined with strong demand for broadband, has resulted in significant growth in this market. Data from the leading broadband access providers indicates that between June 2001 to March 2002, DSL subscriptions have more than doubled, while the early growth of cable internet providers is slowly being pegged back. Bell Canada's DSL service has grown significantly since 2001, surpassing 1 million subscribers in March 2002, and it is now the leading broadband access provider in the country.

### Leading Broadband Access Providers in Canada, 2001 & 2002 (in thousands of subscribers)

	Technology	30 June 2001	End of 2001	31 March 2002
TELUS	DSL	84	131	210
Bell Canada (Sympatico)	DSL	466	757	1,000
Cogeco@home	Cable	94	130	143*
Videotron	Cable	173	228-	
Rogers@home	Cable	347	479	500
Shaw@home	Cable	401	715	731*

Note: \*subscribers as of 28 February 2002

Source: company data, 2002

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Data from the Yankee Group indicates that the market share of Bell Canada and TELUS, the two leading DSL providers, has grown between 2000 and 2001, compared with other the leading cable internet providers, which have either maintained their market share or lost ground.

**High-Speed Internet Service Provider Market Share in Canada, 2000 & 2001**

<b>Market share in year ending December 31</b>		
	<b>2000</b>	<b>2001</b>
1. Shaw	28%	28%
2. Bell	20%	24%
3. Rogers	24%	19%
4. Videotron	11%	9%
5. Telus	6%	9%
6. Cogeco	6%	5%
7. Aliant	3%	3%
8. MTS	1%	1%
9. SaskTel	1%	1%

Source: Yankee Group, 2002; Marketing Online, May 2002

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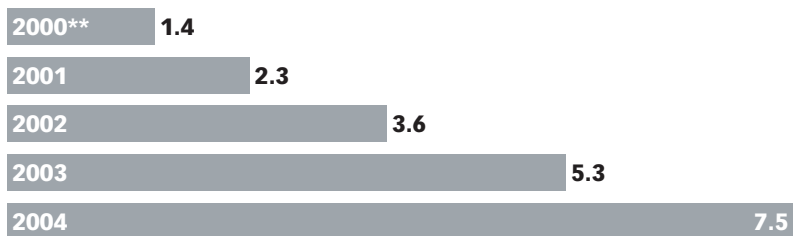
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**“It is no exaggeration to say that over time, the impact of broadband communications on Canadian life will be at least as great as the impact of railways, highways, airlines, traditional telecommunications and broadcasting.”**

– The Canadian National Broadband Taskforce

eMarketer forecasts 7.5 million broadband households in Canada in 2004, up from 2.3 million at the end of 2001.

**Broadband\* Households in Canada, 2000-2004 (in millions)**



Note: \*cable and DSL; \*\*eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD)

Source: eMarketer, December 2001

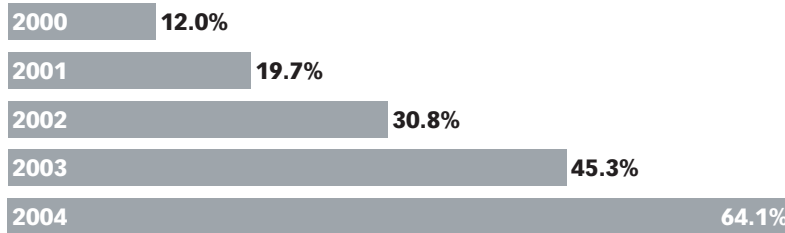
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Broadband penetration will reach 64% of households if broadband continues to grow as quickly as it has done over the last two years.

### Broadband Penetration in Canada, 2000-2004 (as a % of total households)



*Note: Based on 11.7 million households at the end of 2001*  
*Source: eMarketer, June 2002*

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The OECD reported 1.9 million broadband residential and small business subscribers in Canada as of 30 June 2001. eMarketer has based its forward projections on data from the OECD.

**Comparative Estimates: Broadband Households in Canada, 2000-2002 (in millions)**

	<b>2000</b>	<b>2001</b>	<b>2002</b>
Kinetic Strategies, 2000	1.0	–	–
Ovum, October 2000	1.3	1.9	2.1
Convergence Consulting, 2001	–	2.6	3.9
Statistics Canada*, 2001	1.0	–	–
OECD, October 2001	1.4	1.9**	–
Yankee Group, May 2002	1.3	2.5	–
<b>eMarketer, June 2002</b>	<b>1.4</b>	<b>2.3</b>	<b>3.6</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*cable only; \*\*subscribers as of 30 June 2001*

*Source: eMarketer, June 2002; various, as noted, 2000-2002*

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**DSL**

The early launch of cable internet services in Canada has forced the telecommunications companies to act, and as a result of greater DSL availability and cheap access, DSL is growing extremely quickly. Bell Canada and its subsidiaries largely control the telecommunications sector serving the great majority of the population of Canada. The other big holding company is TELUS Corporation which owns the incumbents in British Columbia and Alberta. The remaining major incumbent is SaskTel, which serves Saskatchewan and is owned by the provincial government.

eMarketer forecasts there will be 3.5 million DSL households in the country by 2004, up from less than 1 million in 2001. Bell Canada and TELUS are both experiencing strong subscriber growth in 2002.

**DSL Broadband Households in Canada, 2000-2004 (in millions)**



*Note: \*eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD)*

*Source: eMarketer, December 2001*

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Point-Topic recently estimated Canada had 951,000 residential DSL subscribers at the end of 2001.

**Comparative Estimates: DSL Households in Canada, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Kinetic Strategies, 2001	177	845	-	-	-
OECD, October 2001	400	702*	-	-	-
Point-Topic, April 2002	-	951	-	-	-
<b>eMarketer, June 2002</b>	<b>400</b>	<b>900</b>	<b>1,600</b>	<b>2,300</b>	<b>3,500</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2001 & 2002*

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DSL is well suited to the small to medium business sector. Point-Topic reported that there were 195,000 Canadian businesses utilizing DSL at the end of 2001.

**DSL Subscribers in Canada, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>194.8</b>
<b>Residential</b>	<b>950.8</b>
<b>Total</b>	<b>1,145.6</b>

*Source: Point-Topic, April 2002*

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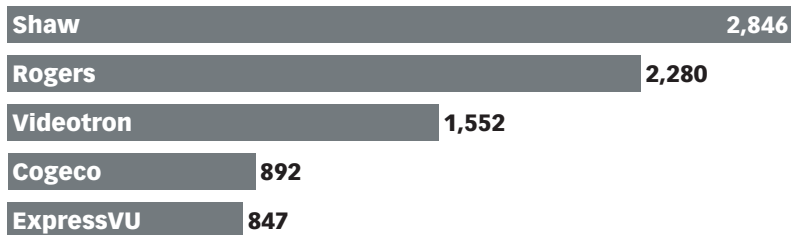
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## Cable

Canada has a cable network infrastructure passing 93% of homes, according to the OECD. Extensive upgrades of the cable television network over the last 2 years has meant that all major cable operators are offering cable internet services to the vast majority of their subscribers. Recent figures indicate that Shaw Communications is the leading cable provider in Canada with over 2.8 million cable TV subscribers at the end of 2001, followed by Rogers with 2.3 million.

### Canadian Cable TV Subscribers, by Provider, 2001 (in thousands)



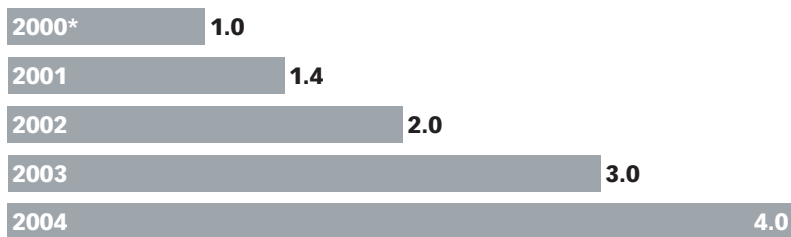
Source: Shaw Communications, 2001

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Cable has taken an early lead over other broadband technologies in Canada. Aggressive pricing and bundling of services from Shaw Communications and Rogers has made broadband affordable to wide sections of the population. eMarketer forecasts 4 million cable modem households in Canada by 2004.

### Cable Modem Broadband Households in Canada, 2000-2004 (in millions)



Note: \*eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD)

Source: eMarketer, December 2001

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The OECD reported 1.2 million cable modem subscribers in Canada as of 30 June 2001. eMarketer has used OECD data for its projections going forward.

**Comparative Estimates: Cable Internet Households in Canada, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Statistics Canada, 2001	1,000	–	–	–	–
Kinetic Strategies, 2001	600	1,600	–	–	–
OECD, October 2001	918	1,200*	–	–	–
<b>eMarketer, June 2002</b>	<b>918</b>	<b>1,400</b>	<b>2,000</b>	<b>3,000</b>	<b>4,000</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2001*

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**Alternative Broadband Technologies**

Fixed wireless is an alternative to cable and DSL that utilizes microwave technology. Auctions for fixed-wireless spectrums in Canada took place in 1998 and 1999, with a number of commercial offerings following shortly afterward. While broadband fixed wireless will predominantly be a last-mile solution targeted at businesses, the market in Canada is expected to grow in regions where cable or fixed-line infrastructure is less developed.

Both Bell Canada Enterprises and Shaw Communications have plans to offer two-way satellite access in the coming years. Shaw has been licensed to place its own Ka-band satellite into the 107.3 degrees west orbital slot. This commercial satellite, the first not owned by Bell Canada, will allow two-way speeds between 300 to 500 Kbps. It is expected to be in service in 2004. The sheer size of Canada means that fixed-line services will not be available to all rural areas. Satellite internet offers a viable means of internet access for many of those not serviced by cable or DSL. Satellite may help bridge the 'digital divide' experienced by some in rural regions.

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## Broadband Costs

One of the strong drivers for broadband in Canada over the last two years has been cheap broadband access. Bell Canada's DSL offering of 960kbps downstream at \$29.74 per month is almost \$20 cheaper than a similar broadband service offered by Verizon in the US. Likewise, cable internet services for \$20 per month currently offered by Shaw is more than twice as cheap as Road Runner's service in New York. These prices, in fact, are not significantly more expensive than US dial-up prices.

What is worth noting, however, is that since Bell Sympatico reduced its prices for DSL there has been a marked increase in subscribers which has resulted in numerous consumer complaints of poor performance of its DSL service. Download speeds advertised at 1Mbps have been reported as low as 120kbps in peak times. This is despite the fact that DSL is supposedly unaffected by the number of people using the network.

### Selected Broadband Access Plans in Canada, 2002

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge	Mbytes included
Bell Canada	DSL	960/120	0	\$29.74	Unlimited
Shaw Communications	Cable	512+ downstream	\$20	\$20.00	Unlimited
Rogers	Cable	512+ downstream	\$66	\$36.34	Unlimited

Source: company reports, 2002

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.

[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

**“We purchased your ‘Benefits of Broadband’ report and have enjoyed it a lot. Finally — a report which summarizes the analysts’ forecasts and focuses on the benefit side through the applications”**

– Jon Bohmer, Chairman, Proto TV AS

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## B. United States

### Summary

The United States is the largest broadband market in the world, but in terms of household penetration it ranks 2nd behind Canada in North America and 7th globally. While cable internet and DSL are available to over 75% of the US population, the demand for broadband has been steady rather than spectacular to date.

### US Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
4,100	6,800	300	11,200	10.39%	2	7

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 2 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International Telecommunication Union reported the United States had 142.8 million internet users in 2001. eMarketer forecasts this number to rise to over 174 million by 2004.

### Internet Users in the US, 2000-2004 (in millions)

2000*	124.0
2001*	142.8
2002	152.8
2003	162.0
2004	174.9

*Note: \*eMarketer's year 2000 and 2001 baselines are from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*

Source: eMarketer, May 2002

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## Internet Households

eMarketer estimates there were 56.4 million households online in the US at the end of 2001. This equates to 52% of all households. Of those households online, 45.2 million used a dial-up connection and 11.2 million used a high-speed internet connection.

### Internet Households in US, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	45,200	41.9%
DSL	4,100	3.8%
Cable	6,800	6.3%
Other	300	0.3%
<b>Total broadband households</b>	<b>11,200</b>	<b>10.4%</b>
<b>Total online households</b>	<b>56,400</b>	<b>52.3%</b>

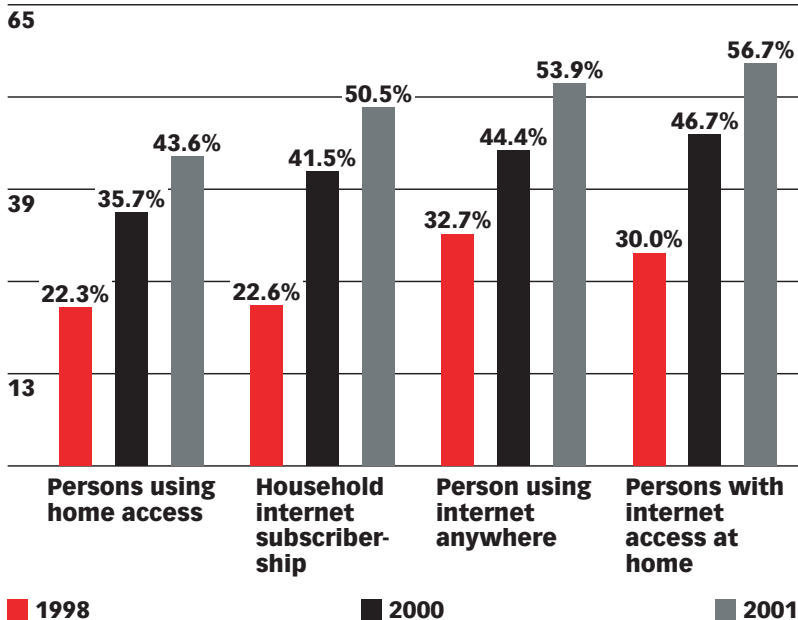
Note: \*based on 107.8 million households; \*\*includes ISDN & WebTV  
Source: eMarketer, 2002

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eMarketer's household penetration rate corresponds closely with the US Department of Commerce surveys. In its study *A Nation Online*, published in February 2002, it reported that 50.5% of US households had an internet subscription as of September 2001.

### Household and Internet Use in the US, December 1998, August 2000 & September 2001



Source: US Department of Commerce, February 2002

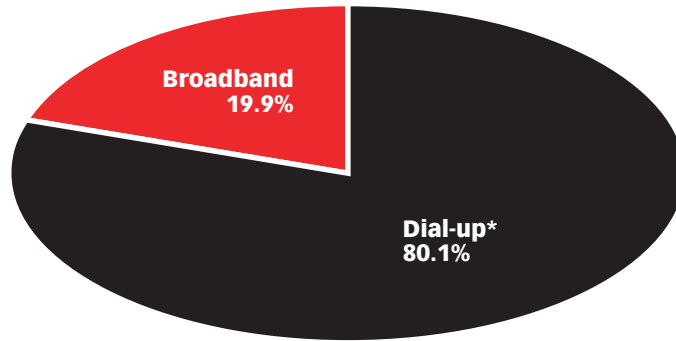
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Broadband households account for 20% of all online households in the US as of year-end 2001. While the dial-up market is shrinking, it will be some time before broadband becomes the most popular means of internet access in US homes.

**Percent of US Online Households, Dial-Up and Broadband, End of 2001**



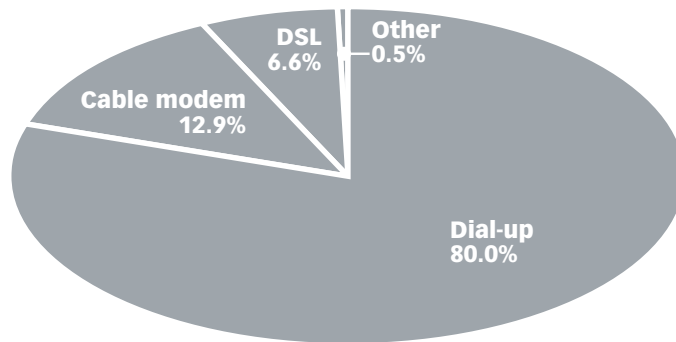
Note: \*Includes ISDN and WebTV  
Source: eMarketer, April 2002

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The US Department of Commerce, likewise, reports that dial-up accounts for 80% of all online households.

**US Online Households, by Access Technology, September 2001 (% of online households)**



Source: US Department of Commerce, February 2002

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## Dial-Up

The dial-up market is not going away anytime soon in the US. For many millions of internet users, the primary reason for getting online is to send and check e-mail and to casually surf the web. Paying double the cost of a dial-up connection for high-speed access makes little sense for these people. eMarketer expects the dial-up market to grow marginally in 2002 and then begin to lose ground as subscribers 'trade-up' to broadband.

### Dial-Up Households in the US, 2000-2004 (in millions)

<b>2000*</b>	<b>41.8</b>
<b>2001</b>	<b>45.2</b>
<b>2002</b>	<b>46.1</b>
<b>2003</b>	<b>44.7</b>
<b>2004</b>	<b>42.1</b>

Note: \*eMarketer dial-up household baseline 2000 figure (end of year) is based on the US Department of Commerce - August 2000 figure (38.9 million) projected forward to the end of year  
 Source: eMarketer, 2002

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Most research firms also predict the dial-up market will peak around 2002 and then begin to lose subscribers over the following years.

### Comparative Estimates: Dial-Up Households in the US, 2000-2004 (in millions)

	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
Adams Media Research, May 2001	40.2	43.2	45.4	45.9	44.5
<b>eMarketer, December 2001</b>	<b>41.8</b>	<b>45.2</b>	<b>46.1</b>	<b>44.7</b>	<b>42.1</b>
Gartner Dataquest, October 2001	50.9	49.8	46.7	42.3	38.3
PricewaterhouseCoopers LLP (PWC), May 2001	42.7	46.1	47.0	46.5	45.0
US Department of Commerce, August 2000	38.9	-	-	-	-

Source: eMarketer, April 2002; various, as noted, 2000 & 2001

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AOL continues to dominate the dial-up internet market, reporting approximately 28 million subscribers across all its brands at the end of 2001. Its next nearest rivals are MSN with 8 million subscribers and United Online with 5.6 million. The leading broadband access provider is Road Runner with 1.9 million subscribers, followed by AT&T Broadband with 1.5 million, according to ISP-Planet.

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It is interesting to note that ISP-Planet reported in May 2002 that AOL lost 1.6 million users in the first three months of 2002. AOL did, however, pick up 3 million subscribers in Europe, and its broadband service, Road Runner, grows apace.

**US Internet Service Providers, by Number of Subscribers and Access Technology, End of 2001 (in millions)**

	<b>Dial-up</b>	<b>Cable Internet</b>	<b>DSL</b>		
AOL Brands	27.7	Road Runner	1.9	SBC	1.3
MSN	8.0	AT&T Broadband	1.5	Verizon	1.2
United Online	5.6	Comcast	0.95	Bell South	0.62
Earthlink	4.8	Cox	0.78	Qwest	0.45
Prodigy	3.6	Charter	0.65	Covad	0.35
Compuserve	3.0	Cablevision	0.51		
AT&T Worldnet	1.4	RCN	0.12		
PeoplePC	0.45				
RCN	0.36				
Volaris Online	0.25				
Bluelight	0.2				

*Source: ISP-Planet, February 2002*

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**Broadband Access**

eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.

The current debate around broadband relates to both the supply and demand for broadband in the US. While the majority of the population may have broadband available to them, this is not necessarily an indication of the adoption of the service.

**“The transformative potential of broadband technologies is, I believe, akin to the major infrastructure developments that built America to greatness.”**

– US Federal Communications Commissioner, Michael Copps

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**Supply**

The Federal Communications Commission (FCC) released a report in February 2002 which indicated that 78% of the nation's zip codes contained a high-speed subscriber. The FCC states that approximately 97% of the nation's population lives in the 78% of zip codes where a provider reports having at least one high-speed subscriber. Multiple high-speed internet providers are within 58% of zip codes in the nation, according to the FCC.

**Access to Broadband in the US, 1999-2001 (as a % of zip codes with high-speed lines in service)**

Number of providers	December 1999	June 2000	December 2000	June 2001
0	40.3%	33.0%	26.8%	22.2%
1	26.0%	25.9%	22.7%	20.3%
2	15.5%	17.8%	18.4%	16.7%
3	8.2%	9.2%	10.9%	13.2%
4	4.3%	4.9%	6.1%	8.2%
5	2.7%	3.4%	4.0%	4.9%
6	1.7%	2.5%	3.0%	3.6%
7	0.8%	1.7%	2.3%	2.8%
8	0.3%	0.8%	2.0%	2.2%
9	0.2%	0.4%	1.6%	1.9%
10+	0.0%	0.4%	2.4%	3.9%

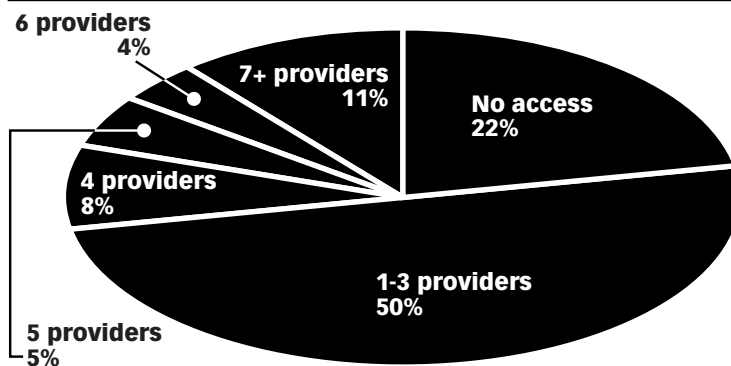
Source: Federal Communications Commission (FCC), February 2002

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In June 2001, the FCC reported that 22% of zip codes have no access to broadband in the US, and within 50% of zip codes, residents have access to between one and three high-speed internet providers.

**Broadband Access in the US, by Number of Providers, 30 June 2001 (as a % of zip codes with high-speed lines in service)**



Source: Federal Communications Commission (FCC), February 2002

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In September 2001, the Information Technology Association of America conducted a random telephone survey which indicated that 64% of respondents said DSL or cable service is available in their home areas, but only 19% said they utilize a high-speed internet connection.

According to the most recent Morgan Stanley Dean Witter consumer broadband forecast, 81 million or 77% of U.S. households will have broadband cable modem service available by the end of 2001. Fifty-one million or 49% of U.S. households will have DSL available. And by year-end 2004, Morgan Stanley projects that homes passed by cable modem service and DSL will increase respectively to 92% and 80% of U.S. households.

While competition is slowly increasing in the local loop in the US and a variety of new broadband technologies are emerging as alternatives to cable and DSL, the current supply of broadband internet access is dominated by cable companies and regional Bell operating companies (RBOCs). Covad is the only new entrant into the broadband space of any note, and as has been well publicized, this company has had its share of financial turmoil. There are currently a number of Bills within Congress and the Senate which propose means to increase competition for broadband in the US, but there is little consensus as to the exact way of doing this. The convergence of voice, video and data has made previous legislation unclear and less relevant in 2002. As a result there is legal uncertainty in the sector, which does not promote or encourage new entrants.

**Demand**

The latest high-speed study from the US Federal Communications Commission (FCC) reports that there were roughly 9.6 million high-speed lines in the US in June, 2001 – a 250% increase since August 2000. The FCC collects its high-speed data from standardized information from advanced telephony providers like wireline telephone companies, cable companies, wireless providers and satellite providers. Data is based on 250 or more high-speed service lines (or wireless “lines”) in a given US state.

The latest FCC study found that the number of high-speed residential and small business lines in particular grew 51% between December 2000 and June 2001 – from roughly 5.2 million to 7.8 million.

**Number of US Residential and Small Business Broadband Lines, by Technology, June 2001 (over 200 kbps in at least one direction)**

	<b>June 2001</b>	<b>% change June 2000-December 2000</b>	<b>% change from December 2000-June 2001</b>
ADSL	2,490,740	107%	56%
Other wireline	138,307	–	–
Coaxial cable	4,998,540	49%	52%
Fiber	2,623	–	–
Satellite or fixed wireless	182,165	59%	78%
<b>Total lines</b>	<b>7,812,375</b>	<b>63%</b>	<b>51%</b>

Source: Federal Communications Commission (FCC), February 2002

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Importantly, the FCC indicates that there were only 4.26 million residences and small businesses with broadband at 200kbps in both downstream and upstream directions in June 2001.

**Number of US Residential and Small Business Broadband Lines, by Technology, June 2001 (over 200 kbps in both directions)**

	<b>June 2001</b>	<b>% change June 2000-December 2000</b>	<b>% change from December 2000-June 2001</b>
ADSL	916,364	101%	133%
Other wireline	138,307	–	–
Coaxial cable	3,146,953	55%	45%
Fiber	2,617	–	–
Satellite or fixed wireless	60,988	–	–
<b>Total lines</b>	<b>4,265,229</b>	<b>62%</b>	<b>54%</b>

Source: Federal Communications Commission (FCC), February 2002

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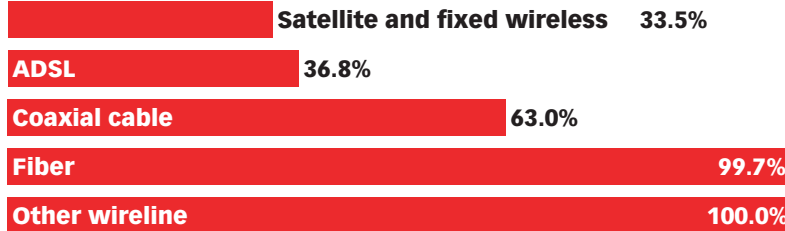
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The FCC data shows that subscribers to cable modems are nearly twice as likely to have broadband over 200kbps in both directions, as are subscribers to Asynchronous Digital Subscriber Line (ADSL).

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**Percent of Total US Residential and Small Business Broadband Lines over 200kbps in Both Directions, by Technology, June 2001**

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Source: Federal Communications Commission (FCC), February 2002; eMarketer calculations, March 2002

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California, New York and Texas have the greatest number of high-speed lines in the US according to the FCC, which is not altogether surprising considering their population sizes.

**US Broadband Lines, by State, June 2001 (over 200 kbps in at least one direction)**

Alabama	86,234	Nebraska	55,188
Alaska	20,906	Nevada	78,583
Arizona	158,122	New Hampshire	55,658
Arkansas	40,803	New Jersey	428,514
California	1,705,814	New Mexico	20,482
Colorado	147,220	New York	893,032
Connecticut	149,057	North Carolina	205,616
Delaware	12,771	North Dakota	6,277
District of Columbia	39,101	Ohio	358,965
Florida	651,167	Oklahoma	92,947
Georgia	302,598	Oregon	93,242
Hawaii	–	Pennsylvania	263,236
Idaho	20,233	Puerto Rico	–
Illinois	350,241	Rhode Island	49,215
Indiana	80,364	South Carolina	96,839
Iowa	72,583	South Dakota	5,448
Kansas	101,734	Tennessee	152,510
Kentucky	39,297	Texas	646,839
Louisiana	121,685	Utah	55,103
Maine	38,149	Vermont	16,230
Maryland	181,021	Virgin Islands	–
Massachusetts	357,256	Virginia	212,808
Michigan	395,583	Washington	227,066
Minnesota	148,012	West Virginia	16,697
Mississippi	21,517	Wisconsin	127,755
Missouri	123,915	Wyoming	–
Montana	10,446	<b>Total</b>	<b>9,616,341</b>

Source: Federal Communications Commission (FCC), February 2002

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Research from Leichtman Research Group shows reported subscriber numbers for the leading cable internet and DSL providers in the US as of the 1<sup>st</sup> quarter 2002. The data indicates subscribers to broadband have grown nearly 80% over the period.

### Broadband Subscribers in the US, Q1 2001 & Q1 2002

#### Cable Modem

	Q1 2002	Q1 2001	Net adds
Time Warner	2,195,000	1,183,000	1,012,000
AT&T	1,625,000	1,134,000	491,000
Comcast	1,040,500	574,300	466,200
Cox	1,001,311	587,170	414,141
Charter	747,700	324,600	423,100
Cablevision	559,765	303,800	255,965
Adelphia	377,500	150,906	226,594
Mediacom	112,300	79,800	32,500
Insight	88,100	30,300	57,800
Cable One	32,900	3,600	29,300
<b>Total top cable</b>	<b>7,780,076</b>	<b>4,371,476</b>	<b>3,408,600</b>

#### DSL

SBC	1,500,000	945,000	555,000
Verizon	1,350,000	720,000	630,000
Bell South	729,000	303,000	426,000
Qwest	484,000	306,000	178,000
<b>Total top DSL</b>	<b>4,063,000</b>	<b>2,274,000</b>	<b>1,789,000</b>
<b>Total broadband</b>	<b>11,843,076</b>	<b>6,645,476</b>	<b>5,197,600</b>

*Note: All data from Q1 2002, except Adelphia, Mediacom, Insight and Cable One from Q4 2001*

*Source: Leichtman Research Group, Inc. (LRG), May 2002*

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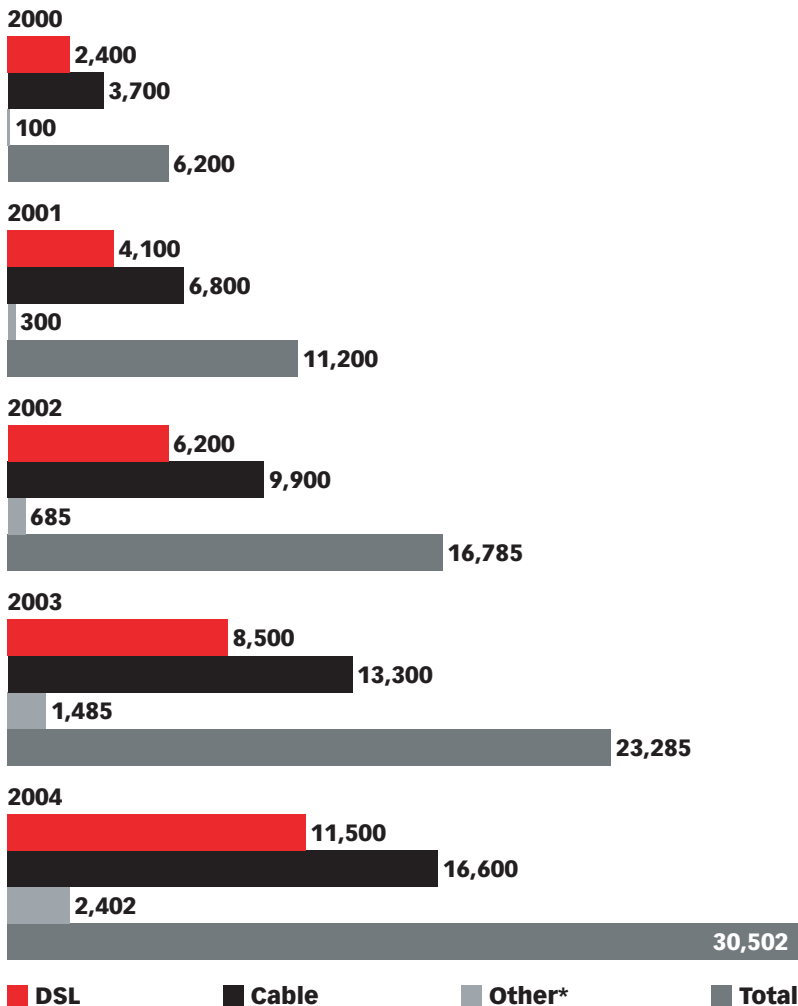
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## eMarketer Broadband Forecast

eMarketer forecasts 30.5 million broadband households in the US in 2004, up from 11.2 million at the end of 2001. This is a demand-driven forecast based on previous and current growth rates.

Cable internet will continue to be the broadband technology of choice growing to 16.6 million households in 2004, from 6.8 million households in 2001. DSL will grow to 11.5 million households in 2004 from 4.1 million in 2001. Alternative broadband technologies such as fixed-wireless, satellite, fiber, Ethernet and others will begin to garner substantial numbers of subscribers over the next few years.

### Broadband Households in the US, by Access Technology, 2000-2004 (in thousands)



Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes, fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, June 2002

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The Yankee Group's residential broadband forecasts are slightly more conservative than those of eMarketer. They forecast that by 2004 there will be 26.7 million households, and by 2007, 41.7 million residential subscribers.

**Residential Broadband Subscribers in the US, by Access Technology, 2002-2007 (in millions)**

	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>
Fixed wireless	0.05	0.06	0.1	0.2	0.2	0.3
Satellite	0.2	0.5	1.3	2.0	2.7	3.4
DSL	5.1	6.7	8.4	10.2	12.1	13.8
Cable modem*	10.6	14.0	16.9	19.6	22.0	24.2
<b>Total</b>	<b>16.0</b>	<b>21.3</b>	<b>26.7</b>	<b>32.0</b>	<b>37.0</b>	<b>41.7</b>

*Note: \*cable modem numbers include businesses subscribing to residential class service*

*Source: Yankee Group, April 2002*

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Among the variety of research estimates for broadband, there is a reasonable amount of consensus that there were approximately 11 million broadband households in 2001 and that there will be approximately 30 million broadband households in the US by 2004. The OECD reported 8.8 million broadband residential and small business subscribers in the US as of 30 June 2001. eMarketer has based its forward projections on data from the OECD.

## Comparative Estimates: Broadband Households in the US, 2000-2004 (in millions)

	2000	2001	2002	2003	2004
Adams Media Research, May 2001	5.9	10.7	16.8	22.2	27.1
BDRC/ European Union, August 2001	5.2	9.7	17.2	22.6	-
<b>eMarketer, June 2002</b>	<b>6.2</b>	<b>11.2</b>	<b>16.8</b>	<b>23.3</b>	<b>30.5</b>
Federal Communications Commission*, February 2002	-	7.8	-	-	-
Gartner Dataquest, October 2001	6.1	11.8	18.5	25.8	32.2
Harris Interactive, September 2001	-	14.9	-	-	-
International Data Corporation (IDC), July 2001	-	-	-	20.0	-
Jupiter Research, December 2000	5.2	8.6	13.3	18.5	23.8
Kinetic Strategies, March 2002	-	10.8	-	-	-
NetProfit, August 2001	6.5	14.4	22.4	30.4	42.5
OECD, October 2001	6.2	8.8*	-	-	-
Parks Associates, September 2001	-	10.7	-	-	30.6
PricewaterhouseCoopers (PwC), May 2001	3.8	8.2	13.2	18.3	23.1
Strategis Group, January 2001	6.1	11.6	17.6	23.5	29.6
US Department of Commerce, October 2000	4.7	-	-	-	-
Yankee Group, April 2002	-	-	16.0	21.3	26.7

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, June 2002; various, as noted, 2000-2002*

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## Broadband Users

While 'broadband households' is the most common metric used when examining the broadband market, it does not necessarily reflect the true size of the market. Typically, one broadband connection in the home will service more than one user. With the growing prevalence of home networks and homes having more than one internet access point (e.g., multiple PCs and internet-enabled TVs), this will increasingly be the case.





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## DSL

The major players in the US DSL market are the traditional incumbent local operators: Verizon, Bell South, Qwest, SBC and others. Two years ago Covad Communications, NorthPoint Communications and Rhythms NetConnections emerged on the scene and looked like realistic competitors to the 'Baby Bells.' In June 2002, only Covad survived, and the baby Bells continue to dominate the space.

From a small base, eMarketer expects DSL will grow to reach 11.5 million households by 2004. It is unlikely that DSL will surpass cable internet subscribers in the US for some years, or at all, due to the early lead and continuing growth within cable internet.

There are a variety of differing estimates for the DSL market in the US in 2004. They range from a low of 8.4 million from the Yankee Group to a high of 26 million from IDC.

### Comparative Estimates: DSL Households in the US, 2000-2004 (in millions)

	2000	2001	2002	2003	2004
Adams Media Research, May 2001	2.2	4.5	7.1	9.6	11.6
BDRC/European Union, August 2001	1.7	3.2	6.4	8.8	-
Cahners In-Stat Group, June 2001	2.4	4.6	7.6	11.5	14.6
<b>eMarketer, December 2001</b>	<b>2.4</b>	<b>4.1</b>	<b>6.2</b>	<b>8.5</b>	<b>11.5</b>
Federal Communications Commission (FCC), February 2002	0.8	2.5	-	-	-
Gartner Dataquest, October 2001	1.9	3.4	5.5	7.7	9.6
International Data Corporation (IDC), July 2001	2.3	-	-	-	26.0
Net Profit, August 2001	2.5	5.9	9.8	12.9	20.3
OECD, October 2001	2.4	*3.3	-	-	-
Point-Topic, April 2002	-	3.3	-	-	-
Telecommunications Reports International, February 2002	2.4	3.9	-	-	-
Yankee Group, April 2002	-	-	5.1	6.7	8.4

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, April 2002; various, as noted, 2001 & 2002*

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DSL is also a particularly attractive broadband technology for the business market. DSL provides dedicated high-speed internet access at a fraction of the cost of services such as copper T-1 and fiber optics and in many markets even ISDN. Few businesses have access to two-way cable networks, therefore DSL will be more readily available than cable modem access. Point-Topic's research indicates that at the end of 2001 there were over 1 million businesses using DSL technology.

**DSL Subscribers in the US, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>1,047.3</b>
<b>Residential</b>	<b>3,316.6</b>
<b>Total</b>	<b>4,363.9</b>

Source: Point-Topic, April 2002

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**Cable**

Data from the National Cable and Telecommunications Association (NCTA) indicate there were nearly 73 million cable TV households, or 69.2% of all TV households in the US at the end of 2001.

**US Cable Industry Statistics, Year-end 2001**

Basic cable households*	72.69 million
US television households*	105.4 million
Cable penetration of TV Households*	69.2%
Homes passed by cable*	98.6 million
Homes passed as a % of TV Households*	96.70%
Basic cable/homes passed*	69.90%
Digital Cable Subscribers (November 2001)	13.7 million
Homes passed by cable modem service (November 2001)	70.0 million
Cable modem subscribers (eMarketer, Year-end 2001)	6.8 million
Cable telephony subscribers (August 2001)	1.5 million
Annual cable revenue	\$48.2 billion

Note: \*December 2001

Source: eMarketer; National Cable & Telecommunications Association (NCTA), 2001

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According to Lehman Brothers, most of the major cable operators will have completed their network upgrades by 2003 to allow for two-way high speed internet. AT&T Broadband, however, which Comcast has expressed an interest in purchasing, still has a significant proportion of its network that needs upgrading compared to its competitors.

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**Percent of Cable Network Upgraded to Allow Two-Way High-Speed Data, by Major US Cable Company, 2000-2003 (as a % of total network)**

	2000	2001	2002	2003
AT&T Broadband	51%	64%	73%	80%
Cox	73%	91%	95%	95%
Cablevision	47%	84%	92%	97%
Charter	51%	65%	85%	95%
Comcast	51%	74%	85%	90%

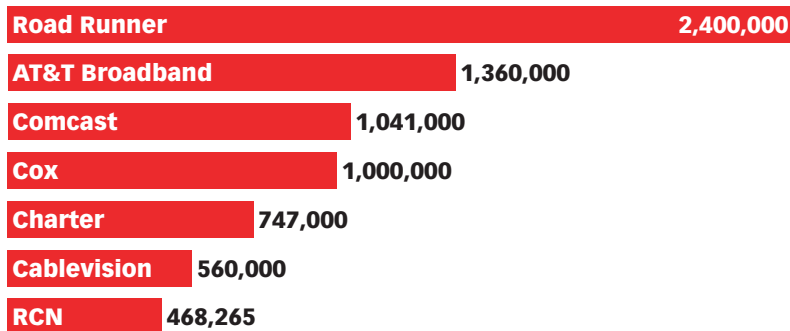
Source: Lehman Brothers, 2002

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Cable modems are the most popular means of broadband access in the US. Due to a high penetration of cable throughout the US and the early customer service difficulties experienced by DSL providers, cable modem access has a head start over other broadband access providers. The leading cable internet access providers are Road Runner, which is Time Warner Cable's broadband ISP, AT&T Broadband and Comcast.

**Leading Cable Internet Access Providers in the US, by Number of Subscribers, Q1 2002**



Source: ISP-Planet, May 2002

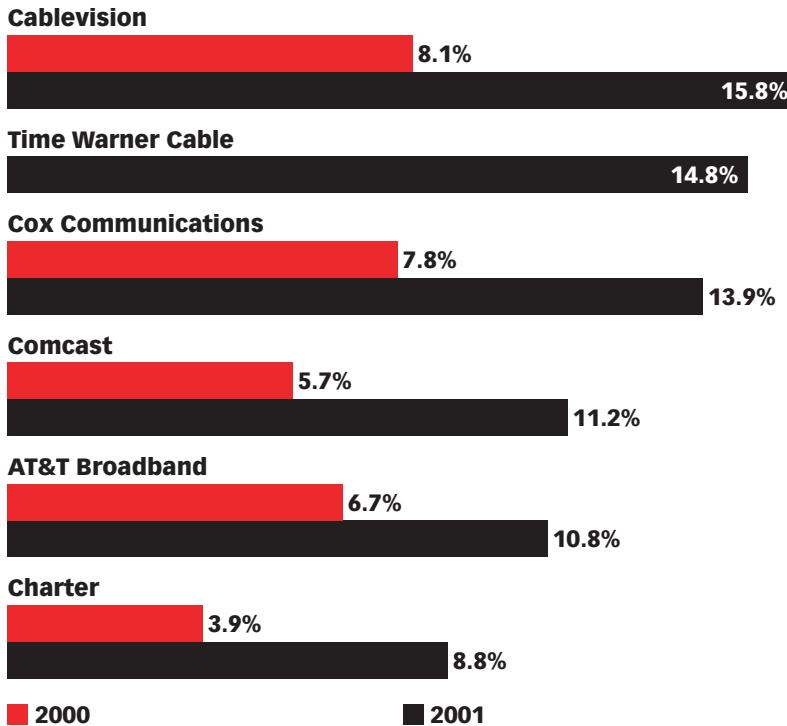
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According to Lehman Brothers, Cablevision has the greatest percentage of high-speed internet subscribers as a percentage of its basic cable subscribers over any cable operator in the US.

**Penetration of High Speed Data Subscribers, by Major US Cable Company, 2000 & 2001 (as a % of basic cable subscribers)**



Source: Lehman Brothers, company reports, February 2002

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eMarketer forecasts that by 2004 there will be 16.6 million cable internet households, rising from 3.7 million households at the end of 2000.

**Comparative Estimates: Cable Internet Households in the US, 2000-2004 (in millions)**

	2000	2001	2002	2003	2004
Adams Media Research, 2001	4.0	6.4	8.6	10.8	13.1
BDRC/European Union, August 2001	3.4	6.0	9.5	11.5	-
Cahner's In-Stat, June 2001	4.2	7.0	10.4	12.5	14.4
<b>eMarketer, June 2002</b>	<b>3.7</b>	<b>6.8</b>	<b>9.9</b>	<b>13.3</b>	<b>16.6</b>
Federal Communications Commission (FCC), February 2002	2.2	5.0*	-	-	-
Gartner Dataquest, October 2001	4.0	7.7	11.6	15.6	18.7
National Cable & Telecommunications Association, March 2002	4.0	7.2	-	-	-
Net Profit, August 2001	3.9	8.1	11.2	14.3	16.6
OECD, October 2001	3.7	5.5*	-	-	-
Telecommunications Reports International, February 2002	4.2	6.6	-	-	-
US Department of Commerce, October 2000	2.4	-	-	-	-
Yankee Group, April 2002	-	-	10.6	14.0	16.9

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, June 2002; various, as noted, 2000-2002*

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## Alternative Broadband Technologies

Two years ago, there was great hope that alternative broadband technologies such as fixed-wireless, satellite and fiber would provide significant competition to cable modems and DSL technology. This has not happened to date. eMarketer has adjusted downwards its previous forecast for this sector as a result of the lack of uptake in the residential sector for broadband technologies other than cable or DSL. eMarketer estimates there are approximately 300,000 households in the US with a broadband connection that is neither DSL or cable modem at the end of 2001. This will grow to 2.4 million US homes in 2004 as alternative broadband technologies become technically and economically viable.

### Comparative Estimates: Alternative Broadband Households in the US, 2000-2004 (in millions)

	2000	2001	2002	2003	2004
Adams Media Research, May 2001	0.1	0.3	1.2	1.7	2.2
Net Profit, August 2001	0.0	0.1	0.3	0.7	1.3
Gartner Dataquest, October 2001	0.2	0.7	1.4	2.5	3.9
Federal Communications Commission (FCC), February 2002	0.1	0.3	-	-	-
Yankee Group, April 2002	-	-	0.3	0.6	1.4
<b>eMarketer, June 2002</b>	<b>0.1</b>	<b>0.3</b>	<b>0.7</b>	<b>1.5</b>	<b>2.4</b>

*Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology*

*Source: eMarketer, December 2001; various, as noted, 2001 & 2002*

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## Fixed Wireless

During 2001, AT&T announced it was getting out of the fixed wireless business. It simply cited that this segment of its business has not met its financial targets, and without further significant capital expenditure, it would not be profitable for some time. The sector also saw some high-profile bankruptcies such as Winstar, Teligent and Metricom.

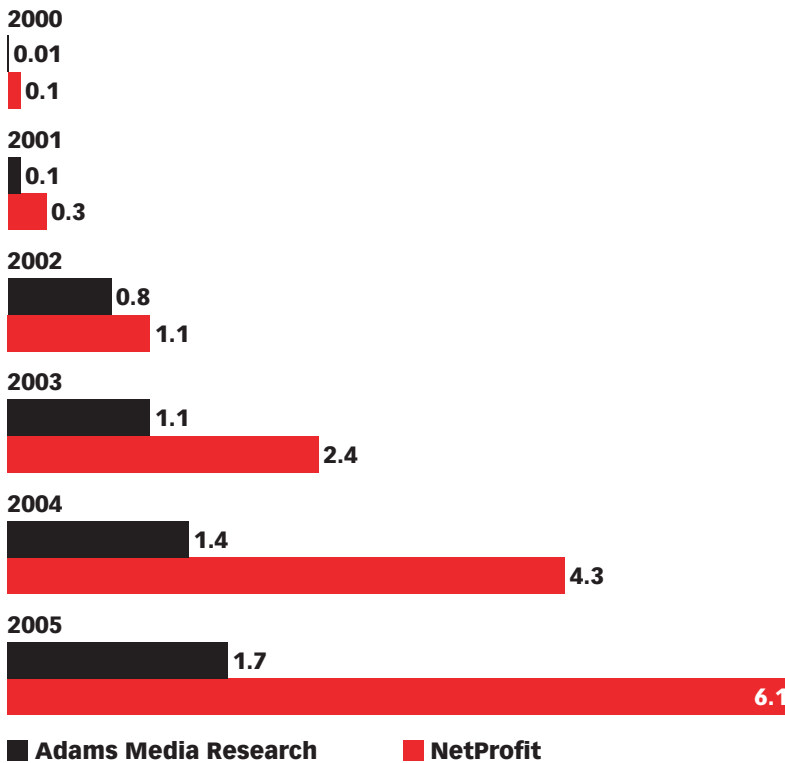
Broadband fixed-wireless connections send data back and forth through fixed antennas via microwave transmission links. There are a number of technologies which utilize different frequency spectrums, but the two most common flavors of fixed wireless are Multipoint Multichannel Distribution Service (MMDS) and Local Multipoint Distribution Service (LMDS).

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Broadband fixed wireless has largely been seen as a complementary broadband solution to existing wire line products such as leased lines, digital subscriber line (DSL) and cable. One of its primary advantages is that service providers can roll out the service without the huge cost of laying last-mile fiber optics cable, and it provides customers a broadband option when the distance limitation of DSL is an issue. The major drawback to the service in the past has been line of sight issues. If leafy trees or buildings obstruct the line of sight between the customer and the base station, then the service can be interrupted.

Adams Media Research and Net Profit both predict strong growth in the fixed-wireless sector. eMarketer is more conservative in this regard.

**Comparative Estimates: Broadband Fixed Wireless Internet Households in the US, 2000-2005 (in millions)**



Source: Adams Media Research, NetProfit, 2001



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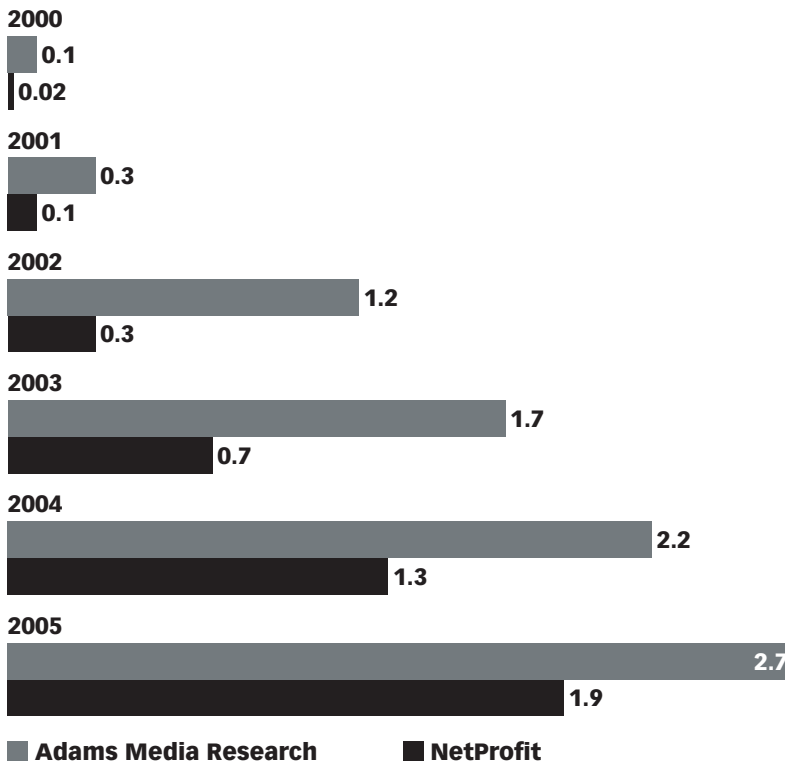
## Satellite

In the past, satellite technology has not been ideal for internet access because it has essentially been a one-way service. Although download speeds can be very high, users have had to use the phone line to transmit their upstream data. Two-way satellite services from providers, such as Starband and DirecPC have now been on the market for over 12 months but have not really attracted large numbers of subscribers. Starband promises downloads speeds of 500 Kbps and upload speeds of 150 Kbps. DirecPC, a subsidiary of DirecTV, the leading satellite television provider in the US, says it can deliver up to 400 Kbps downstream and 128 Kbps (possibly 256 Kbps) upstream. While a satellite dish and installation may cost over \$500, DirecPC's AOL Plus service has a comparable monthly rate (\$42/month) to cable and DSL internet services.

It seems clear that satellite internet will always remain a complementary broadband internet access technology to cable and DSL and be predominately suited to those in rural and regional areas where fixed-line services are not available. The potential for satellite TV providers, however, is bundling digital TV and interactive services together.

Net Profit and Adams Media Research both predict millions of satellite internet subscribers by 2004.

### Comparative Estimates: Satellite Internet Households in the US, 2000-2005 (in millions)



Source: Adams Media Research, NetProfit, 2001

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## Broadband Costs

Broadband costs have remained reasonably static since eMarketer last examined the broadband sector in August 2001. If anything, there has been a slight price rise. In comparison to dial-up internet access, however, broadband still remains at least twice as expensive per month. One of the real problems for broadband providers has been selling the potential benefits of broadband to customers.

---

### Selected Broadband Access Plans in the US, 2002

Company	Access technology	Speed downstream/upstream (Kbps)	Monthly charge	Initial charge
Roadrunner	Cable	512+ /128	\$44.95	\$100
Verizon	DSL	768/128	\$49.95	\$5.85

*Source: company reports, 2002*

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.

[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

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**“We purchased your ‘Benefits of Broadband’ report and have enjoyed it a lot. Finally — a report which summarizes the analysts’ forecasts and focuses on the benefit side through the applications”**

– Jon Bohmer, Chairman, Proto TV AS

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	<b>F. Germany</b>	<b>123</b>
	<b>G. Italy</b>	<b>135</b>
	<b>H. Netherlands</b>	<b>147</b>
	<b>I. Norway</b>	<b>158</b>
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Sweden, Belgium, the Netherlands and Denmark were the leading European broadband countries in terms of household penetration at the end of 2001. These four countries made it into the top 10 list globally. Germany, however, is the leading broadband country in Europe in absolute numbers of subscribers at almost 2.1 million. France, Netherlands and Sweden followed Germany in numbers of broadband households.

Last in Europe is the United Kingdom with approximately 300,000 broadband households at the end of 2001, equating to a household penetration rate of 1.32%.

### Western Europe Broadband Snapshot, End of 2001 (in thousands and household penetration)

	DSL	Cable	Other*	Total	Household penetration	Regional rank	Global rank**
Sweden	190	167	185	542	13.38%	1	5
Belgium	250	170	0	420	10.12%	2	8
Netherlands	120	430	0	550	8.09%	3	9
Denmark	105	85	1	191	7.82%	4	10
Austria	100	140	0	240	6.95%	5	11
Germany	2,000	35	55	2,090	5.50%	6	13
Norway	42	38	2	82	4.19%	7	14
Finland	55	45	0	100	4.12%	8	15
Switzerland	35	64	2	101	3.31%	9	16
Spain	305	70	0	375	3.00%	10	17
Portugal	3	80	0	83	2.52%	11	18
France	400	205	0	605	2.47%	12	19
Italy	250	0	40	290	1.36%	13	21
UK	60	225	10	295	1.32%	14	22
<b>Total</b>	<b>3,915</b>	<b>1,754</b>	<b>295</b>	<b>5,964</b>			

*Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; \*\*Global rank of 27 countries examined*  
*Source: eMarketer, June 2002*

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DSL is the most popular broadband technology in Europe with nearly double the number of cable internet subscribers. If we were to take out Germany's 2 million DSL subscribers, however, cable internet and DSL subscribers would be remarkably similar. Characteristic of the European broadband market is a patchy cable TV network. In some countries such as Belgium and the Netherlands, nearly 100% of households are passed by cable. In other countries such as Italy, Spain and Germany, the cable network is non-existent or needs significant upgrading to allow for two-way internet.

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Sweden and Italy are two countries where alternative broadband technologies to cable and DSL have now established themselves. A number of companies in Sweden and Italy are connecting apartment buildings with optical fiber. Individual apartments are connected using Ethernet at speeds of 10Mbps upstream and downstream.

eMarketer expects Germany to dominate the European broadband sector making up nearly one-third of all broadband subscribers in Europe by 2004. France, Spain, the UK, Italy and the Netherlands will also be significant markets.

### Broadband Households in Western Europe, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Austria	138	240	410	595	755
Belgium	146	420	640	875	1,115
Denmark	67	191	335	505	740
Finland	30	100	202	405	607
France	186	605	1,480	2,745	4,277
Germany	210	2,090	3,790	5,860	8,042
Italy	119	290	680	1,190	1,934
Netherlands	265	550	847	1,380	1,751
Norway	17	82	188	375	618
Portugal	26	83	166	290	470
Spain	61	375	825	1,430	2,146
Sweden	157	542	774	1,046	1,338
Switzerland	31	101	269	574	875
UK	52	295	735	1,420	2,142
<b>Total</b>	<b>1,505</b>	<b>5,964</b>	<b>11,341</b>	<b>18,690</b>	<b>26,810</b>

Source: eMarketer, June 2002

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## A. Austria

### Summary

Austria is one of the more advanced broadband countries in Europe ranking 5th in the region and 11th globally in terms of broadband penetration. Early cable internet services offered by chello Broadband has forced the incumbent – Telekom Austria – to quickly roll out its DSL services and will see DSL overtake cable internet as the most popular broadband technology by the end of 2002.

### Austria Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
100	140	0	240	6.95%	5	11

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International Telecommunication Union reported that Austria had 2.6 million internet users at the end of 2001, up from only 1.25 million in 1999.

### Internet Users in Austria, 1999-2001 (in millions)

1999	1.3
2000	2.1
2001	2.6

Source: International Telecommunication Union (ITU), 2000-2002

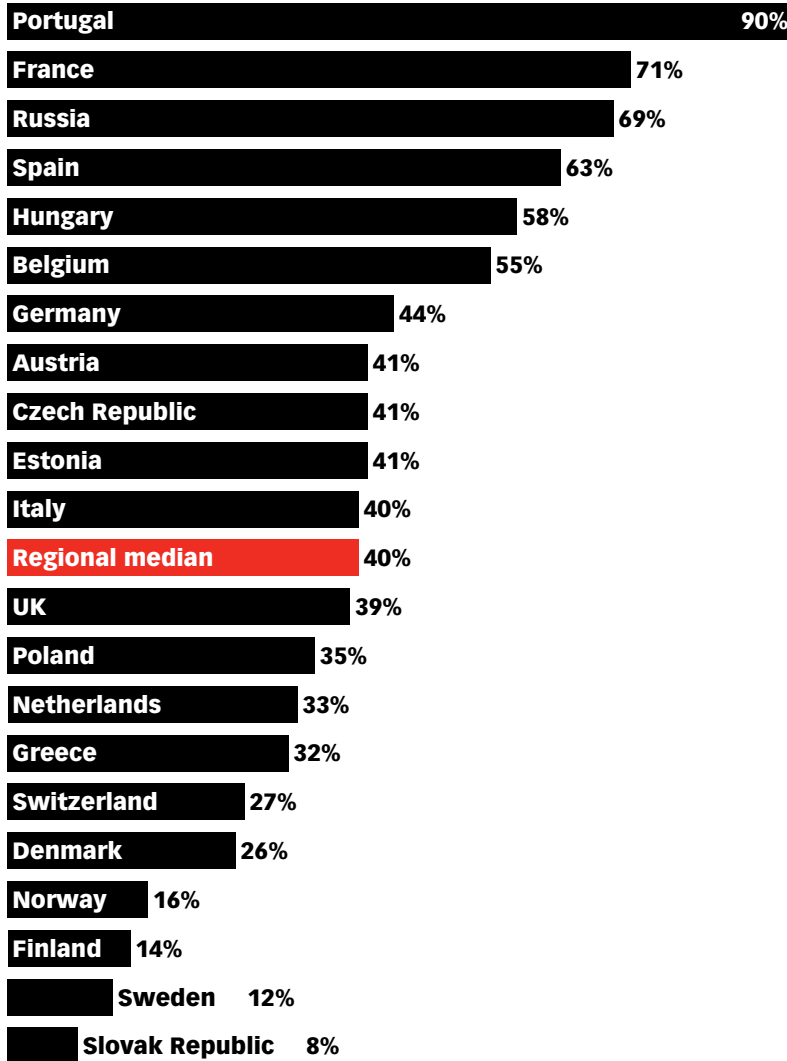
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With the number of internet users growing at a compound annual growth rate of 41% between 1999 and 2001, Austrians are getting online quicker than the regional average, and it is likely that the number of internet users will reach 50% of the population within two years.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002

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## Internet Households

eMarketer estimates there were approximately 1.6 million online households in Austria at the end of 2001. Of these, 1.36 million had a dial-up connection and only 240,000 had a broadband connection.

### Internet Households in Austria, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	1,360	39.4%
DSL	100	2.9%
Cable	140	4.1%
Other	0	0.0%
<b>Total broadband</b>	<b>240</b>	<b>7.0%</b>
<b>Total online households</b>	<b>1,600</b>	<b>46.4%</b>

Note: \*based on 3.45 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

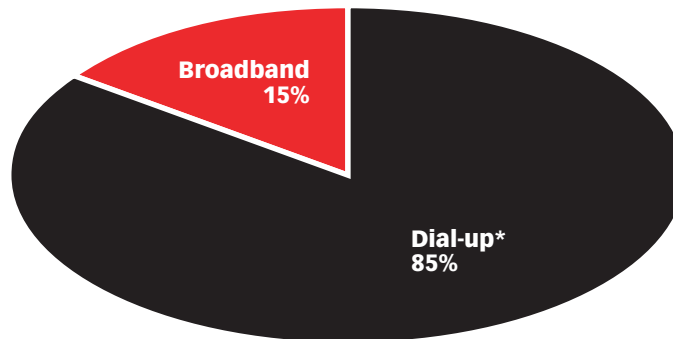
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The European Commission's internet study in December, 2001 showed 47% of Austrian households had internet access. This estimate corresponds closely with with eMarketer's.

While dial-up continues to dominate in Austria, 15% of online households at the end of 2001 connected to the internet using a high-speed connection.

### Percent of Austrian Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

Dial-up access still dominates the internet landscape in Austria, with the incumbent's internet service provider, Jet2Web, recording 656,000 internet subscribers at the end of 2001. According to recent financial reports, Jet2Web controls 37% of the Austrian internet market at the end of 2001, a significant increase from 28% at the end of 2000. Other competitors in the market include Netway and UTA.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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Broadband internet access is now offered by most ISPs and is becoming more widely available in Austria. The Organization for Economic Cooperation and Development (OECD) reports that cable is available to over 53% of all TV households in Austria and Telekom Austria recently announced DSL will be available to 77% of households in 2002. With much of the cable network being able to support two-way service, cable internet stole an early lead on DSL in Austria, due in large part to United Pan-Europe Communications' (UPC) aggressive rollout of its internet service – chello Broadband. This dominance, however, is unlikely to continue for much longer.

Telekom Austria reported 100,000 DSL subscribers at the end of 2001. UPC's chello Broadband service reported 130,000 cable internet subscribers in September 2001, but DSL subscribers are growing far more rapidly than cable internet.

### Leading Broadband Access Providers in Austria, End of 2001 (in thousands)

	Access technology	Subscribers
Telekom Austria	DSL	100.0
UPC/chello Broadband	Cable	129.5*

*Note: \*as of September 2001  
Source: company data, 2002*

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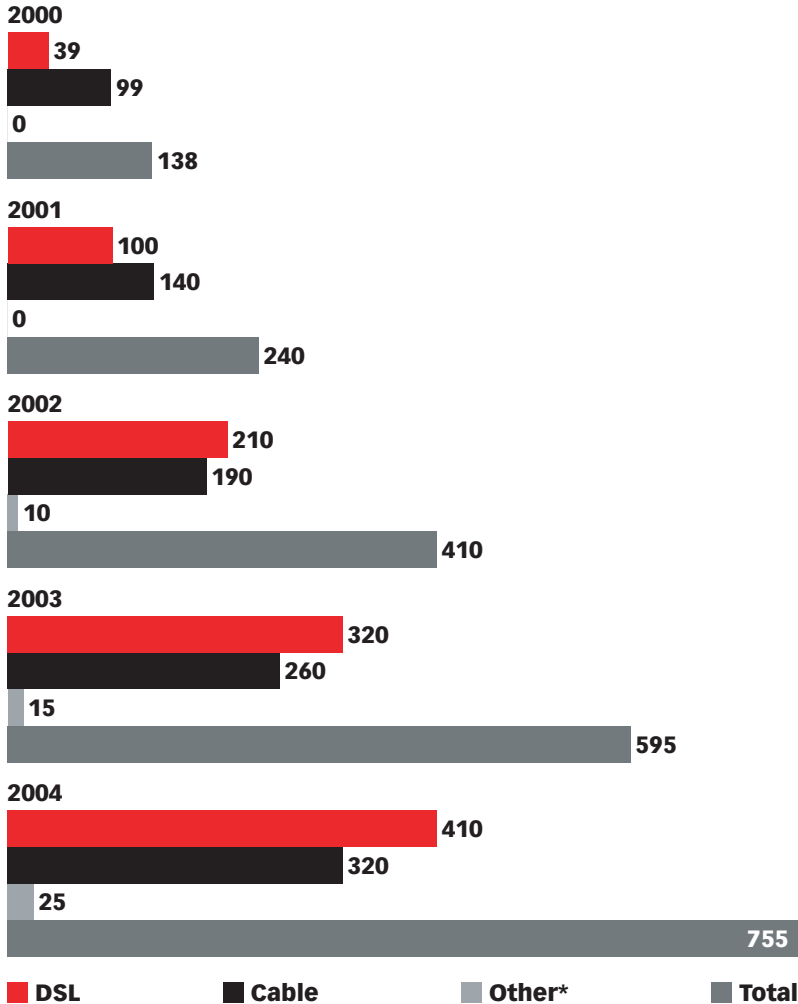
### **“Jet2Web Internet, increased its subscriber base 127% during the business year 2001.”**

– Telekom Austria financial report, 2002

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eMarketer estimates 755,000 broadband households in Austria at the end of 2004, from 240,000 at the end of 2001. Based on current growth rates, the number of DSL subscribers will surpass cable internet subscribers in 2002 and will become the most dominant residential broadband access technology.

**Broadband Households in Austria, by Access Technology, 2000-2004 (in thousands)**



Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

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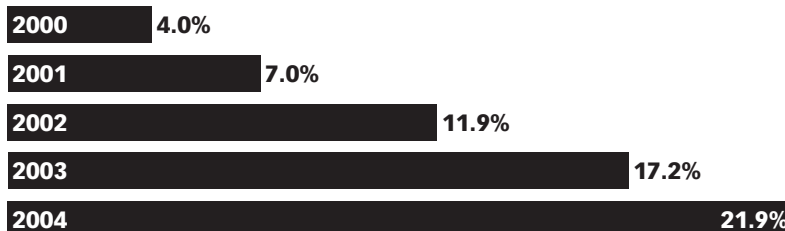
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Broadband penetration at the end of 2001 stood at 7% of all households. eMarketer forecasts this to rise to 22% of all households by 2004.

### Broadband Penetration in Austria, 2000-2004 (as a % of total households)



Note: Based on 3.451 million households at the end of 2001

Source: eMarketer, June 2002

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The OECD reported 191,000 broadband residential and small business subscribers in Austria as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. Screen Digest's projections, published in December 2000, predicted significant broadband growth in Austria in 2001 and 2002, but the growth has been steady rather than spectacular. If there are to be 1 million broadband subscribers in Austria by 2003, as Screen Digest predicted, then the broadband market will need to pick up significantly over the next 12 months.

### Comparative Estimates: Broadband Households in Austria, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	130	293	519	1,028	-
BDRC/ER, August 2001	65	135	401	640	-
OECD, October 2001	138	191*	-	-	-
<b>eMarketer, May 2002</b>	<b>138</b>	<b>240</b>	<b>410</b>	<b>595</b>	<b>755</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000 & 2001

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## DSL

Telekom Austria's fixed-line market share, which includes internet dial-up, has been steadily declining since 1999, when the local loop was opened up to competition. Recent financial reports show that Telekom Austria's fixed-line market share fell from 63.7% at the end of 2000 to 56.2% at the end of 2001. As a result of this, Telekom Austria announced in February, 2002 a comprehensive market offensive, with DSL as its major weapon. Telekom Austria expects its DSL subscribers to double in 2002 to over 200,000. Other competitors to the incumbent include KPNQwest, Inode, Arges.Tempo and several others.

Among the comparative estimates for DSL households in Austria, Point-Topic's recent estimate of 92,000 coincides with Telekom Austria's financial report indicating 100,000 DSL subscribers at the end of 2001.

### Comparative Estimates: DSL Households in Austria, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	20	80	200	500	-
BDRC/EU, August 2001	11	51	147	236	-
OECD, October 2001	39	69*	-	-	-
Point-Topic, April 2002	-	92	-	-	-
<b>eMarketer, May 2002</b>	<b>39</b>	<b>100</b>	<b>210</b>	<b>320</b>	<b>410</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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Point-Topic's research indicates that of the 115,000 DSL subscribers in Austria at the end of 2001, 92,000 are residential and 23,000 are business subscribers.

### DSL Subscribers in Austria, Business and Residential, End of 2001 (in thousands)

<b>Business</b>	<b>23.0</b>
<b>Residential</b>	<b>92.0</b>
<b>Total</b>	<b>115.0</b>

Source: Point-Topic, April 2002

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## Cable

UPC Telekabel controls approximately 40% of the Austrian cable market. Owned by United Pan-Europe Communications (UPC), Telekabel is the largest cable TV operator in Austria with over 1 million homes passed and reaching 493,000 basic TV subscribers as of September 30 2001. UPC has upgraded nearly 100% of its cable infrastructure to allow two-way broadband services and, in late 1997, launched cable modem services through chello Broadband. Chello subscribers currently stand at over 130,000, making it one of the leading broadband internet service providers in the country. Recent financial troubles combined with the general malaise within the telecom sector, however, have cast some doubt about UPC's long term future. Its aggressive expansion plans of 1999 and 2000 have given way to caution and consolidation over 2001 and early 2002, which has resulted in a slowing in subscriber growth.

Other competition in the cable sector comes from Liwest, Telesystem Tirol, Safe and Kabelsignal, which between them control around 50% of the market, according to Screen Digest.

eMarketer's estimates for cable internet are more conservative than that of Screen Digest or BDRC/EU. Telekom Austria's plans over 2002 and 2003 will mean DSL will be offered to wider sections of the Austrian population and will be directly competing with cable internet services.

### Comparative Estimates: Cable Internet Households in Austria, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	110	213	319	528	-
BDRC/EU, August 2001	54	84	252	397	-
OECD, October 2001	99	122*	-	-	-
<b>eMarketer, May 2002</b>	<b>99</b>	<b>140</b>	<b>190</b>	<b>260</b>	<b>320</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## Alternative Broadband Technologies

In February 2001, The Austrian Telecommunications Authority awarded nine fixed wireless licenses, all in the 24.5-26.5 GHz band. According to research firm BDRC, these licenses went to Star 21 and Broadnet.

Commercial fixed wireless services are expected to be available in 2002.

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## Broadband Costs

According to an OECD report published October 2001, Telekom Austria's DSL offering cost \$54.52 per month with additional megabyte charges over 1,000 Megabytes downloaded. Chello's cable internet service is approximately \$10 per month cheaper.

### Selected Broadband Access Plans in Austria, 2002

Company	Access technology	Speed down-stream/upstream (Kbps)	Initial charge	Monthly charge	Additional cost per Mbyte	Mbytes included
Telekom Austria (1)	DSL	512/64	\$6.75	\$54.52	\$0.07	1,000
UPC-chello (2)	Cable	512/128	\$45.90	\$45.00	0	Unlimited

Source: (1) Organization for Economic Cooperation and Development (OECD), October 2001; (2) company reports, May 2002

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The European Commission's study of broadband costs across Europe shows that Austrian broadband costs are about in the middle of pack in both ADSL and cable internet services.

### Monthly Access Costs for ADSL and Cable Modem Internet Access in Selected European Countries, December 2001

	ADSL	Cable modem
Austria	€58.53	€45.82
Belgium	€29.14	€28.21
Denmark	€29.70	€16.79
Finland	€43.63	€13.86
France	€38.65	€38.84
Germany	€24.09	€33.63
Italy	€63.70	–
Netherlands	€37.61	€61.55
Portugal	€106.40	€55.95
Spain	€90.73	€11.31
Sweden	€40.45	€17.04
UK	€67.18	€40.30

Note: Lowest monthly cost at 1 Megabit/sec. Euros at purchasing price parity excluding value added tax

Source: European Commission, December 2001

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## B. Belgium

### Summary

Belgium ranks 2nd in Europe and 8th globally in terms of broadband penetration. With DSL covering 90% of the population and widespread two-way cable, Belgium has created an environment ripe for broadband growth.

#### Belgium Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
250	170	0	420	10.12%	2	8

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*

*Source: eMarketer, June 2002*

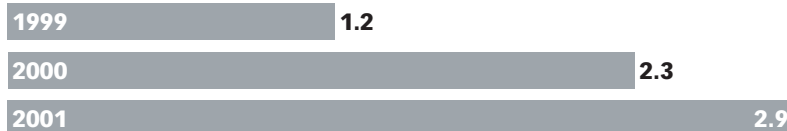
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### Internet Users

The International Telecommunication Union reported Belgium had 2.9 million internet users in 2001, up from 1.2 million in 1999.

#### Internet Users in Belgium, 1999-2001 (in millions)



*Source: International Telecommunication Union (ITU), 2000-2002*

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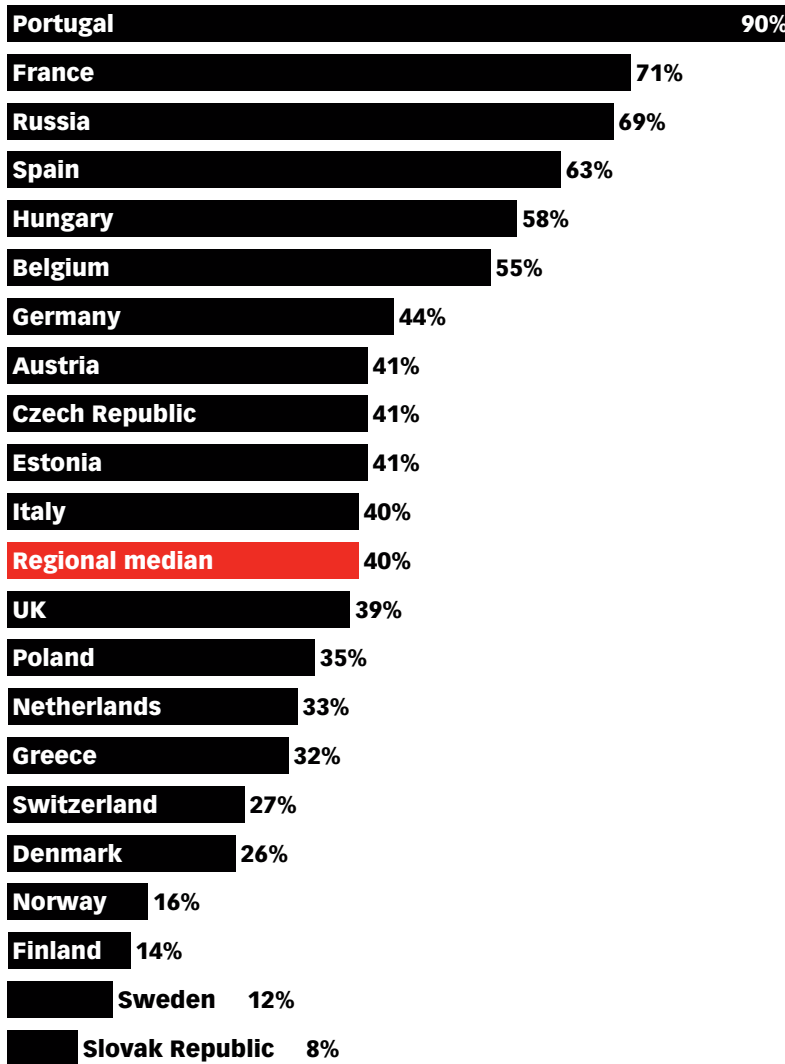
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The Belgian internet sector continues to grow strongly with a growth rate between 1999 and 2001 of 55%.

### Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001



Note: \*based on ITU internet user statistics for 1999-2001

Source: eMarketer\*, March 2002

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## Internet Households

While Belgium has one of the lower household penetration rates in Europe, broadband subscribers are making up an increasing percentage of those households online. eMarketer estimates there were 1.35 million households online in Belgium at the end of 2001. Of those online households, 935,000 were dial-up and 420,000 were broadband.

### Internet Households in Belgium, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	935	22.5%
DSL	250	6.0%
Cable	170	4.1%
Other	0	0.0%
<b>Total broadband</b>	<b>420</b>	<b>10.1%</b>
<b>Total online households</b>	<b>1,355</b>	<b>32.7%</b>

Note: \*based on 4.15 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

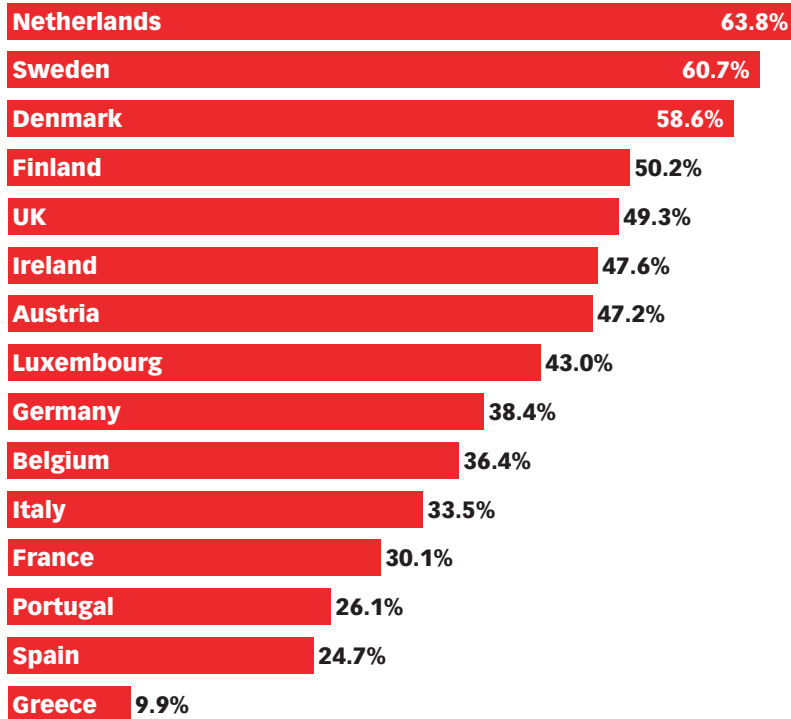
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The European Commission's internet study in December, 2001 showed 36% of Belgian households had internet access. This estimate is slightly higher than eMarketer's estimate.

### Household Internet Penetration in the European Union, by Member State, December 2001



Source: European Commission, December 2001

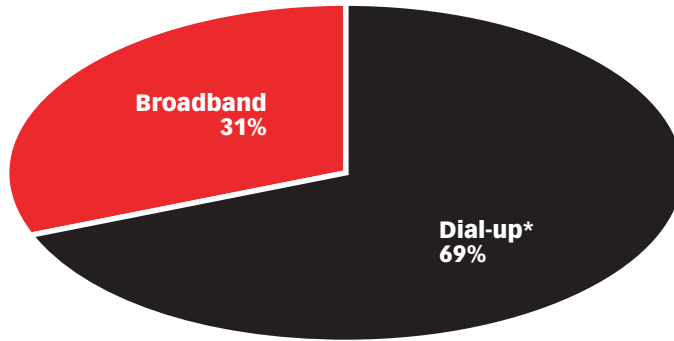
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At current growth rates, broadband households will surpass dial-up households in 12 to 18 months. At the end of 2001, 31% of Belgian households had broadband. In comparison, 20% of online households in the US at the same time were broadband.

### Percent of Belgian Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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### Dial-Up

Dial-up modems are the access technology used by the vast majority of internet users in Belgium. The dial-up market in Belgium is quite competitive but Skynet, the incumbent telecom's (Belgacom) internet service, has the largest market share. Other major ISPs in Belgium include UUNet, Planet Internet, Tiscali, Compuserve and EUNet. Internet users continue to grow strongly in Belgium, but with broadband becoming so widely available, more and more first time internet users will be going straight to broadband and missing the dial-up step altogether.

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## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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While PC penetration may not be very high in Belgium, cable TV has a firm foothold. The main competitor to Belgacom's DSL service is the cable sector which passes 97% of the population. DSL services are available to over 90% of Belgian households, so cable and DSL services are going head-to-head for a share of broadband subscribers. Recent numbers from Belgacom would indicate that DSL is winning this battle.

**“Broadband continues to grow at a steady pace of 125,000 connections per quarter.”**

*– Belgium Internet Service Provider Association, April 2002*

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### **Leading Broadband Access Providers in Belgium, 2001 & 2002 (in thousands of subscribers)**

	<b>Access technology</b>	<b>30 June 2001</b>	<b>End of 2001</b>	<b>30 March 2002</b>
Belgacom	DSL	70.0	230.0	312.0
Telenet Operaties N.V.	Cable	114.5	201.0	–
UPC-chello	Cable	–	20.3*	–

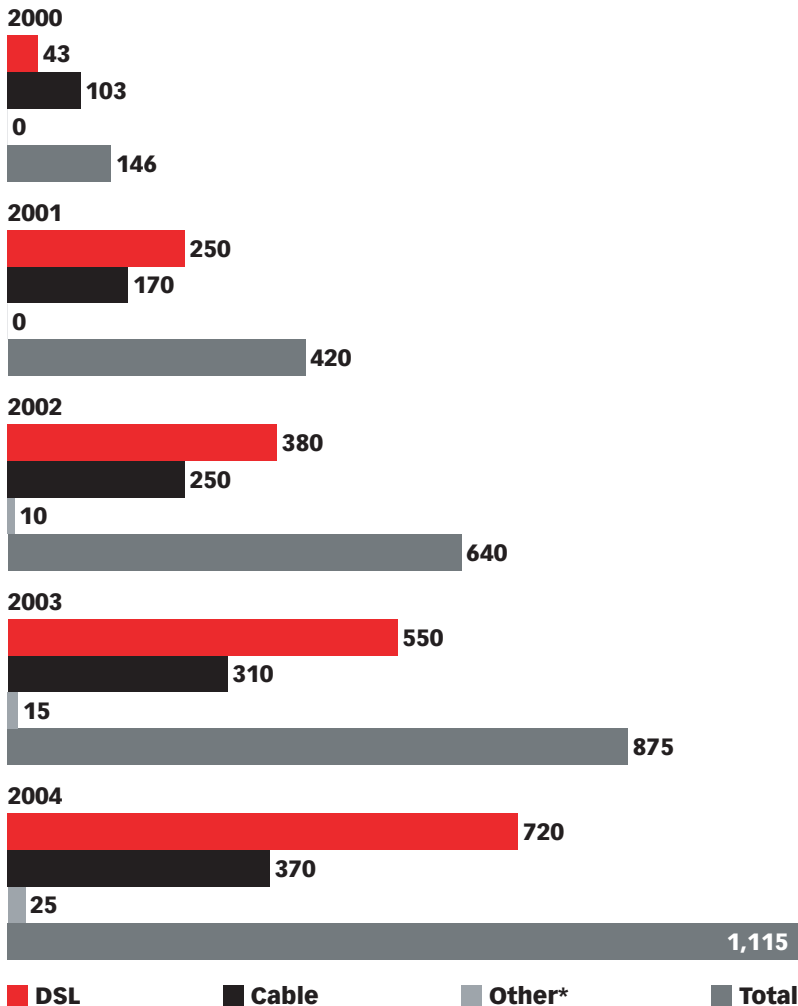
*Note: \*as of September 2001  
Source: company data, 2002*

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eMarketer forecasts 1.1 million broadband households in Belgium in 2004, from 420,000 in 2001. While cable internet subscribers took an early lead in 2000, DSL is now, and will continue to be, the broadband technology favored by most.

**Broadband Households in Belgium, by Access Technology, 2000-2004 (in thousands)**



Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

The OECD reported 232,000 broadband residential and small business subscribers in Belgium as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. It is worth noting that Belgian research firm InSight's broadband figure is for users, rather than broadband households. It is usually the case that one broadband household equates to roughly two broadband users.

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The trend within the comparative estimates suggests strong growth in broadband for Belgium. In 2003 the estimates range from 783,000 to 1.2 million. eMarketer's projections are not out of line with the views of other firms.

**Comparative Estimates: Broadband Households in Belgium, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	132	260	550	1,200	-
BDRC/EU, August 2001	113	232	439	783	-
VECAI, August 2001	-	130	-	-	-
OECD, October 2001	146	232*	-	-	-
InSights**, December 2001	-	735	-	-	-
<b>eMarketer, May 2002</b>	<b>146</b>	<b>430</b>	<b>640</b>	<b>875</b>	<b>1,115</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001; \*\*broadband users*  
*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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**DSL**

According to Belgacom, the incumbent national telecom operator in Belgium, DSL is available to 90% of the population as of the beginning of 2002. From mid-1999, Belgacom began offering a portfolio of ADSL access offerings to both business and residential customers. They recently announced they had 312,000 DSL customers and have set a goal of 400,000 by the end of 2002. In the first three months of 2002, Belgacom's DSL subscribers increased by 36%. Belgacom has also announced the introduction of SDSL (Synchronous or Symmetric DSL) targeted particularly to the business sector.

According to leading DSL research firm, Point-Topic, Belgacom is looking to DSL for more than just fast internet access. The operator is therefore launching a video-on-demand trial in 2002, which will offer TV e-mail, TV banking, digital TV and gaming.

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**“ADSL connections grew by 500% in 2001, and the boom is continuing this year.**

– Belgacom, March 2002

**Comparative Estimates: DSL Households in Belgium, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	30	100	300	800	–
BDRC/EU, August 2001	26	73	210	431	–
VECAI, August 2001	–	72*	–	–	–
OECD, October 2001	43	92*	–	–	–
Point-Topic, April 2002	–	269	–	–	–
<b>eMarketer, May 2002</b>	<b>43</b>	<b>250</b>	<b>380</b>	<b>550</b>	<b>720</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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DSL is well suited as a business broadband technology but according to Point-Topic, only 11,000 DSL lines are used in the Belgian business sector.

**DSL Subscribers in Belgium, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>10.9</b>
<b>Residential</b>	<b>269.1</b>
<b>Total</b>	<b>280.0</b>

Source: Point-Topic, April 2002

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The Internet Service Provider Association (ISPA) of Belgium has broken down the business internet sector by technology and reports a total of 198,000 business internet connections in Belgium. Broadband connections make up 107,000 PC connections according to the ISPA.

**Business Internet Connections in Belgium, by Technology, as of 31 March 2001 (in thousands)**

	<b>Number of connections</b>
<b>PC connections</b>	
Dial-up/ISDN	58.7
Broadband	106.6
<b>LAN connections</b>	
Dial-up/ISDN	9.6
Broadband	19.4
Leased lines	3.6
<b>Total business connections</b>	<b>197.9</b>

Source: Internet Service Provider Association (ISPA) - Belgium, April 2002

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**Cable**

Cable penetration in Belgium is the highest among OECD countries, at 97% of homes passed. The market is characterized by fragmentation across communities and municipalities, however, which Screen Digest/Van Dusseldorf suggest may hamper cable internet growth in the future. The cable network is run at the municipal authority level, and each of the three main communities – French, German and Belgian – maintains its own media and communications regulator.

Telenet is the largest cable network in Belgium, passing over 50% of Belgian homes. Telenet was recently acquired by the US firm Callahan Associates, who now controls 1.5 million customers. In December 2001, Telenet reported 201,000 cable modem subscribers, up from 113,000 at the end of 2000. Other competitors in the cable market include pan-European cable company UPC, which has introduced its chello service to the Brussels and Leuven area and had over 20,000 cable modem subscribers at the end of 2001.



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There is a reasonable amount of consensus between research firms forecasting cable modem subscribers in Belgium. The range in 2001 was between 130,000 – 170,000. In 2003, the range is between 310,000 and 400,000. Recent data from Telenet indicates continued growth in the cable internet sector, which may prove eMarketer’s forecast for this sector slightly conservative.

**Comparative Estimates: Cable Internet Households in Belgium, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	102	160	250	400	–
BDRC/EU, August 2001	87	158	223	335	–
VECAI, August 2001	–	132*	–	–	–
OECD, October 2001	100	140**	–	–	–
<b>eMarketer, May 2002</b>	<b>100</b>	<b>170</b>	<b>250</b>	<b>310</b>	<b>370</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 31 March 2001; \*\*subscribers as of 30 June 2001*  
*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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**Alternative Broadband Technologies**

Swedish broadband operator Bredbandsbolaget (B2) has announced plans to target business and residential customers in the Benelux region with its FTTH high-speed services. To date, however, B2 has not offered its service in Belgium.

With both DSL and cable internet becoming widely available in conjunction with the recent allocation of fixed-wireless licenses, alternative broadband technologies will make up less than 10% of broadband households by 2004.

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## Broadband costs

At \$34.68 per month for a 750kbps ADSL connection, Belgium has one of the cheapest broadband products in Europe in terms of value for speed. Chello's cable internet offering is also priced competitively.

### Selected Broadband Access Plans in Belgium, 2002

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge (December 2001)
UPC-chello (1)	Cable	512/128	\$116.70	\$42.30
Belgacom (2)	ADSL	750/128	\$78.00	\$34.68

Source: (1) company reports, May 2002; (2) Point-Topic, April 2002

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The European Commission's study of broadband costs across Europe confirms that Belgium's broadband costs are among the lowest in Europe.

### Monthly Access Costs for ADSL and Cable Modem Internet Access in Selected European Countries, December 2001

	ADSL	Cable modem
Austria	€58.53	€45.82
Belgium	€29.14	€28.21
Denmark	€29.70	€16.79
Finland	€43.63	€13.86
France	€38.65	€38.84
Germany	€24.09	€33.63
Italy	€63.70	-
Netherlands	€37.61	€61.55
Portugal	€106.40	€55.95
Spain	€90.73	€11.31
Sweden	€40.45	€17.04
UK	€67.18	€40.30

Note: Lowest monthly cost at 1 Megabit/sec. Euros at purchasing price parity excluding value added tax

Source: European Commission, December 2001

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## C. Denmark

### Summary

Ranked 4th in Europe and 10th globally, Denmark is a leading broadband country. Early introduction of DSL services and a competitive telecommunications environment are driving broadband growth.

#### Denmark Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
105	85	1	191	7.82%	4	10

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*

*Source: eMarketer, June 2002*

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### Internet Users

The International Telecommunication Union reported Denmark had 2.4 million internet users in 2001, up from 1.5 million in 1999.

#### Internet Users in Denmark, 1999-2001 (in millions)



*Source: International Telecommunication Union (ITU), 2000-2002*

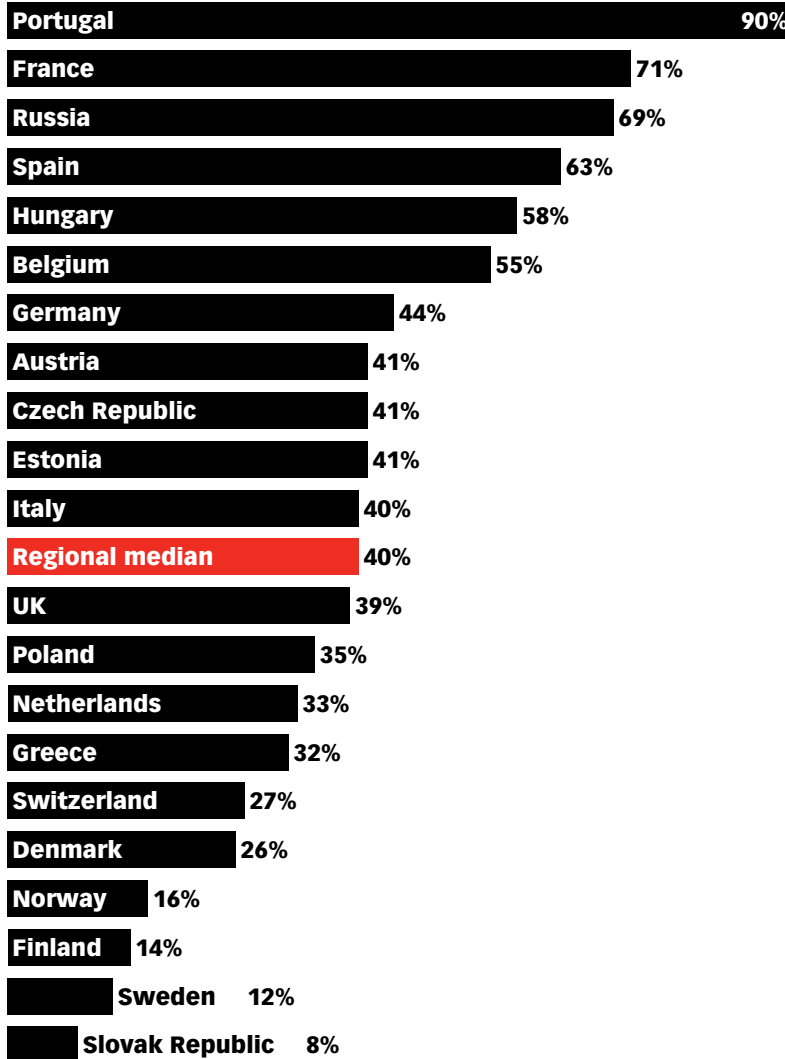
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Denmark has long been one of the leading internet countries in Europe and it is not surprising that its internet growth between 1999 – 2001 is below the regional average because of its population’s early internet adoption.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002

eMarketer expects Denmark's internet growth to slow somewhat over the coming years but internet users should number 3.1 million by 2004.

**Internet Users in Denmark, 2001-2004 (in millions)**



*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
 Source: eMarketer, April 2002

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**Internet Households**

At nearly 60% penetration, Denmark is one of the leading countries in the world in terms of household internet penetration. eMarketer estimates that at the end of 2001, 1.26 million Danish households had a dial-up internet connection and 191,000 households had broadband.

**Internet Households in Denmark, by Access Technology, End of 2001 (in thousands and as a % of total households\*)**

	Internet households	% of total households
Dial-up**	1,266	51.8%
DSL	105	4.3%
Cable	85	3.5%
Other	1	0.04%
<b>Total broadband households</b>	<b>191</b>	<b>7.8%</b>
<b>Total online households</b>	<b>1,442</b>	<b>59.0%</b>

*Note: \*based on 2.44 million households; \*\*includes ISDN*  
 Source: eMarketer, May 2002

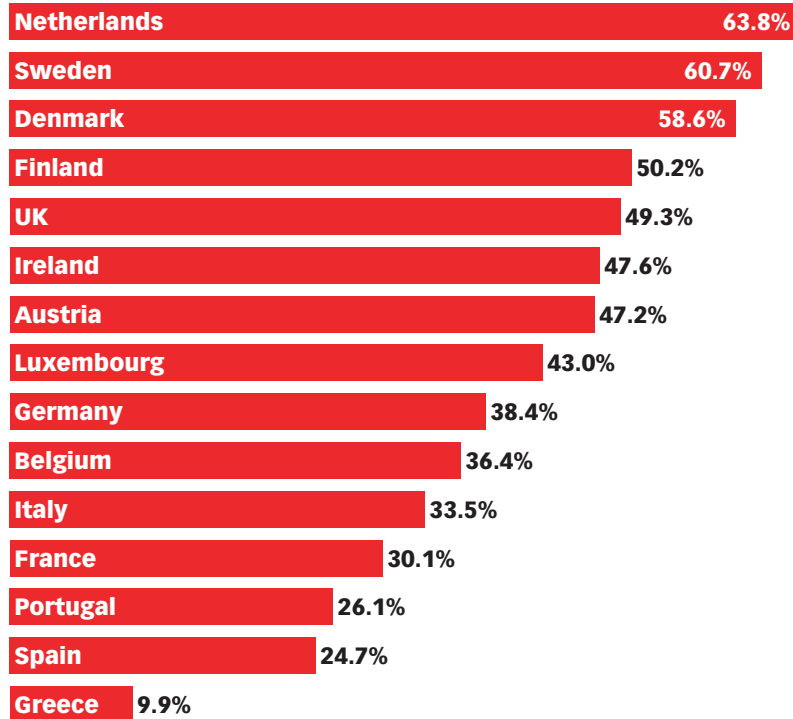
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The European Commission's internet study in December, 2001 showed 58.6% of Danish households had internet access. This estimate corresponds closely with eMarketer's.

### Household Internet Penetration in the European Union, by Member State, December 2001



Source: European Commission, December 2001

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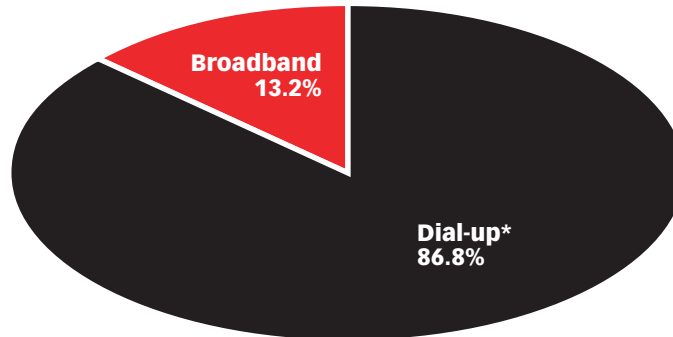
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While few countries have a household penetration rate as high as Denmark, the vast majority of online households are dial-up households. eMarketer estimates only 13% of online households at the end of 2001 were broadband.

### Percent of Danish Online Households, Dial-Up and Broadband, End of 2001



*Note: \*includes ISDN*  
*Source: eMarketer, June 2002*

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## Dial-Up

The Danes have embraced the internet and have one of the highest penetration rates in Europe, yet they have been relatively slow to adopt broadband internet. Many Danes access the internet through ISDN lines at speeds over 100 Kbps, so many may perceive little value in paying extra for a service that may not return great added value. TDC (formerly TeleDenmark) and leading ISP CyberCity dominate the dial-up internet market in Denmark with pan-European ISP Tiscali providing competition.

## Broadband Access

**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

Like the other Nordic countries, the roll-out of high-speed internet has been slower than might have been expected considering such high internet penetration in Denmark. The OECD suggests that a major reason for this is the fact that in Denmark, Finland, Norway and Sweden the incumbent telecommunication carrier also own significant shares of the cable network markets. When one company controls both of the major broadband networks, then there is little economic incentive to drive broadband growth or develop one platform over another. This gives consumers less choice in the broadband technologies consumers can choose from and less competition usually means higher prices for access.

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TDC's ADSL coverage of Danish households at year end 2000 was 65%, and its aim is to reach 95% coverage by July 2002. It reported 93% coverage by the end of the first quarter of 2002. TDC "Kabel TV" is also the largest cable network in the country with approximately 60% of cable TV subscribers according to the OECD.

According to Denmark's Telecom Agency, by mid 2002, 40% of Danish households will be able to subscribe to cable internet services, 90% of households will be able to subscribe to ADSL service at 512kbps and 95% of the population will be able to access fixed wireless services at up to 4Mbps. ISDN is available throughout Denmark.

**High-Speed Internet Access in Denmark, 2001**

	<b>Household availability</b>	<b>Date available</b>	<b>Maximum downstream speed</b>
ISDN (ISDN2)	100%	Universal service obligation	64kbps-128kbps
ADSL	70-95%	Mid 2002	95%: ADSL 256kbps; 90%: ADSL 512kbps; 70%: ADSL 2Mbps
Fixed wireless	95%	End of 2001	Up to 4Mbps
Cable internet	40%	Mid 2002	256kbps-512kbps

*Source: National Telecom Agency - DK, June 2001*

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The National Telecom Agency, Denmark reports that the leading ISP in the country is TDC with 677,000 internet subscriptions including 110,000 DSL subscribers. Tiscali with 450,000 subscribers and Tele2 with 416,000 subscribers are the two other leading ISPs.

**Leading Internet Service Providers (ISPs) in Denmark, End of 2001 (in thousands)**

	<b>DSL subscriptions</b>	<b>Total internet subscriptions</b>
TDC	110	677
Tiscali	17	450
Tele2	-	416
Orange	3	166
Telia	-	146
CyberCity	21	112
<b>Total</b>	<b>152</b>	<b>1,996</b>

*Note: business and residential*

*Source: National Telecom Agency - DK, March 2002*

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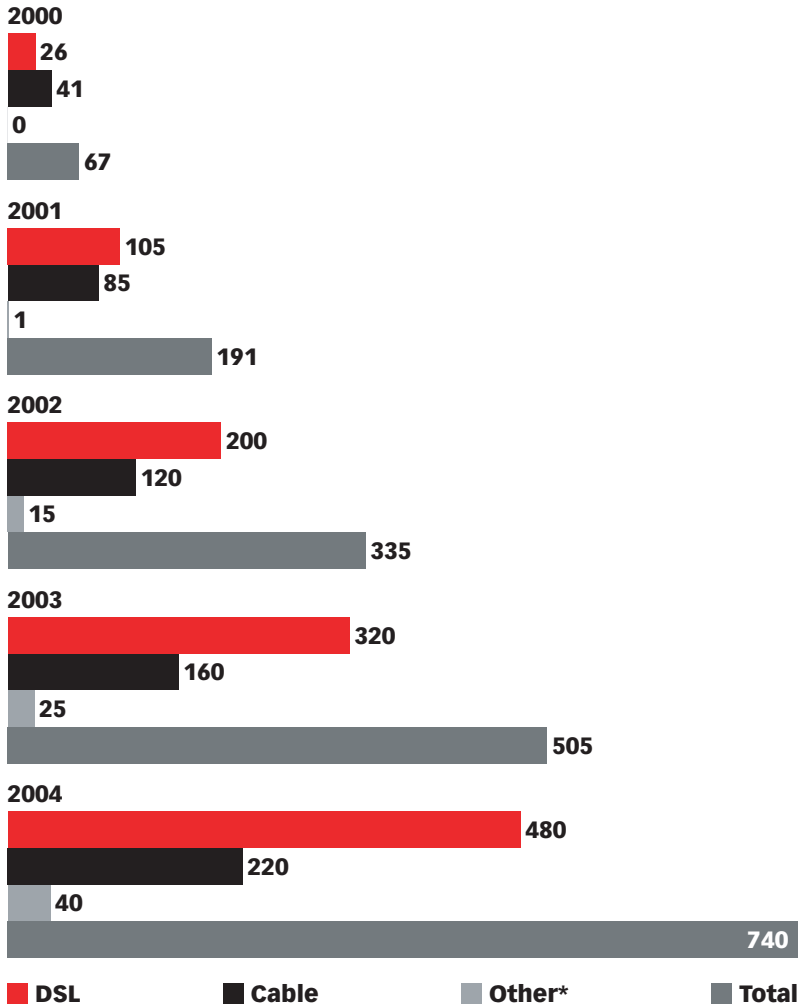
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eMarketer estimates there will be 740,000 broadband households in Denmark in 2004. DSL will dominate the landscape making up 65% of all residential broadband subscriptions.

**Broadband Households in Denmark, by Access Technology, 2000-2004 (in thousands)**



*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

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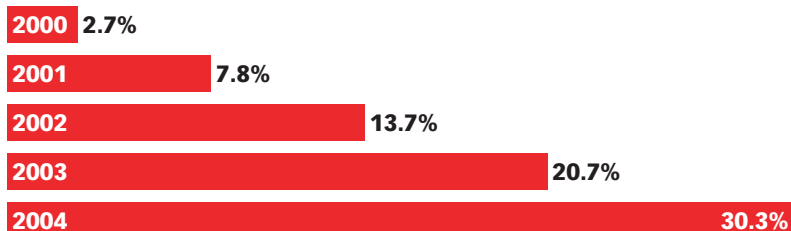
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Denmark will continue to be one of the leading broadband countries in Europe with 30% of all households having broadband by 2004.

### Broadband Penetration in Denmark, 2000-2004 (as a % of total households)



Note: Based on 2.444 million households at the end of 2001  
Source: eMarketer, June 2002

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The OECD reported 124,000 broadband residential and small business subscribers in Denmark as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. Most of the research firms estimate 200,000 broadband households in 2001 and by 2003 the range is between 500,000 – 730,000.

### Comparative Estimates: Broadband Households in Denmark, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	75	205	415	730	–
BDRC/EU, August 2001	41	215	364	557	–
OECD, October 2001	67	124*	–	–	–
Telestyrelsen**, 2002	67	239	–	–	–
<b>eMarketer, May 2002</b>	<b>67</b>	<b>191</b>	<b>335</b>	<b>505</b>	<b>740</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001; \*\*residential and SMEs

Source: eMarketer, May 2002; various, as noted, 2000-2002

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## DSL

TDC's goal for the expansion of broadband is to increase ADSL coverage of Danish households from 65% at the end of 2000 to 95% in July 2002. This goal seems likely to be achieved. Since unbundled access to TDC's local loop was made available in mid-1999, DSL services have been launched not only by the incumbent telco but also by two major ISPs. Leading Danish ISP CyberCity began offering DSL services in September 1999, and pan-European ISP Tiscali has also launched DSL services.

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Most research firms concur that there were approximately 100,000 residential DSL subscriptions at the end of 2001. eMarketer expects this to grow to 480,000 by 2004, which is in line with other available estimates.

**Comparative Estimates: DSL Households in Denmark, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	20	100	250	500	-
BDRC/EU, August 2001	18	97	167	297	-
OECD, October 2001	26	70*	-	-	-
Point-Topic, April 2002	-	100	-	-	-
Telestyrelsen**, 2002	26	151	-	-	-
<b>eMarketer, May 2002</b>	<b>26</b>	<b>105</b>	<b>200</b>	<b>320</b>	<b>480</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001; \*\* residential and SMEs

Source: eMarketer, May 2002; various, as noted, 2000-2002

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Point-topic reported in April that 50,000 DSL connections in Denmark were business DSL connections. This is a significant percentage of all DSL lines in service and indicates that Danish business have embraced DSL as a broadband technology.

**DSL Subscribers in Denmark, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>52.4</b>
<b>Residential</b>	<b>99.4</b>
<b>Total</b>	<b>151.8</b>

Source: Point-Topic, April 2002

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**Cable**

According to the Danish National Telecom Agency, the entire cable network in Denmark covers approximately 1.7 million households. They estimate 500,000 have the possibility to use the network as access to the internet. TDC, the national incumbent telco, owns the country's largest cable network (TeleDanmark Kabel) and has approximately 864,000 cable TV subscribers. Broadband internet access is available to existing cable TV subscribers with the purchase of a modem, and, in early 2002, it reported 22,000 cable internet subscribers. Telia Stofa, a subsidiary of Swedish telco Telia, is the major competitor to TDC's cable arm. It has over 600,000 cable TV subscribers and has offered cable modem services for over 2 years.

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The OECD reported 54,000 cable modem subscriptions in June 2001. Going forward, both Screen Digest and BDRC/EU estimate approximately 240,000 cable modem subscriptions in 2003. eMarketer's estimate is slightly more conservative than this.

**Comparative Estimates: Cable Internet Households in Denmark, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	55	105	165	230	-
BDRC/EU, August 2001	23	115	187	250	-
OECD, October 2001	41	54*	-	-	-
Telestyrelsen**, 2002	41	88	-	-	-
<b>eMarketer, May 2002</b>	<b>41</b>	<b>70</b>	<b>95</b>	<b>160</b>	<b>220</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001; \*\*residential and SMEs*  
*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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**Alternative Broadband Technologies**

Seven fixed-wireless licenses were awarded in late December 2000 covering the 3.5 GHz and 26 GHz band frequencies. The winners were US company Formus Communications Denmark, In2Loop owned by Tele2, Sonofon, Global Connect Access and Mediascape communications.

Swedish broadband provider Bredbandsbolaget (B2) has announced intentions of entering the Danish market and intends to offer 10 Mbps connections to the residential market. To date, however, this has not occurred.

**Broadband Costs**

**“The market for DSL connections in Denmark began to grow faster when the main providers on the Danish telecommunications market changed to flat rate pricing during 2000.”**

– Telestyrelsen - Danish National Telecom Agency

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The OECD reported a 256kbps cable internet connection in Denmark cost \$25 per month in late 2001. DSL at similar speeds costs \$43.90. Compared to other countries globally, this ranks as one of the more expensive connections in terms of value for money, considering the slow internet speed made available.

### Selected Broadband Access Plans in Denmark, 2001

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge
TeleDanmark	Cable	256/64	\$125.00	\$25.00
TeleDanmark	DSL	256/128	\$125.00	\$43.89

Source: Organization for Economic Cooperation and Development (OECD), October 2001

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The European Commission's study of broadband costs across Europe shows that Denmark's broadband costs are about in the middle of the pack in both ADSL and cable internet services, but what they don't indicate is the speed of the internet connection.

### Monthly Access Costs for ADSL and Cable Modem Internet Access in Selected European Countries, December 2001

	ADSL	Cable modem
Austria	€58.53	€45.82
Belgium	€29.14	€28.21
Denmark	€29.70	€16.79
Finland	€43.63	€13.86
France	€38.65	€38.84
Germany	€24.09	€33.63
Italy	€63.70	-
Netherlands	€37.61	€61.55
Portugal	€106.40	€55.95
Spain	€90.73	€11.31
Sweden	€40.45	€17.04
UK	€67.18	€40.30

Note: Lowest monthly cost at 1 Megabit/sec. Euros at purchasing price parity excluding value added tax

Source: European Commission, December 2001

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## D. Finland

### Summary

Finland ranks only 8th in Europe and 15th globally in terms of broadband penetration of households. Like its Scandinavian neighbor Norway, Finland has been surprisingly slow to adopt broadband, quite possibly as a result of the major telecommunications provider controlling both the cable and DSL networks. This inevitably provides little incentive for the incumbent to upgrade both networks to allow for broadband internet.

### Finland Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
55	45	0	100	4.12%	8	15

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined  
Source: eMarketer, June 2002*

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### Internet Users

The International Telecommunication Union reported that Finland had 2.2 million internet users in 2001, an increase from 1.7 million in 1999.

### Internet Users in Finland, 1999-2001 (in millions)



*Source: International Telecommunication Union (ITU), 2000-2002*

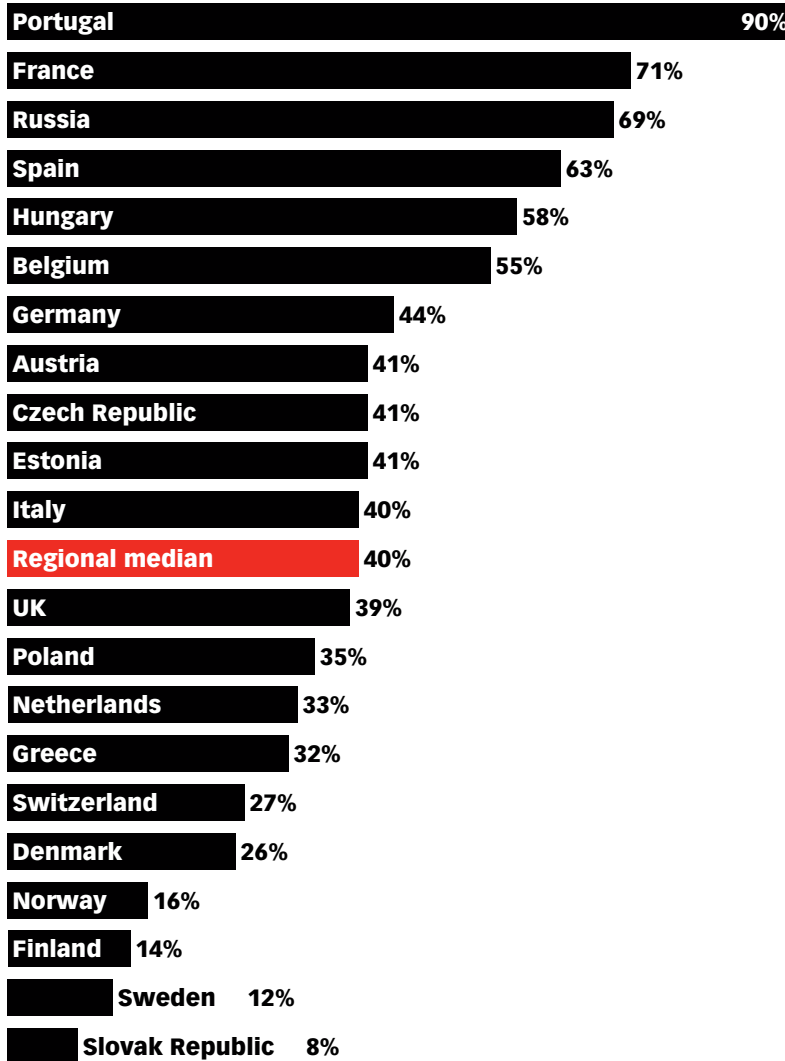
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Finland has experienced relatively little growth in internet users between 1999 and 2001, at 14%. This is well below the regional average which may be a result of Finland's early adoption of the internet.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002

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The number of internet users in Finland will continue to grow, although more slowly than in the past. eMarketer forecasts 3.1 million internet users in 2004.

### Internet Users in Finland, 2001-2004 (in millions)



*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
*Source: eMarketer, April 2002*

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### Internet Households

Finland has a high household internet penetration at 51%. Of those households online, eMarketer estimates 1.1 million had a dial-up connection and only 100,000 had a broadband connection at the end of 2001.

### Internet Households in Finland by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	1,137	46.9%
DSL	55	2.3%
Cable	45	1.9%
Other	0	0.0%
<b>Total broadband households</b>	<b>100</b>	<b>4.1%</b>
<b>Total online households</b>	<b>1,237</b>	<b>51.0%</b>

*Note: \*based on 2.43 million households; \*\*includes ISDN*  
*Source: eMarketer, May 2002*

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The European Commission's internet study in December, 2001 showed 50.2% of Finnish households had internet access. This estimate corresponds closely with with eMarketer's.



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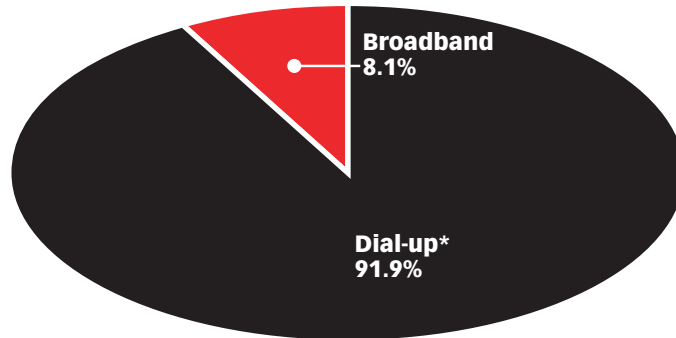
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Only 8% of online households had broadband in Finland at the end of 2001.

### Percent of Finnish Online Households, Dial-Up and Broadband, End of 2001



*Note: \*includes ISDN*

*Source: eMarketer, June 2002*

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## Dial-Up

Finland has a reasonably competitive telecom marketplace, with incumbent Sonera competing with Elisa for market share in the fixed-line and internet markets. ISDN, which typically offers speeds at less than 128kbps, is a popular dial-up access technology in Finland and may be one reason for the relatively slow growth in broadband in the country.

## Broadband Access

**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

Cable TV penetration sits at approximately 64% in Finland, with household subscribers shared among approximately 40 cable TV companies. Much of the cable network, however needs upgrading to allow for two-way internet services which will further delay adoption of broadband in Finland. Widespread DSL services in metropolitan Finland are now available and in early 2002, subscriber adoption had been quite rapid.

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Elisa Communications, Sonera's leading competitor, reported 27,500 DSL subscribers at the end of 2001. Sonera reported 12,500.

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**Leading Broadband Access Providers in Finland, End of 2001 (in thousands)**

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	<b>Access technology</b>	<b>Subscribers</b>
Elisa Communications	DSL	27.5
Sonera	DSL	12.5

*Source: company data, 2002*

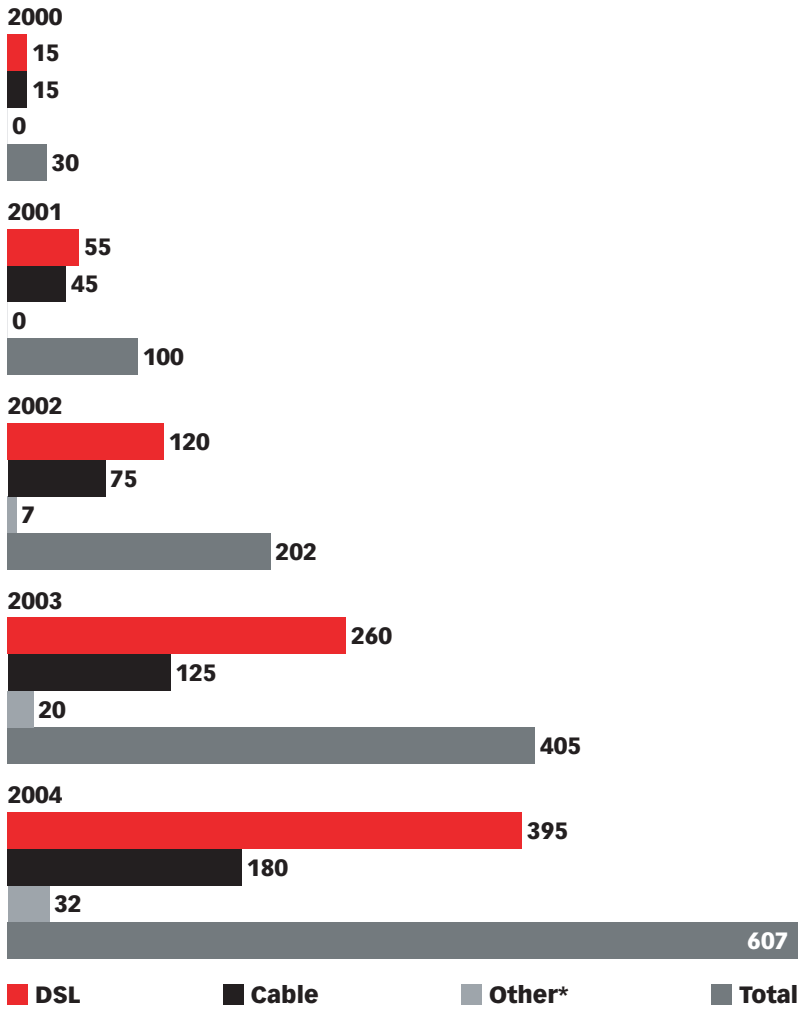
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After a slow start, broadband subscribers should grow quickly in Finland through 2004. eMarketer estimates there will be over 600,000 subscribers in Finland in 2004, from only 100,000 subscribers in 2001.

### Broadband Households in Finland, by Access Technology, 2000-2004 (in thousands)



Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

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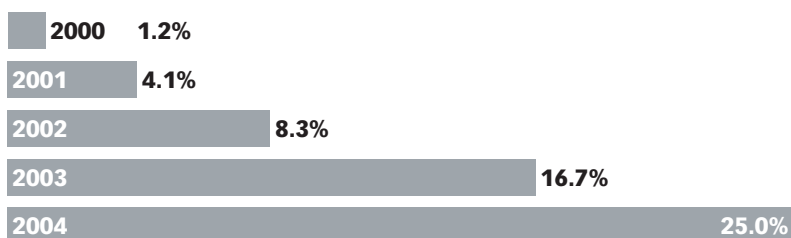
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### Broadband Penetration in Finland, 2000-2004 (as a % of total households)



*Note: Based on 2.425 million households at the end of 2001*  
*Source: eMarketer, June 2002*

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The OECD reported 38,000 broadband residential and small business subscribers in Finland as of 30 June 2001. eMarketer has based its forward projections on data from the OECD.

### Comparative Estimates: Broadband Households in Finland, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	33	201	390	820	–
BDRC/EU, August 2001	29	114	221	407	–
OECD, October 2001	30	38*	–	–	–
<b>eMarketer, May 2002</b>	<b>30</b>	<b>100</b>	<b>202</b>	<b>405</b>	<b>607</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## DSL

According to Finland's Ministry of Transport and Communications in January 2002, only eight municipalities in the provinces of southern and western Finland and Aland do not fall within the scope of ADSL. In all other areas, at least half of all households currently have access to some form of ADSL service.

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The comparative estimates vary for DSL in Finland. In 2003, Screen Digest forecast 620,000 subscribers, while BDRC/EU forecast only 211,000. eMarketer's estimate of 260,000 DSL subscribers is on the conservative side.

**Comparative Estimates: DSL Households in Finland, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	13	156	310	620	-
BDRC/EU, August 2001	9	54	112	211	-
OECD, October 2001	15	20*	-	-	-
Point-Topic, April 2002	-	60	-	-	-
<b>eMarketer, May 2002</b>	<b>15</b>	<b>55</b>	<b>120</b>	<b>260</b>	<b>395</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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Point-Topic reported Finland had 26,000 business DSL lines in service in 2001, out of a total 86,000 DSL lines nationally.

**DSL Subscribers in Finland, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>25.8</b>
<b>Residential</b>	<b>60.2</b>
<b>Total</b>	<b>86.0</b>

*Source: Point-Topic, April 2002*

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## Cable

According to Screen Digest and Van Dusseldorp & Partners, nearly 64% of all Finnish households are passed by cable, with 61% of them taking cable TV services. The largest cable operator, with over 200,000 subscribers, is Helsinki Televisio, followed by incumbent telco Sonera, with over 140,000. Other smaller cable operators include Tampereen Tietoverkko Oy, Turun Kaapelitelevisio Oy and Oulu TV Oy, with approximately 200,000 cable TV subscribers between them. The two major cable TV providers have both launched cable internet services and eMarketer estimates there are about 45,000 subscribers between all the networks.

### Comparative Estimates: Cable Internet Households in Finland, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	20	45	80	200	-
BDRC/EU, August 2001	19	56	97	148	-
OECD, October 2001	15	18*	-	-	-
<b>eMarketer, May 2002</b>	<b>15</b>	<b>45</b>	<b>75</b>	<b>125</b>	<b>180</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## Alternative Broadband Technologies

Ten companies – Formus Communications Finland, Sonera, Riihimaen Puhelin, Callahan Broadband Finland, Oy Interloop, Priority Wireless (UPC), Facicom Finland, Advanced Radio Telecom Nordic, FirstMark Communications Finland and Tele2 Finland Oy – successfully obtained a fixed-wireless access license in July 2000.

A number of local governments in Finland have started developing their own broadband networks. In a village in Ylojarvi, aptly called Broadband Village, houses are connected to a broadband Asynchronous Transfer Mode (ATM) network via Ethernet connections. The residents are testing new interactive multimedia services.

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## Broadband Costs

The OECD reported that at the end of 2001, DSL and cable internet was priced competitively at approximately \$39 per month in Finland. This is at the cheaper end of the scale among European countries.

### Selected Broadband Access Plans in Finland, 2001

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge
Elisa	DSL	512/256	\$118.43	\$38.69
Helsinki Television	Cable	500-1000/768	\$52.00	\$38.69

Source: Organization for Economic Cooperation and Development (OECD), October 2001

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## E. France

### Summary

With a broadband penetration rate of 2.5%, France only ranked above the UK and Italy in Western Europe at the end of 2001. Slow roll-out of DSL services by France Telecom coupled with a lack of competition in the market will hamper the growth of broadband in France.

### France Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
400	205	0	605	2.47%	12	19

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*

*Source: eMarketer, June 2002*

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### Internet Users

With 49 million adults (14 and older), France is a formidable market for internet services. The International Telecommunication Union reported France had 15.7 million internet users in 2001, up from 5.4 million in 1999.

### Internet Users in France, 1999-2001 (in millions)



*Source: International Telecommunication Union (ITU), 2000-2002*

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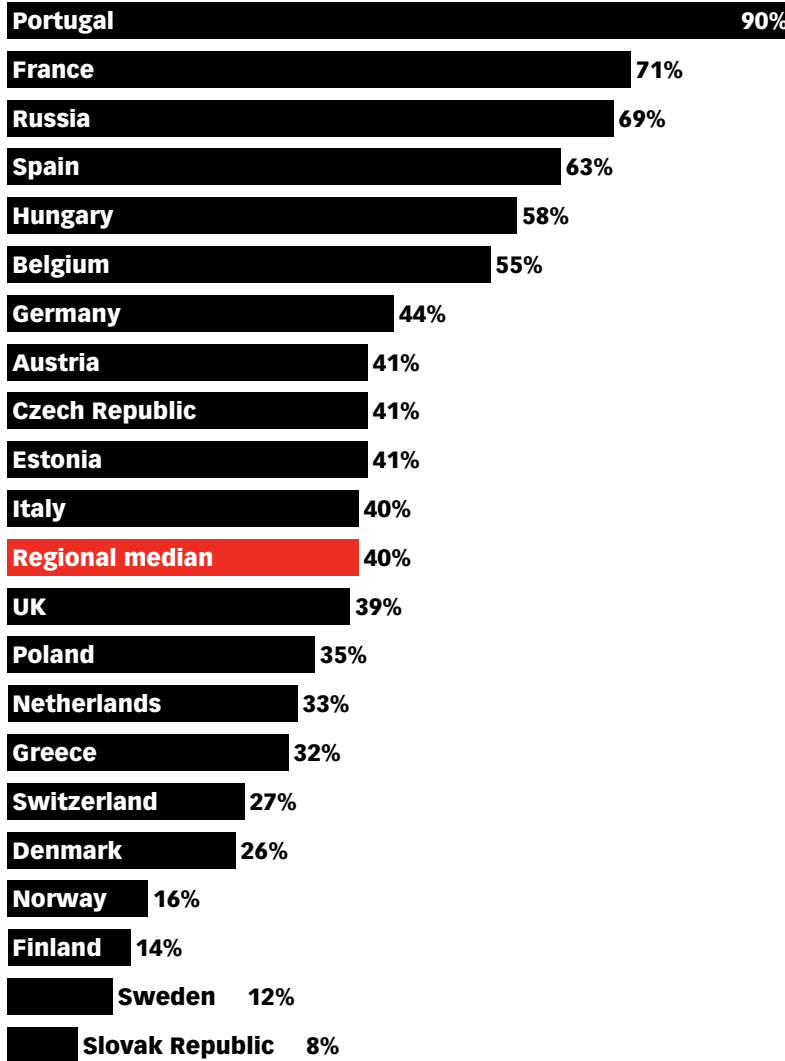
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With a population embracing the internet later than its European neighbors, France is now experiencing a much higher growth rate than other European countries.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002

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eMarketer expects 26.7 million French internet users by 2004.

**Internet Users in France, 2001-2004 (in millions)**



*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
 Source: eMarketer, April 2002

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**Internet Households**

France has one of the lowest households internet penetration rates in Western Europe at approximately 30%. eMarketer estimates 6.85 million households had a dial-up connection at the end of 2001 and 605,000 used broadband.

**Internet Households in France, by Access Technology, End of 2001 (in thousands and as a % of total households\*)**

	Internet households	% of total households
Dial-up**	6,850	28.0%
DSL	400	1.6%
Cable	205	0.8%
Other	0	0.0%
<b>Total broadband households</b>	<b>605</b>	<b>2.5%</b>
<b>Total online households</b>	<b>7,455</b>	<b>30.4%</b>

*Note: \*based on 24.5 million households; \*\*includes ISDN*  
 Source: eMarketer, May 2002

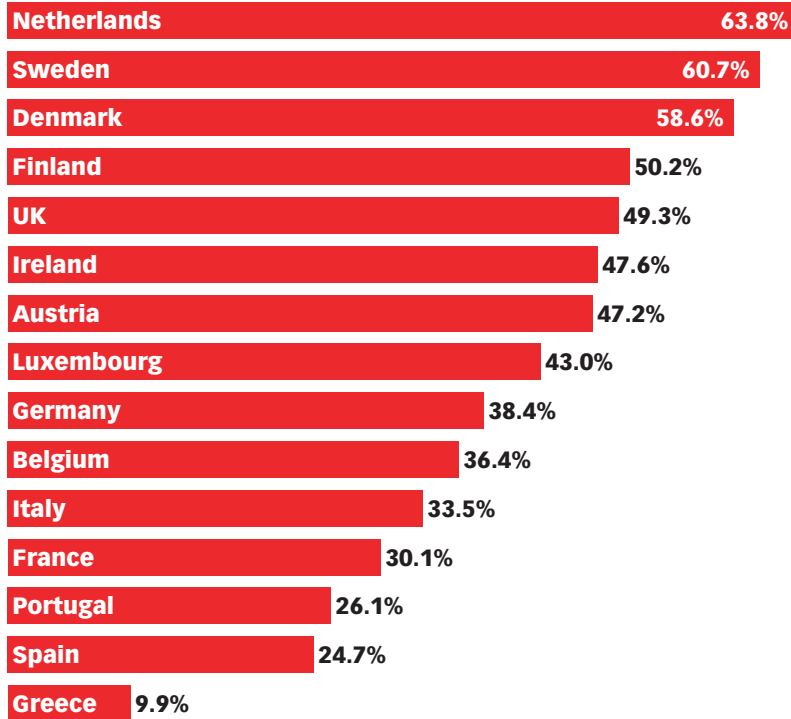
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The European Commission's internet study in December, 2001 showed only 30% of French households had internet access. This estimate corresponds closely with eMarketer's.

**Household Internet Penetration in the European Union, by Member State, December 2001**



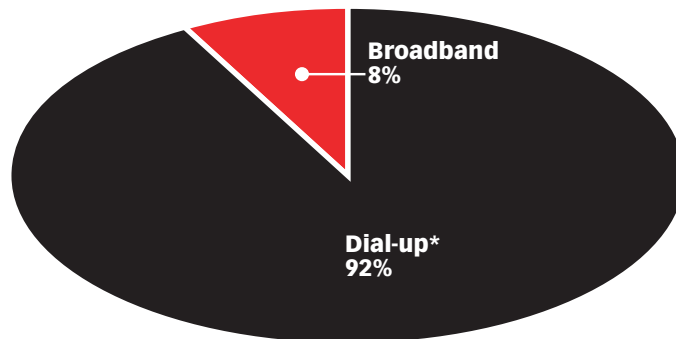
Source: European Commission, December 2001

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Of those online at home, only 8% have a broadband connection according to eMarketer, with dial-up dominating the access technology.

**Percent of French Online Households, Dial-Up and Broadband, End of 2001**



Note: \*includes ISDN  
 Source: eMarketer, June 2002

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## Dial-Up

While France's internet penetration rate is lower than the average across Europe, it is growing fast. The French dial-up ISP market is quite competitive, with France Telecom's Wanadoo internet service receiving competition from AOL France, LibertySurf, Free, Club Internet and Tiscali.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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With only 11% of French households subscribing to cable TV and DSL available to approximately 50% of households, broadband availability is still limited. Despite this, much of the cable network is two-way ready and there are indications that France Telecom is beginning to focus its broadband efforts on DSL. France represents a potentially large broadband market.

**“The broadband market in France is relatively uncompetitive. France Telecom has been allowed to dominate the business and residential sectors and faces little challenge from the cable networks – some of which it owns or formerly owned.”**

– *Point-Topic, 2002*

Leading internet service provider in France, Wanadoo released 1<sup>st</sup> Quarter 2002 results which indicated that it had 700,000 broadband internet subscribers across Europe. Within France, it had 531,000 subscribers of which 482,000 were DSL subscriptions. Cable operators Noos and UPC reported 100,000 and 20,000 subscribers respectively, at the end of 2001.

---

### **Leading Broadband Access Providers in France, 2001 & 2002 (in thousands of subscribers)**

	<b>Access technology</b>	<b>End of 2001</b>	<b>Q1 2002</b>
Wanadoo	Various	408.0	531.0
Noos	Cable	100.0+	–
UPC/chello Broadband	Cable	19.9*	–

*Source: company data, 2002*

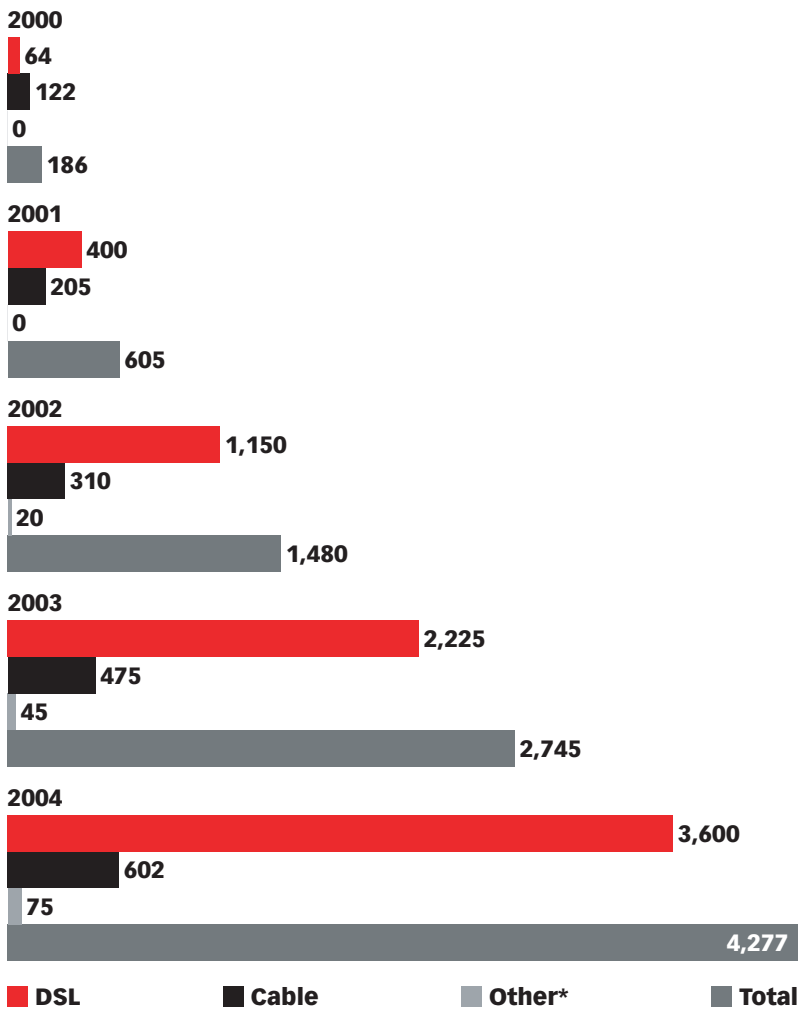
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eMarketer estimates there were 605,000 broadband households in France at the end of 2001. This was over twice the number in the UK at the same time. If DSL grows as it currently is doing, eMarketer expects there will be over 4.2 million broadband households in France by 2004. This equates to approximately 18% of all households.

**Broadband Households in France, by Access Technology, 2000-2004 (in thousands)**



Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

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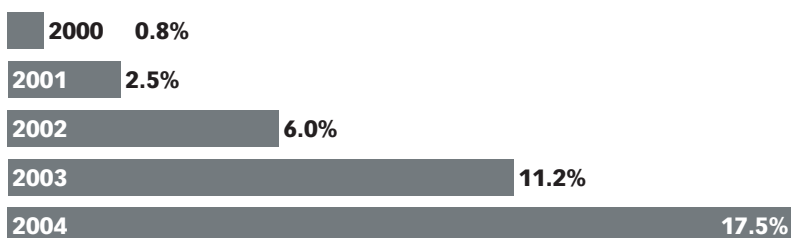
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### Broadband Penetration in France, 2000-2004 (as a % of total households)



Note: Based on 24.5 million households at the end of 2001

Source: eMarketer, June 2002

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The OECD reported 351,000 broadband residential and small business subscribers in France as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. The comparative estimates for broadband households in 2003 range from 1.2 million to 2.7 million. eMarketer's estimate is one of the more optimistic and is based on recent broadband growth.

### Comparative Estimates: Broadband Households in France, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	182	421	799	1,740	-
BDRG/EU, August 2001	138	543	1,160	2,165	-
Jupiter Research, October 2001	-	379	805	1,240	1,826
OECD, October 2001	186	351*	-	-	-
Gartner, February 2002	-	500	-	-	-
<b>eMarketer, May 2002</b>	<b>186</b>	<b>605</b>	<b>1,480</b>	<b>2,745</b>	<b>4,277</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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## DSL

After losing an appeal in the French courts, France Telecom was ordered to unbundle its local loop by the end of 2000. Kicking and screaming, the incumbent agreed to the decision and now faces limited competition from the likes of Cegetel, Siris, 9 Telecom, Easynet, KPNQwest and Mangoosta, among others. France Telecom has launched DSL services through its internet arm Wanadoo as well as directly through a service called Netissimo.

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Recent estimates from Point-Topic and Probe Research indicate there were between 400,000 and 500,000 DSL subscribers at the end of 2001. Going forward, by 2003 estimates range from 883,000 to 2.22 million.

**Comparative Estimates: DSL Households in France, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	60	200	400	1,000	-
BDRC/EU, August 2001	53	196	564	1,221	-
Jupiter Research, October 2001	-	208	559	883	1,341
OECD, October 2001	64	177*	-	-	-
Probe Research, February 2002	100	500	-	-	-
Point-Topic, April 2002	-	409	-	-	-
<b>eMarketer, May 2002</b>	<b>64</b>	<b>400</b>	<b>1,150</b>	<b>2,225</b>	<b>3,600</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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Point-Topic reported France had 22,000 business DSL lines at the end of 2001, in addition to the 409,000 residential DSL lines.

**DSL Subscribers in France, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>21.5</b>
<b>Residential</b>	<b>408.5</b>
<b>Total</b>	<b>430.0</b>

*Source: Point-Topic, April 2002*

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**Cable**

A report published by the European Union indicates less than 15% of French households have access to cable TV and approximately 11% subscribe to the service. Noos (formerly Lyonnaise Cable) is France's largest cable company, with a 26% market share and a substantial footprint in the key metropolitan areas. In 2000, France Telecom sold its 49.9% stake in Noos to UK cable group NTL and to Morgan Stanley, leaving the remaining 51.1% owned by Suez Lyonnaise des Eaux. France Telecom still owns a sizeable cable infrastructure through its France Telecom Cable arm so has a stake in both cable internet and DSL services in the country.

Other competitors in the cable market include UPC, which made some significant acquisitions in 1999 to establish a footprint outside the major metropolitan regions. UPC also acquired a nationwide fixed-wireless license, which should help it reach a wider audience for its chello Broadband services.

The two other major cable operators are NC Numericable and Est Videocommunication. All of the major cable operators have begun offering cable internet services where the network can support it.

eMarketer estimates there will be approximately 600,000 cable internet subscribers in France in 2001, from 205,000 at the end of 2000. The range of estimates for cable internet in 2003 are between 329,000 from Jupiter to 786,000 from BDRC/EU.

**Comparative Estimates: Cable Internet Households in France, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	122	221	399	740	-
BDRC/EU, August 2001	85	335	532	786	-
Jupiter Research, October 2001	-	171	246	329	421
OECD, October 2001	122	174*	-	-	-
<b>eMarketer, May 2002</b>	<b>122</b>	<b>205</b>	<b>310</b>	<b>475</b>	<b>602</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

**Alternative Broadband Technologies**

French regulator Autorité de Regulation des Telecommunications (ART) awarded two national licenses to UPC and US-based FirstMark Communications as well as 44 regional licenses allowing fixed-wireless services. Since these licenses have been awarded, however, little activity has occurred in the fixed-wireless sector and alternative broadband technologies such as fixed-wireless, satellite and fiber are unlikely to penetrate the broadband market for some years.

**Comparative Estimates: Alternative Broadband Households in France, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	0	12	64	158	-
Jupiter Research, October 2001	0	0	0	28	64
<b>eMarketer, May 2002</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>45</b>	<b>75</b>

*Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology*

*Source: eMarketer, May 2002; various, as noted, 2001*



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## Broadband Costs

Broadband access in France, both cable and DSL is available for approximately \$40-45 per month. This is in line with prices in other Western European countries and the US.

### Selected Broadband Access Plans in France, 2001

Company	Speed down-stream/upstream (Kbps)	Initial charge	Monthly charge	Additional cost per Mbyte	Mbytes included
France Télécom	500/128	\$132.39	\$39.85	0	Unlimited
France Télécom	512/128	\$77.29	\$45.66	\$.03	500

Source: Organization for Economic Cooperation and Development (OECD), October 2001

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Data from the European Commission shows French broadband costs to be about in the middle of the pack.

### Monthly Access Costs for ADSL and Cable Modem Internet Access in Selected European Countries, December 2001

	ADSL	Cable modem
Austria	€58.53	€45.82
Belgium	€29.14	€28.21
Denmark	€29.70	€16.79
Finland	€43.63	€13.86
France	€38.65	€38.84
Germany	€24.09	€33.63
Italy	€63.70	-
Netherlands	€37.61	€61.55
Portugal	€106.40	€55.95
Spain	€90.73	€11.31
Sweden	€40.45	€17.04
UK	€67.18	€40.30

Note: Lowest monthly cost at 1 Megabit/sec. Euros at purchasing price parity excluding value added tax

Source: European Commission, December 2001

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.  
[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

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**“We purchased your ‘Benefits of Broadband’ report and have enjoyed it a lot. Finally — a report which summarizes the analysts’ forecasts and focuses on the benefit side through the applications”**

– Jon Bohmer, Chairman, Proto TV AS

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## F. Germany

### Summary

Germany is the largest broadband market in Europe but only ranks 6th in the region and 13th globally in terms of broadband penetration of households. With little cable infrastructure that is two-way ready, Germans have little choice other than DSL from the incumbent - Deutsche Telekom - for broadband access. Nevertheless, Deutsche Telekom has quickly acquired 2 million subscribers and DSL adoption is rapid.

### Germany Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
2,000	35	55	2,090	5.50%	6	13

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined  
Source: eMarketer, June 2002*

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### Internet Users

The International Telecommunication Union reported that Germany had 30 million internet users at the end of 2001 from only 14.4 million in 1999.

### Internet Users in Germany, 1999-2001 (in millions)



*Source: International Telecommunication Union (ITU), 2000-2002*

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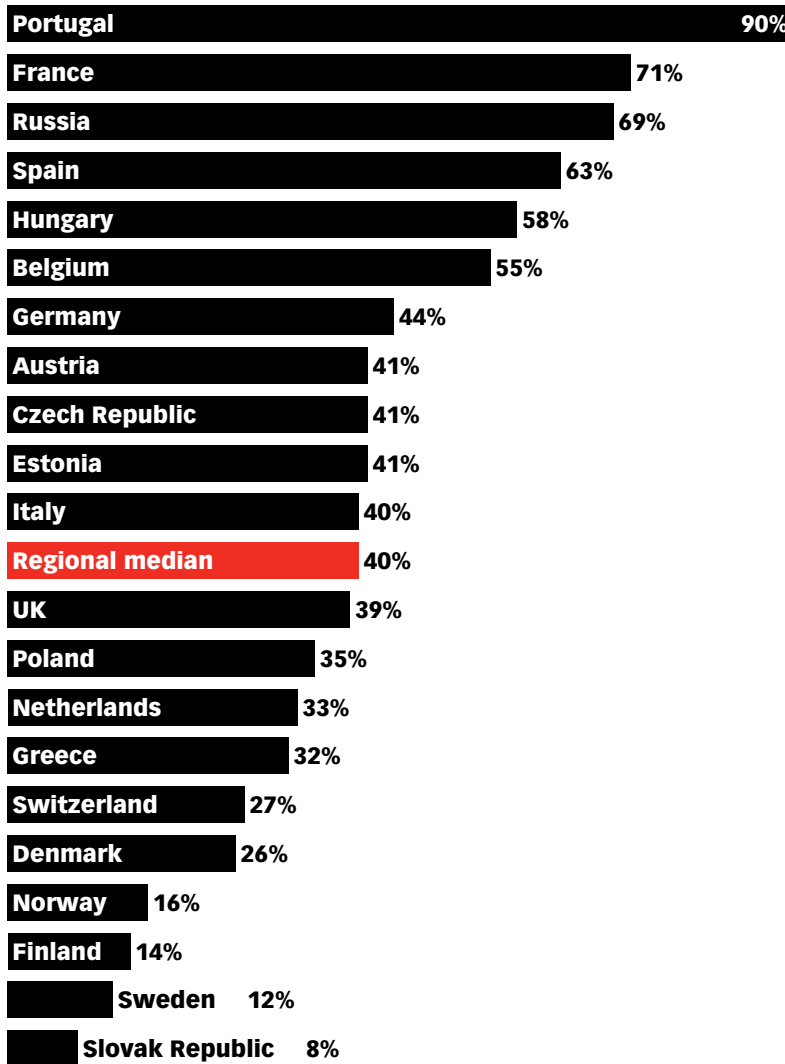
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The growth rate during this period has been 44%, which is higher than the regional average.

### Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001



Note: \*based on ITU internet user statistics for 1999-2001

Source: eMarketer\*, March 2002

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eMarketer forecasts there will be 42.5 million internet users in Germany in 2004.

**Internet Users in Germany, 2001-2004 (in millions)**



*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
 Source: eMarketer, 2002

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Less than 40% of households were online in Germany at the end of 2001. eMarketer estimates that 12.8 million households had a dial-up internet connection, 2 million a DSL connection and less than 100,000 used cable modems or alternative broadband technologies.

**Internet Households in Germany, by Access Technology, End of 2001 (in thousands and as a % of total households\*)**

	Internet households	% of total households
Dial-up**	12,775	33.6%
DSL	2,000	5.3%
Cable	35	0.09%
Other	55	0.1%
<b>Total broadband households</b>	<b>2,090</b>	<b>5.5%</b>
<b>Total online households</b>	<b>14,865</b>	<b>39.1%</b>

*Note: \*based on 38.0 million households; \*\*includes ISDN*  
 Source: eMarketer, May 2002

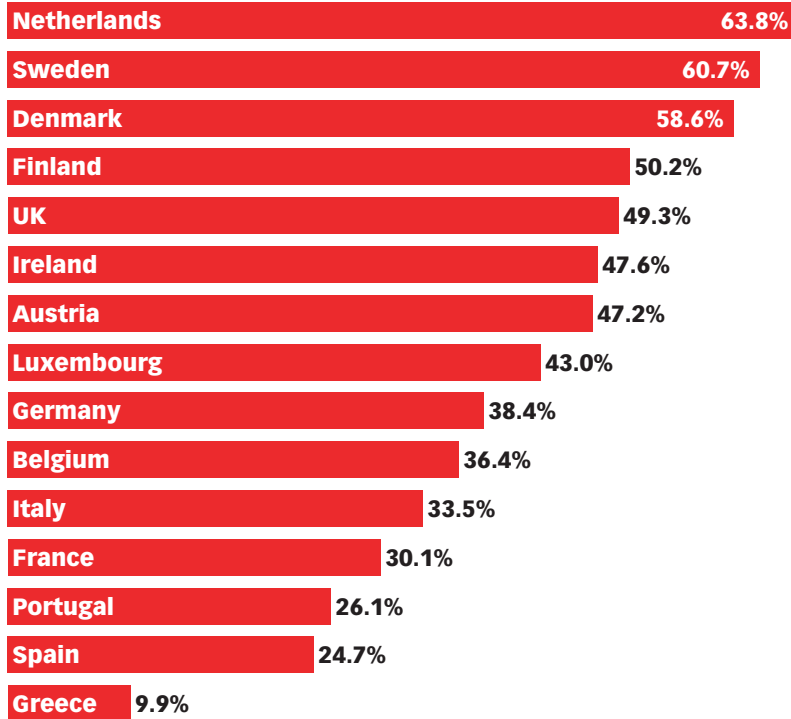
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eMarketer's household internet penetration rate closely corresponds to the European Commission's report which showed that only 38% of German households were online.

### Household Internet Penetration in the European Union, by Member State, December 2001



Source: European Commission, December 2001

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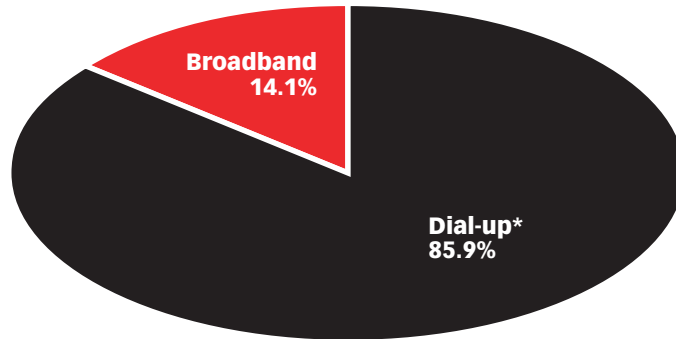
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Of those households online, 14% had a broadband connection and the remaining used dial-up. In comparison, at the same time in the US, 20% of online households had broadband, and 80% had dial-up.

### Percent of German Online Households, Dial-Up and Broadband, End of 2001



*Note: \*includes ISDN*

*Source: eMarketer, June 2002*

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### Dial-Up

Deutsche Telekom's ISP T-Online is the largest ISP in Europe with 7.9 million subscribers throughout Europe at the end of 2001. Subscribers in Germany numbered 6.5 million in 2001 according to recent financial reports.

ISDN, which typically provides speeds of less than 128kbps, is very popular in Germany with approximately 12% of German households using the technology. It is likely that with Deutsche Telekom's new focus on DSL that many households will exchange their ISDN connection for a faster ADSL connection over the coming years. Other major dial-up ISPs include AOL.de, Mannesmann Arcor, FreeNet, Viag Interkom and CityWeb.

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## Broadband Access

While Germany's cable internet market will be slow to attract subscribers for the next few years, the country will nonetheless become the largest broadband market in Europe and one of the largest in the world. Early and affordable rollout of DSL services by Deutsche Telekom has led to explosive growth. Recent reports by Deutsche Telekom show that the number of DSL subscribers has doubled in 6 months to reach 2 million at the end of 2001, from only 1 million six months earlier.

### **Leading Broadband Access Provider in Germany, 2001 (in thousands of subscribers)**

	<b>Access technology</b>	<b>30 June 2001</b>	<b>End of 2001</b>
Deutsche Telekom	DSL	1,000	2,000

*Source: eMarketer, May 2002; company data, 2002*

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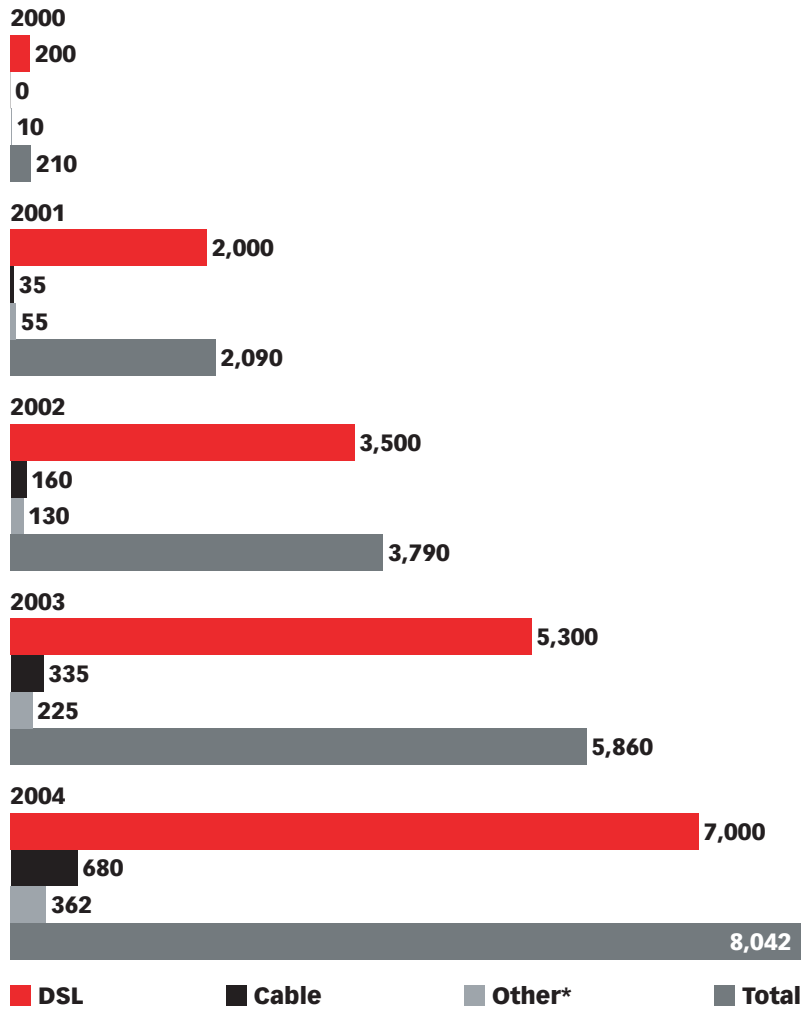


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Although 86% of German households are passed by cable, much of the network needs upgrading to allow for two-way broadband internet access. Since Deutsche Telekom has been selling off its cable network over the last two years, it has not invested much money in upgrading the network.

eMarketer forecasts 8 million broadband households in Germany by 2004, from 2 million in 2001. DSL households will make up nearly 90% of all broadband households.

**Broadband Households in Germany, by Access Technology, 2000-2004 (in thousands)**



Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

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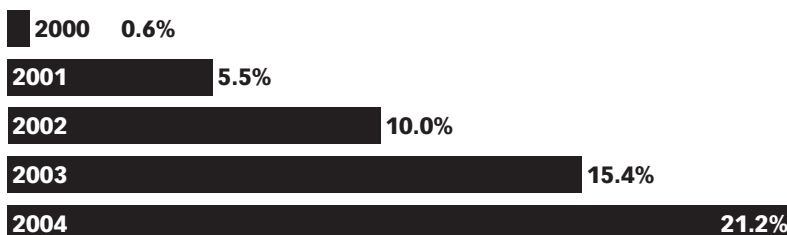
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Household penetration will reach 21% in 2004, from only 5.5% in 2001.

### Broadband Penetration in Germany, 2000-2004 (as a % of total households)



*Note: Based on 37.995 million households at the end of 2001*

*Source: eMarketer, June 2002*

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The OECD reported 780,000 broadband residential and small business subscribers in Germany as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. The German Regulatory Authority for Posts and Telecommunications reported 2.1 million broadband subscribers at the end of 2001. This corresponds closely to eMarketer's estimate. In 2003, Screen Digest and BDRC/EU estimate there will be between 5.1 and 6 million subscribers. In contrast, Jupiter estimates only 2.7 million subscribers in that year. It would seem that if there are over 2 million subscribers as of June 2002, Jupiter's forecasts may be overly conservative.

### Comparative Estimates: Broadband Households in Germany, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	401	1,010	2,550	5,100	-
BDRC/EU, August 2001	429	1,527	3,393	6,084	-
Jupiter Research, October 2001	-	643	1,500	2,671	4,544
OECD, October 2001	<b>210</b>	780*	-	-	-
German Regulatory Authority for Post & Telecommunications, 2002	-	2,100	-	-	-
Gartner, February 2002	-	1,000	-	-	-
<b>eMarketer, May 2002</b>	<b>210</b>	<b>2,090</b>	<b>3,790</b>	<b>5,860</b>	<b>8,042</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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## DSL

Deutsche Telekom has been offering DSL services for residential users for a number of years. The DSL market in Germany will become the biggest in Europe. The DSL sector is already fiercely competitive with many national and international operators vying for a share of the lucrative market, but there is still a virtual monopoly with Deutsche Telekom dominating the market. Some of the key competitors of Deutsche Telekom in this sector include KPNQwest, QS Communications, VersaPoint and Atlantic Telecom Group.

The recent strong growth in subscribers of DSL would point to a sector likely to attract over 5 million subscribers by 2003.

**“Deutsche Telekom has left other DSL providers in Europe and the USA far behind with these figures.”**

– Deutsche Telecom, end of 2001 financial statement

### Comparative Estimates: DSL Households in Germany, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	400	1,000	2,500	5,000	–
BDRC/EU, August, 2001	174	686	1,482	2,684	–
Jupiter Research, October 2001	–	554	1,240	2,155	3,681
OECD, October 2001	200	780*	–	–	–
Probe Research, February 2002	–	1,400	–	–	–
Point-Topic, April 2002	–	1,654	–	–	–
<b>eMarketer, May 2002</b>	<b>200</b>	<b>2,000</b>	<b>3,500</b>	<b>5,300</b>	<b>7,000</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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Point-Topic reported Germany had 184,000 business DSL subscribers at the end of 2001, in addition to 1.65 million residential subscriptions.

### DSL Subscribers in Germany, Business and Residential, End of 2001 (in thousands)

<b>Business</b>	<b>183.8</b>
<b>Residential</b>	<b>1,654.1</b>
<b>Total</b>	<b>1,837.9</b>

Source: Point-Topic, April 2002

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## Cable

Nearly 80% of all German homes are passed by cable, as cable is the principal means of television distribution in Germany. However, the German cable infrastructure is currently not well suited to broadband internet. First, much of the network is in need of an upgrade to allow for two-way services. Second, the market is a complex system consisting of four levels with different operators controlling different levels of the network.

Deutsche Telekom is in the process of divesting its interest in its cable networks and has already sold its North Rhine-Westphalia system to Callahan Associates, and EWT/TSS to UPC. Further sales are expected with Deutsche Telekom maintaining a 25.1% interest in each of the regional networks it sells in order to exert a level of control over the new owner.

Callahan Associates acquired 55% of the North Rhine Westphalia cable operation from Deutsche Telekom in July, 2000. The company has also successfully completed its negotiations with Deutsche Telekom to acquire 55% of its cable business in Baden Württemberg. Callahan Associates is planning a rapid upgrade of its coverage area with the plan of offering internet, video on demand, telephone and TV.

Other cable companies in the market include TeleColumbus, Bosch Cable and PrimaCom, which together control approximately 22% of the 20 million cable subscribers in Germany. Bertelsmann, the global media giant, is also looking to partner with cable companies with the ultimate goal of packaging premium interactive content for the TV platform.

According to the Annual report from the German Regulatory Authority for Posts and Telecommunications, at the end of 2001 more than 20 cable operators in over 30 towns were offering cable internet services. Currently 780,000 households are potentially able to use this service and approximately 30,000 did so.

The comparative forecasts below indicate that cable internet will not gather steam for at least another 12 to 18 months. The outlier in the bunch is BDRC/EU, which suggests there will be 3 million cable internet subscribers by 2003 from 788,000 in 2001. Clearly its 788,000 subscriber estimate in 2001 flies in the face of more recent data from the German regulatory authority.

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eMarketer estimates that by 2004, 680,000 households will access the internet via cable modems.

**Comparative Estimates: Cable Internet Households in Germany, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	2	10	50	100	-
BDRC/EU, August 2001	250	788	1,744	3,087	-
Jupiter Research, October 2001	-	32	135	304	526
<b>eMarketer, May 2002</b>	<b>0</b>	<b>35</b>	<b>160</b>	<b>335</b>	<b>680</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD)*  
*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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**Alternative Broadband Technologies**

Powerline technology utilizes the existing electricity networks to transmit data calls. While the jury is still out on whether this technology is commercially viable, the German Telecommunications Regulatory Authority indicated in its Annual Report that three companies currently offer this service in four cities in Germany. They estimate approximately 2,000 households subscribe to this service.

Fixed-wireless licenses have been awarded to 17 companies: Associated Communications Deutschland, BayNet, BroadNet Deutschland, Callino, CominT, Deutsche LandTel, FirstMark Communications Deutschland, Highway One, K-Net Kommunikation, Landover, Mannesmann, PfalzKo, Star One 2 in 1 Networks, Tesion Kommunikationsnetze Sudwest, Viag, Viatel and Winstar Communications. Many of these companies will shortly launch broadband services, and Screen Digest and Van Dusseldorp & Partners suggest that Germany will be the commercial testbed for fixed-wireless technology but to date little activity has taken place.

German firm Teles is currently offering satellite-based internet access through SkyDSL. According to Strato, which controls the SkyDSL service, the firm has approximately 50,000 subscribers.

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eMarketer estimates there were approximately 50,000 broadband subscribers to alternative broadband technologies at the end of 2001. eMarketer's forecasts are slightly more conservative than Jupiter and BDRC/EU in this sector, going forward.

**Comparative Estimates: Alternative Broadband Households in Germany, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	5	53	167	313	–
Jupiter Research, October 2001	–	57	125	212	337
<b>eMarketer, May 2002</b>	<b>10</b>	<b>55</b>	<b>130</b>	<b>225</b>	<b>362</b>

*Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology*

*Source: eMarketer, May 2002; various, as noted, 2001*

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**Broadband Costs**

Deutsche Telekom's current DSL offering at 768kbps costs \$42.67 per month. In the recent past, Germany's broadband prices were some of the cheapest in Europe, which was a major factor in the rapid uptake of the service. In January 2002, Deutsche Telekom announced it was raising its prices significantly, which will take effect on 1 July 2002. A further price hike is expected in 2003. This may dramatically slow the growth in DSL over the next few years.

**Selected Broadband Access Plans in Germany, 2001**

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge
Deutsche Telekom	DSL	768/128	\$48.42	\$42.67*

*Note: \*in July 2002 T-DSL is expected to rise to \$68.39/month*

*Source: Organization for Economic Cooperation and Development (OECD), October 2001*

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.

[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

**"We purchased your 'Benefits of Broadband' report and have enjoyed it a lot. Finally — a report which summarizes the analysts' forecasts and focuses on the benefit side through the applications."**

*–Jon Bohmer, Chairman, Proto TV AS*

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## G. Italy

### Summary

With only 5% of Italian homes passed by cable, Italy's broadband sector is severely hampered. At 1.4% broadband penetration, Italy ranks 13th in Western Europe and 21st globally. Telecom Italia, however has announced aggressive plans to make DSL available to over 75% of the population in the next 12 months which will drastically increase broadband adoption.

### Italy Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
250	0	40	290	1.36%	13	21

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International Telecommunication Union reported that Italy had 16 million internet users at the end of 2001 from only 8.2 million in 1999.

### Internet Users in Italy, 1999-2001 (in millions)

1999	8.2
2000	13.2
2001	16.0

Source: International Telecommunication Union (ITU), 2000-2002

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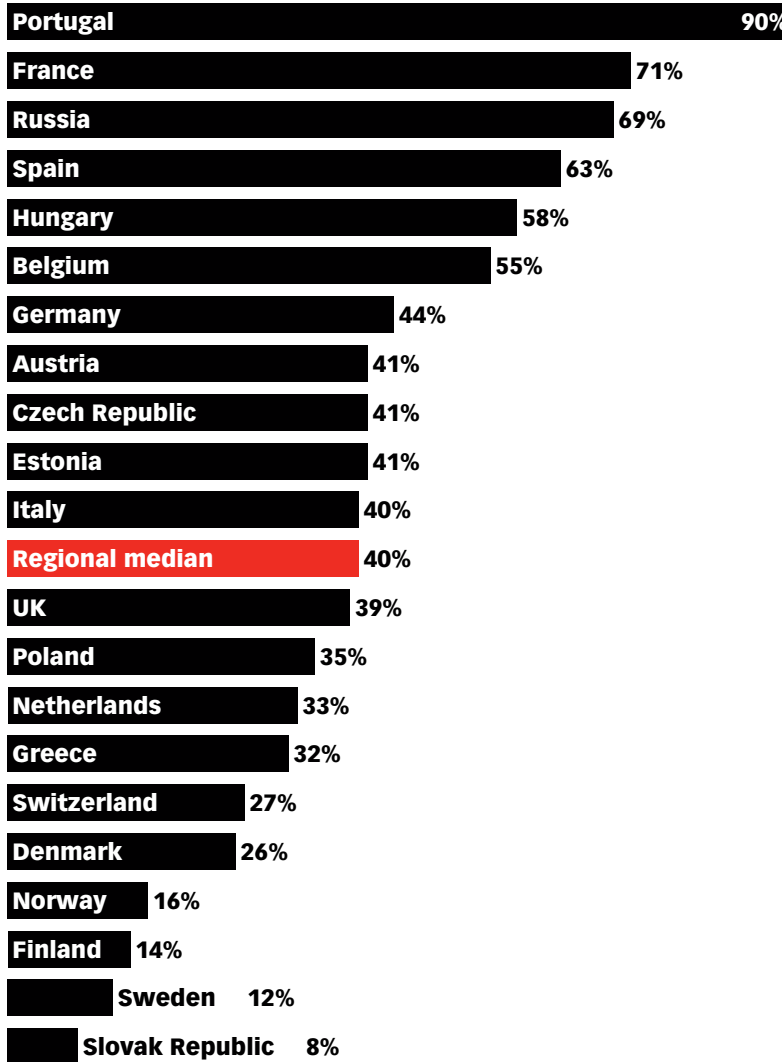
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Italian internet users grew 40% between 1999 and 2001, which is right on the regional average.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001

Source: eMarketer\*, March 2002

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eMarketer expects 21.9 million Italian internet users by 2004 at current growth rates.

## Internet Users in Italy, 2001-2004 (in millions)

<b>2001</b>	<b>16.0</b>
<b>2002</b>	<b>19.2</b>
<b>2003</b>	<b>21.1</b>
<b>2004</b>	<b>21.9</b>

*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
*Source: eMarketer, April 2002*

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## Internet Households

There were 7.2 million (34%) households online at the end of 2001, according to eMarketer. Nearly 7 million of these households were dial-up, 250,000 were DSL, there were less than 1,000 cable internet subscribers and 40,000 households used alternative broadband technologies.

## Internet Households in Italy, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	6,969	32.6%
DSL	250	1.2%
Cable	0	0.0%
Other	40	0.2%
<b>Total broadband households</b>	<b>290</b>	<b>1.4%</b>
<b>Total online households</b>	<b>7,259</b>	<b>34.0%</b>

*Note: \*based on 21.35 million households; \*\*includes ISDN*  
*Source: eMarketer, May 2002*

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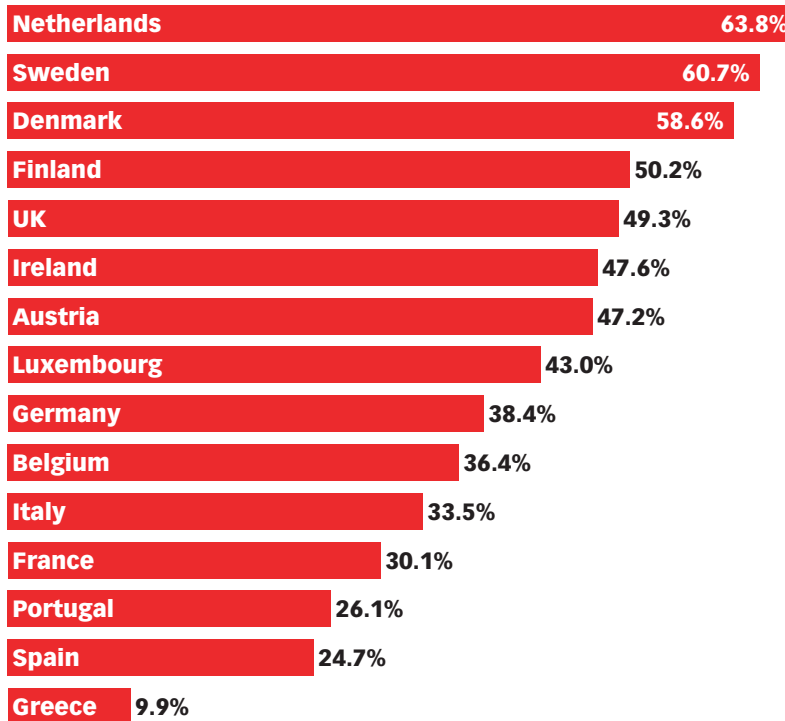
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The European Commission's internet study in December, 2001 reported 33.5% of Italian households had internet access. This is one of the lowest in the EU.

**Household Internet Penetration in the European Union, by Member State, December 2001**



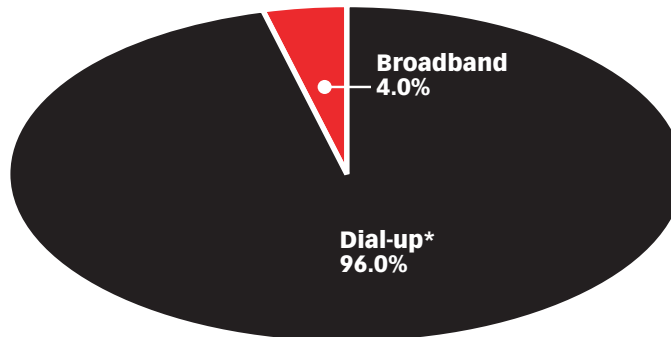
Source: European Commission, December 2001

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As broadband access is still limited, the vast majority of internet households access the internet with a dial-up connection.

**Percent of Italian Online Households, Dial-up and Broadband, End of 2001**



Note: \*Includes ISDN

Source: eMarketer, June 2002

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### Dial-Up

Italy is home to Tiscali, the second largest ISP in Europe behind German ISP T-Online. It is aggressively acquiring dial-up subscribers in Italy and across Europe. Telecom Italia and Infostra are the other major Italian ISPs and together control the dial-up internet market. With only 300,000 broadband-connected homes and 16 million active internet users in Italy at the end of 2001, it is quite apparent that dial-up overwhelmingly dominates the internet access market.

### Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

---

Twelve months ago, the prospects for broadband in Italy did not look good. Telecom Italia was only just beginning to roll-out DSL and little activity was occurring in the cable internet front. In June 2002, however, things are looking brighter. The Italian government recently formed a task force to drive the supply and adoption of broadband, Telecom Italia is ahead of schedule in making DSL available to 80% of the population and alternative broadband providers such as eBiscom's FastWeb have established themselves as viable broadband alternatives.

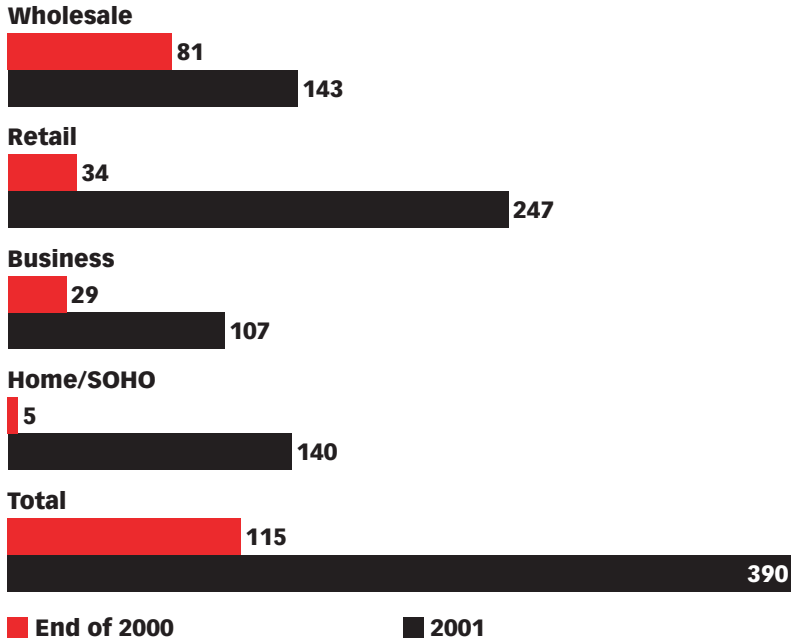
**"The problem of broadband distribution is largely a result of the current state of the local loop."**

*– Italian Task Force on Broadband Communications, 2002*

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Telecom Italia's recent financial reports indicate the progress that has been made on the DSL front. At the end of 2001 they reported 390,000 DSL customers across business and residential, up from 115,000 in 2000.

**Telecom Italia Broadband Subscribers, End of 2000 & 2001 (in thousands)**



Source: eMarketer, May 2002; company reports, 2002

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On the fiber front, Fast Web has also made great strides reporting nearly 50,000 subscribers in 2001 and it has forecast 130,000 subscribers in 2002.

**Fast Web Subscribers in Italy, 2001 & 2002 (in thousands)**



Note: \*estimate; includes residential and business subscribers  
Source: company reports (e.Biscom), March 2002

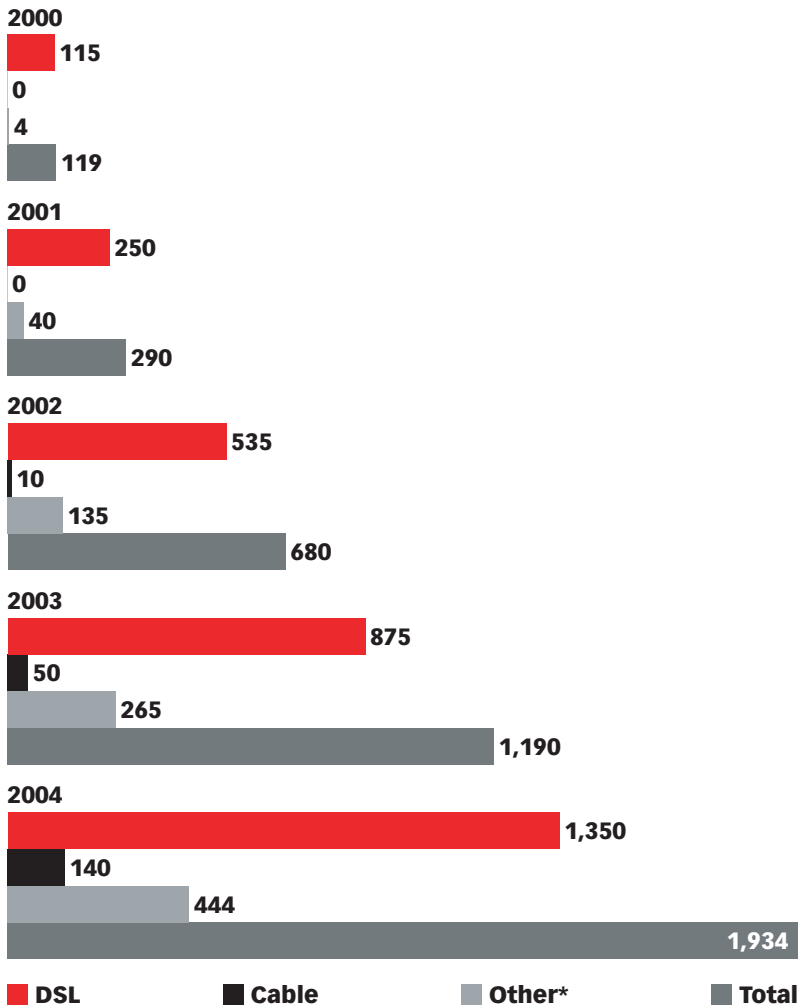
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eMarketer estimates there were 290,000 broadband households in Italy at the end of 2001. This number will grow to nearly 2 million by 2004. DSL will dominate the sector, as it will take some years before a substantial cable network is developed, but fiber solutions will also attract nearly 500,000 subscribers by 2004.

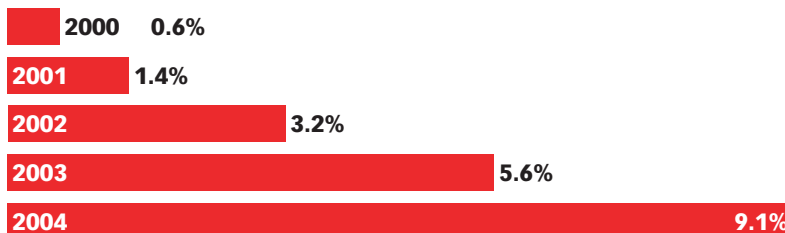
**Broadband Households in Italy, by Access Technology, 2000-2004**



*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

If eMarketer predictions prove correct, only 9% of households will have broadband by 2004.

**Broadband Penetration in Italy, 2000-2004 (as a % of total households)**



Note: Based on 21.35 million households at the end of 2001  
Source: eMarketer, June 2002

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The OECD reported 255,000 broadband residential and small business subscribers in Italy as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. Early forecasts by Screen Digest and BDRC/EU do not foresee the broadband growing much above 700,000 subscribers by 2003. More recent estimates from Jupiter and eMarketer, however forecast that there will be 1.9 million broadband households by 2004.

**Comparative Estimates: Broadband Households in Italy, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	10	100	250	500	-
BDRC/EU, August 2001	10	78	283	731	-
Jupiter Media Metrix, October 2001	-	240	703	1317	1,900
OECD, October 2001	119	255*	-	-	-
<b>eMarketer, May 2002</b>	<b>119</b>	<b>290</b>	<b>680</b>	<b>1,190</b>	<b>1,934</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001  
Source: eMarketer, May 2002; various, as noted, 2000 & 2001

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**DSL**

In January 2000, Telecom Italia's ISP Tin.it launched retail DSL services. Other ISPs followed including Infostrada, Dada, Galactica, Informatica Commerciale, Internet Village, Nextra, Pro.Net, Telvia, Unidata and Unisource, as well as pan-European DSL provider KPNQwest.

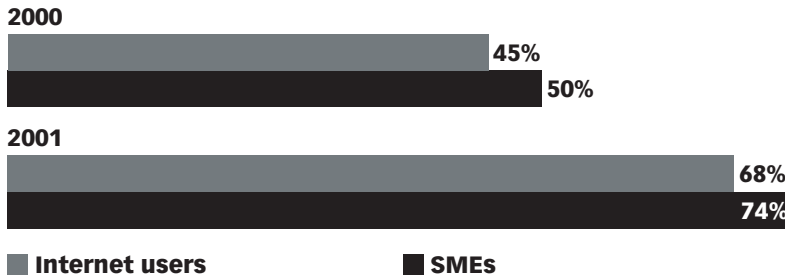
There is considerable competition for fixed-line telephony services in Italy, which should help foster competition for DSL services in the future.

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According to Point-Topic, the average length of the telephone local loop in Italy is short, with 75% less than 2 km. This fact, in combination of with high population densities in cities, makes DSL a very favorable broadband technology in the country.

According to Telecom Italia, DSL was available to 68% of internet users and 74% of SMEs in 2001.

**Telecom Italia ADSL Coverage in Italy, 2000 & 2001 (as a % of households and SMEs)**



Source: Telecom Italia, March 2002

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The consensus opinion among research firms is that there were between 200,000 and 250,000 DSL subscribers in Italy at the end of 2001. eMarketer’s estimate of 1.4 million DSL households by 2004 corresponds closely with Jupiter’s prediction.

**Comparative Estimates: DSL Households in Italy, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	10	100	250	500	-
BDRC/EU, August 2001	10	71	241	571	-
Jupiter Media Metrix, October 2001	-	201	571	1,066	1,477
OECD, October 2001	115	239*	-	-	-
Point-Topic, April 2002	-	222	-	-	-
<b>eMarketer, May 2002</b>	<b>115</b>	<b>250</b>	<b>535</b>	<b>875</b>	<b>1,350</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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Point-Topic reports there were 168,000 business DSL subscribers in Italy at the end of 2001.

**DSL Subscribers in Italy, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>167.7</b>
<b>Residential</b>	<b>222.3</b>
<b>Total</b>	<b>390.0</b>

Source: Point-Topic, April 2002

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**Cable**

National incumbent Telecom Italia owns the only cable network in the country and has recently decided not to invest in expanding or upgrading its network. Less than 5% of Italian homes are passed by cable, and, of these homes, only 7% take cable services. Prospects for two-way broadband cable services are some way off.

Few research firms predict many cable internet households at all in the years to come.

**Comparative Estimates: Cable Internet Households in Italy, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	0	0	0	0	-
BDRC/EU, August 2001	0	5	22	70	-
Jupiter Media Metrix, October 2001	-	0	0	0	0
OECD, October 2001	0	0*	-	-	-
<b>eMarketer, May 2002</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>50</b>	<b>140</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD);\*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000 & 2001

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## Alternative Broadband Technologies

While cable internet is lacking in Italy, fiber-to-the-building solutions are becoming more widely available. FastWeb and MetroWeb, both owned by e.Biscom, are currently wiring apartment buildings with optical fiber and then using Ethernet to connect individual apartments at speeds of 10Mbps. This is a similar model to B2 in Sweden. Fastweb recently reported 50,000 subscribers to its services and has set the goal of 135,000 customers by the end of 2002. Fiber solutions may provide the necessary choice and competition needed to drive broadband in Italy in the coming years.

### Comparative Estimates: Alternative Broadband Households in Italy, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	0	2	20	90	-
Jupiter Media Metrix, October 2001	-	39	132	251	423
OECD, October 2001	4	15*	-	-	-
<b>eMarketer, May 2002</b>	<b>4</b>	<b>40</b>	<b>135</b>	<b>265</b>	<b>444</b>

*Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology; \*subscribers as of 30 June 2001*  
*Source: eMarketer, May 2002; various, as noted, 2001*

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## Broadband Costs

At \$72.90 per month for a 640kbps DSL connection, Italy ranks as having one of the most costly DSL subscriptions in the world. FastWeb's fiber solution in contrast is cheaper at \$68 per month and comes at a speed of 10Mbps.

### Selected Broadband Access Plans in Italy, 2002

Company	Access technology	Speed downstream/upstream	Monthly charge
Telecom Italia	ADSL	640Kpbs/128Kpbs	\$72.90
Fastweb	Fiber	10Mbps/10Mbps	\$68.44

*Source: company reports, 2002*

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The high price of broadband is confirmed by a European Commission study published in December 2001. Italy's DSL prices some of the most expensive in Europe.

**Monthly Access Costs for ADSL and Cable Modem Internet Access in Selected European Countries, December 2001**

	<b>ADSL</b>	<b>Cable modem</b>
Austria	€58.53	€45.82
Belgium	€29.14	€28.21
Denmark	€29.70	€16.79
Finland	€43.63	€13.86
France	€38.65	€38.84
Germany	€24.09	€33.63
Italy	€63.70	–
Netherlands	€37.61	€61.55
Portugal	€106.40	€55.95
Spain	€90.73	€11.31
Sweden	€40.45	€17.04
UK	€67.18	€40.30

*Note: Lowest monthly cost at 1 Megabit/sec. Euros at purchasing price parity excluding value added tax*  
*Source: European Commission, December 2001*

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.

[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

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## H. Netherlands

### Summary

The Netherlands ranks 3rd in Europe and 9th globally with a broadband penetration rate of 8% of households at the end of 2001. Early roll-out of cable modem services from chello Broadband has been the catalyst for early adoption of broadband in the Netherlands. The Netherlands is one of the few countries, apart from the US, where cable internet dominates the broadband sector.

### Netherlands Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
120	430	0	550	8.09%	3	9

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International Telecommunications Union reports the Netherlands had 5.3 million internet users in 2001, up from 3 million in 1999.

### Internet Users in the Netherlands, 1999-2001 (in millions)



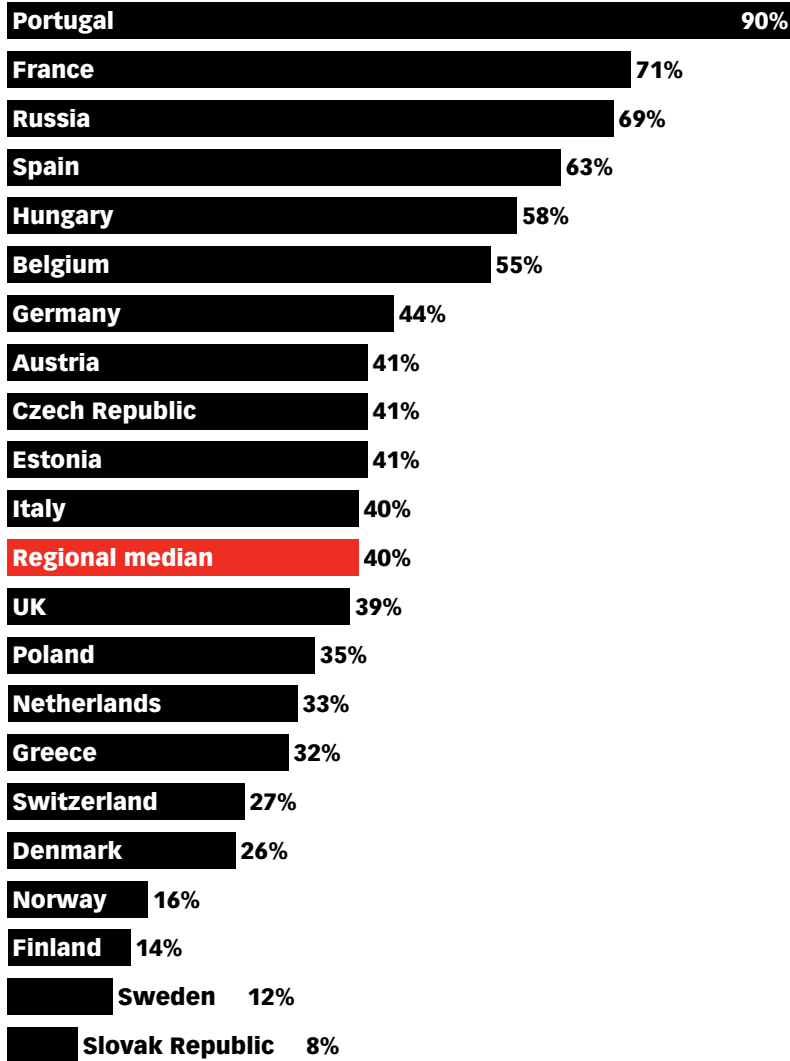
Source: International Telecommunication Union (ITU), 2000-2002

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The Dutch internet sector is quite mature and as such is not growing as quickly as other less developed internet countries in Europe, recording a growth between 1999 and 2001 of 33%. The European average for that period was 40%.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002

eMarketer forecasts there will be 9.4 million internet users in the Netherlands in 2004.

**Internet Users in the Netherlands, 2001-2004 (in millions)**



Source: eMarketer, 2002

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**Internet Households**

Early adoption of the internet has seen the Netherlands have one of the highest household internet penetration rates in the world. eMarketer estimates that at the end of 2001 there were 4.2 million online households equating to nearly 62% of all households in the country. Of those households online, 3.6 million had dial-up and 550,000 had broadband.

**Internet Households in the Netherlands, by Access Technology, End of 2001 (in thousands and as a % of total households\*)**

	Internet households	% of total households
Dial-up**	3,648	53.6%
DSL	120	1.8%
Cable	430	6.3%
Other	0	0.0%
<b>Total broadband households</b>	<b>550</b>	<b>8.1%</b>
<b>Total online households</b>	<b>4,198</b>	<b>61.7%</b>

Note: \*based on 6.8 million households; \*\*includes ISDN

Source: eMarketer, May 2002

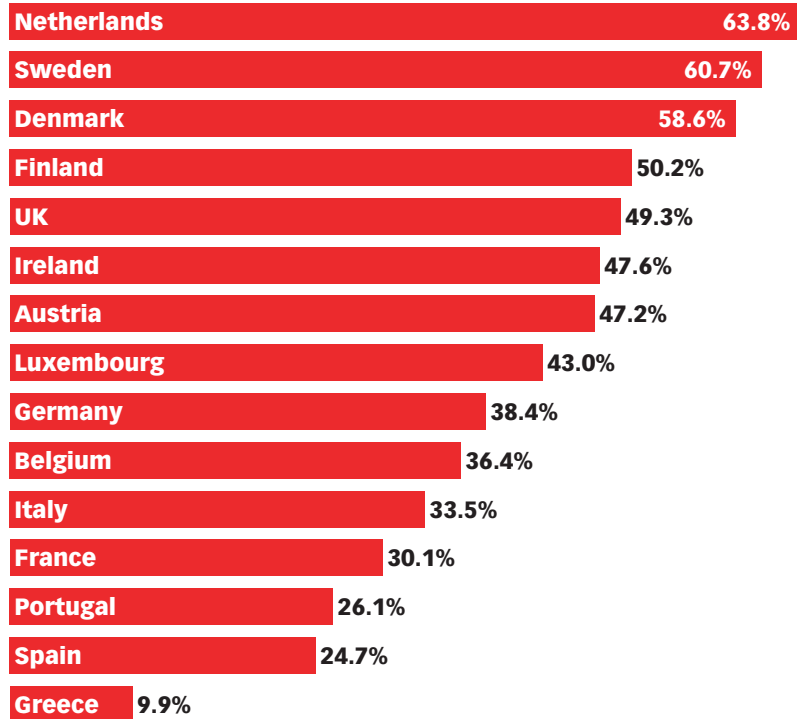
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The European Commission's internet study in December, 2001 showed 63.8% of Dutch households had internet access. This estimate is slightly higher than eMarketer's estimate of 61.7%.

### Household Internet Penetration in the European Union, by Member State, December 2001



Source: European Commission, December 2001

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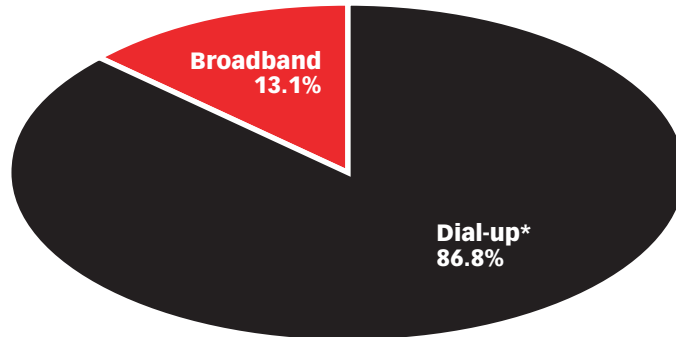
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Despite widespread broadband being available for over two years, dial-up continues to be the dominant internet access technology. eMarketer estimates that only 13% of online households had broadband at the end of 2001.

### Percent of Dutch Online Households, Dial-Up and Broadband, End of 2001



*Note: \*includes ISDN*  
*Source: eMarketer, June 2002*

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## Dial-Up

The internet dial-up market is a competitive one in the Netherlands, with national and international ISPs vying for the largest share of the internet market. HetNet, Planet Internet, Tiscalie, Zon, Freeler, Wish and Wanadoo all have a significant subscriber base in the Netherlands with the former national monopoly KPN dominating the market.

## Broadband Access

**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

With early penetration of cable internet services and a competitive DSL market forecast, the Netherlands will be one of the biggest broadband internet markets in Europe. Cable providers chello Broadband and Casema have stolen an early lead in the broadband market resulting in cable internet access dominating the broadband sector. The Netherlands is one of the few countries, apart from the US, where cable internet services are outpacing DSL services.

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Former national telcom, KPN reported 138,000 DSL subscribers at the end of 2001. United pan-European Cable (UPC) and its broadband ISP chello Broadband was the leading broadband provider in the country at the end of 2001, reporting 215,000 subscribers. Casema reported 90,000 cable internet subscribers.

**Leading Broadband Access Providers in the Netherlands, End of 2001 (in thousands)**

	<b>Access technology</b>	<b>Subscribers</b>
Casema	Cable	90.0
Royal KPN N.V	DSL	138.0
UPC/chello Broadband	Cable	215.0*

*Note: \*as of September 2001*

*Source: company data, 2002*

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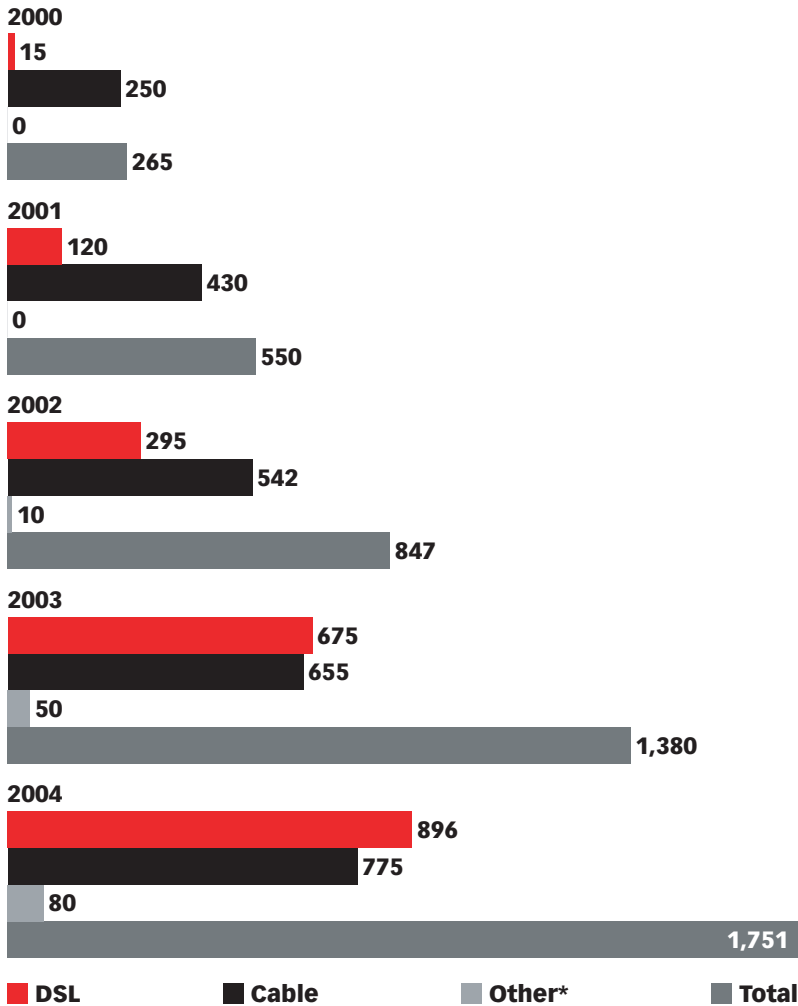
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eMarketer foresees the number of broadband households in the Netherlands to reach 1.75 million by 2004 from 550,000 in 2001. While cable internet has taken an early lead in this market, eMarketer predicts that DSL will pick up momentum in 2003 and 2004 to surpass cable as the leading broadband access technology.

**Broadband Households in the Netherlands, by Access Technology, 2000-2004 (in thousands)**



Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

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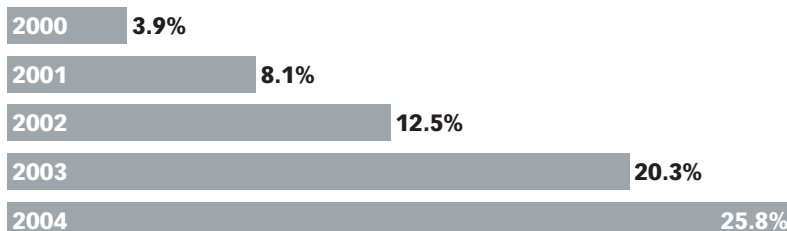
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More than one in four households in the Netherlands will have broadband by 2004 at current growth rates. This is a significant rise from 8% in 2001.

### Broadband Penetration in Netherlands, 2000-2004 (as a % of total households)



*Note: Based on 6.8 million households at the end of 2001*

*Source: eMarketer, June 2002*

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The OECD reported 433,000 broadband residential and small business subscribers in the Netherlands as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. eMarketer's projection of 1.75 million broadband households in 2004 is in line with other comparative estimates, and if anything, slightly more conservative.

### Comparative Estimates: Broadband Households in the Netherlands, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	260	560	1,100	1,950	–
BDRC/EU, August 2001	245	641	1,140	1,750	–
VECAI, August 2001	–	395	–	–	–
OECD, October 2001	267	433*	–	–	–
<b>eMarketer, May 2002</b>	<b>267</b>	<b>550</b>	<b>847</b>	<b>1,380</b>	<b>1,751</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## DSL

KPN is the former national telecom monopoly and launched DSL services through its Mxstream service in early 2000. Its original plan was to make DSL available to all metropolitan areas of the Netherlands by the end of 2001, but competitive considerations and technical limitations have seen KPN change focus to only covering areas where they see a competitive advantage. Other ISPs that are offering DSL services include Planet Internet (KPN), XS4ALL (KPN), Sonera, Tiscali and others. In May 2002, The Dutch Authority for Posts and Telecommunications (OPTA) stated that there were 198,900 incumbent DSL lines and 17,000 OLO unbundled lines (including DSL and shared lines) in the Netherlands.

### Comparative Estimates: DSL Households in the Netherlands, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	30	150	450	1,000	-
BDRC/EU, August 2001	24	50	175	391	-
VECAI, August 2001	-	65	-	-	-
OECD, October 2001	15	97*	-	-	-
Point-Topic, April 2002	-	117	-	-	-
<b>eMarketer, May 2002</b>	<b>15</b>	<b>120</b>	<b>295</b>	<b>675</b>	<b>896</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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Point-topic reported there were 29,000 business DSL subscriptions in the Netherlands at the end of 2001, in addition to the 117,000 residential DSL subscriptions.

### DSL Subscribers in the Netherlands, Business and Residential, End of 2001 (in thousands)

<b>Business</b>	<b>29.2</b>
<b>Residential</b>	<b>116.8</b>
<b>Total</b>	<b>146.0</b>

Source: Point-Topic, April 2002

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## Cable

The cable market in the Netherlands is divided between three large operators: UPC, France Telecom-owned Casema and Essent. Together they control over 80% of the cable market and have over 6 million cable TV subscribers, according to Screen Digest and Van Dusseldorp & Partners. Pan-European cable company UPC is the largest cable operator in the Netherlands, passing over 2 million homes. In early 1999, UPC, through its internet arm chello Broadband, launched cable modem services, and in September, 2001 reported 215,000 subscribers. Other cable modem services that are available in the Netherlands include Cable Wandao, which uses the Casema network, reporting 90,000 subscribers at the end of 2001.

Cable internet services have taken an early lead over DSL due in large part to the aggressive customer acquisition of chello Broadband. This lead is forecast to be whittled down in 2003 and 2004 when DSL services will become more popular than cable internet. This is not a view shared by BDRC/EU, however, who indicates that cable internet will substantially outpace DSL subscriptions.

### Comparative Estimates: Cable Internet Households in the Netherlands, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	230	410	650	950	-
BDRC/EU, August 2001	220	588	951	1320	-
VECAI, August 2001	-	330	-	-	-
OECD, October 2001	250	336*	-	-	-
<b>eMarketer, May 2002</b>	<b>250</b>	<b>430</b>	<b>542</b>	<b>655</b>	<b>775</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## Alternative Broadband Technologies

Swedish broadband operator Bredbandsbolaget (B2) has a base in the Netherlands and has announced plans to target customers in the Benelux region with its fiber to the home offering. Alternative broadband technologies such as fixed-wireless, satellite, powerline and fiber/Ethernet solutions have not made significant head-way in the Netherlands as of mid-2002.

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## Broadband Costs

ADSL and cable internet in the Netherlands will set you back approximately \$44 per month according to data from OECD and Point-Topic. This is slightly more expensive than other broadband services around Europe and the world but about the same as in the US.

### Selected Broadband Access Plans in the Netherlands, 2002

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge
UPC-chello (1)	Cable	512/128	\$82.70	\$41.40
Casema (2)	Cable	256/96	\$64.00	\$42.39
KPN (3)	ADSL	512/64	\$150.00	\$44.01

Source: (1) company reports, May 2002; (2) Point-Topic, April 2002; (3) Organization for Economic Cooperation and Development (OECD), October 2001

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The European Commission survey, published in December, 2001 reported the average cable internet service in the Netherlands was considerably higher than its European counterparts. ADSL in contrast, according to the survey, was one of the cheaper broadband services in Europe. Clearly, measuring different access plans at different times accounts for the different prices.

### Monthly Access Costs for ADSL and Cable Modem Internet Access in Selected European Countries, December 2001

	ADSL	Cable modem
Austria	€58.53	€45.82
Belgium	€29.14	€28.21
Denmark	€29.70	€16.79
Finland	€43.63	€13.86
France	€38.65	€38.84
Germany	€24.09	€33.63
Italy	€63.70	–
Netherlands	€37.61	€61.55
Portugal	€106.40	€55.95
Spain	€90.73	€11.31
Sweden	€40.45	€17.04
UK	€67.18	€40.30

Note: Lowest monthly cost at 1 Megabit/sec. Euros at purchasing price parity excluding value added tax

Source: European Commission, December 2001

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## I. Norway

### Summary

Considering Norway's high internet penetration, they have been relatively slow in adopting broadband. At a household penetration of 4.2%, Norway ranks 7th in Europe and 14th globally. One of the barriers to broadband growth has been the dominant incumbent - Telenor - largely controlling both the cable and DSL markets.

### Norway Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
42	38	2	82	4.19%	7	14

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

Internet users numbered 2.7 million in 2001 according to the International Telecommunications Union, up from 2 million in 1999.

### Internet Users in Norway, 1999-2001 (in millions)

1999	2.0
2000	2.2
2001	2.7

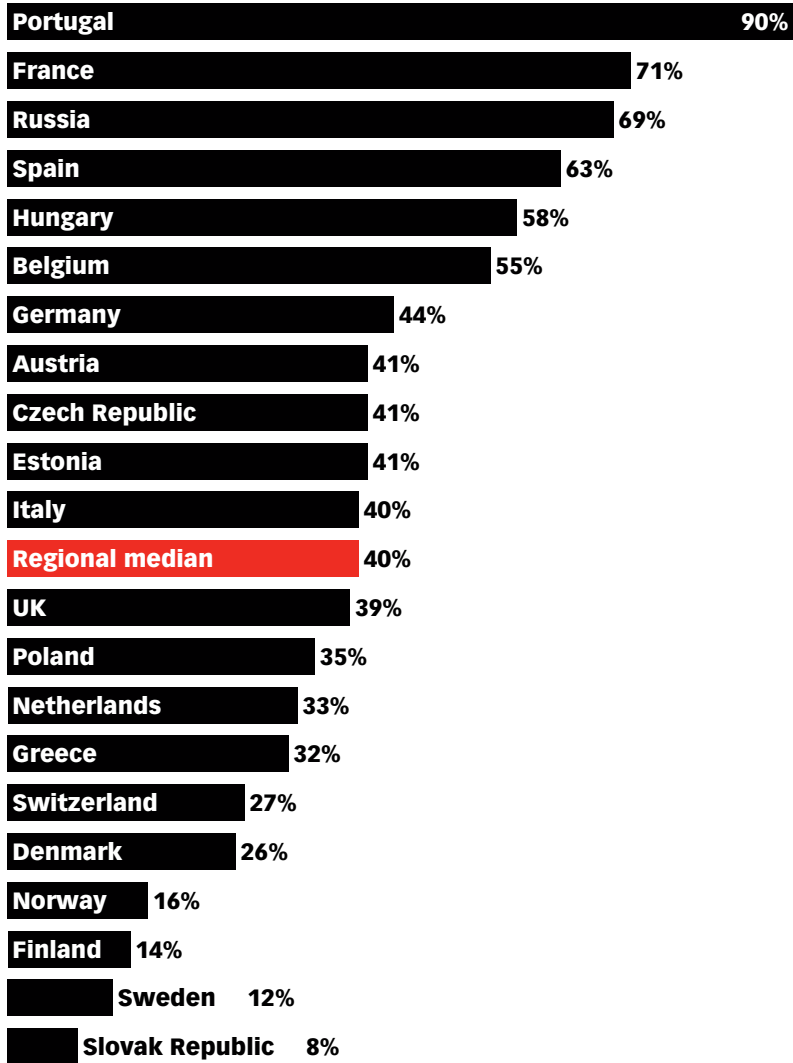
Source: International Telecommunication Union (ITU), 2000-2002

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Early internet adoption in Norway has meant internet user growth is not as great as in other less developed markets in Europe. The internet user growth between 1999 and 2001 in Norway was only 16%. In comparison, the regional median was 40%.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**

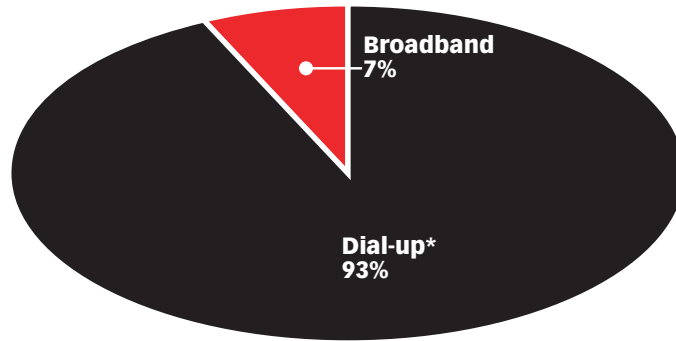


Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002

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Only 7% of online households in Norway had broadband at the end of 2001 according to eMarketer's analysis.

**Percent of Norwegian Online Households, Dial-Up and Broadband, End of 2001**



Note: \*includes ISDN  
Source: eMarketer, June 2002

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**Internet Households**

The number of internet households in Norway in 2001 reached 1.18 million, or 60.3% of all households, according to eMarketer. With only 82,000 broadband households at that time, dial-up internet access was by far the most popular home internet access technology.

**Internet Households in Norway, by Access Technology, End of 2001 (in thousands and as a % of total households\*)**

	Internet households	% of total households
Dial-up**	1,097	56.1%
DSL	42	2.1%
Cable	38	1.9%
Other	2	0.1%
<b>Total broadband households</b>	<b>82</b>	<b>4.2%</b>
<b>Total online households</b>	<b>1,179</b>	<b>60.3%</b>

Note: \*based on 1.96 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

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## Dial-Up

Dial-up ISPs that currently dominate the market include Nextra (Telenor's internet arm), Online.no, Tele 2, KPNWest and Telia.

Telenor reported 893,000 internet subscriptions at the end of the 1<sup>st</sup> Q 2002, 481,000 through its Frisurf service.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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The cable network passes approximately 50% of households in Norway, according to the OECD. UPC is the market leader in terms of cable TV subscribers with 42%, but Telenor's own cable network is the second largest cable TV provider with 36% of the market. Telenor has been relatively slow to roll-out its DSL service and reported only 42,000 DSL subscribers as of March 2002. Leading cable internet provider chello Broadband reported 23,000 internet subscribers in September, 2001.

### Leading Broadband Access Providers in Norway, End of 2001 (in thousands)

	Access technology	Subscribers
Telenor	DSL	42.0*
UPC/chello Broadband	Cable	23.3**

*Note: \*as of 30 March 2002; \*\*as of September 2001  
Source: company data, 2002*

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Norway will reach 618,000 broadband households by 2004. DSL will begin to garner significant subscribers by late 2002 and will lead cable modem services through to 2004.

**“This autumn we have seen a shift in the customer base. More and more families with teenagers now want ADSL. A faster internet connection is still the most important advantage of ADSL, but the new content services with added entertainment value are important to these families.”**

*– Knut Haakon Nilsen, Managing Director, Telenor Plus*

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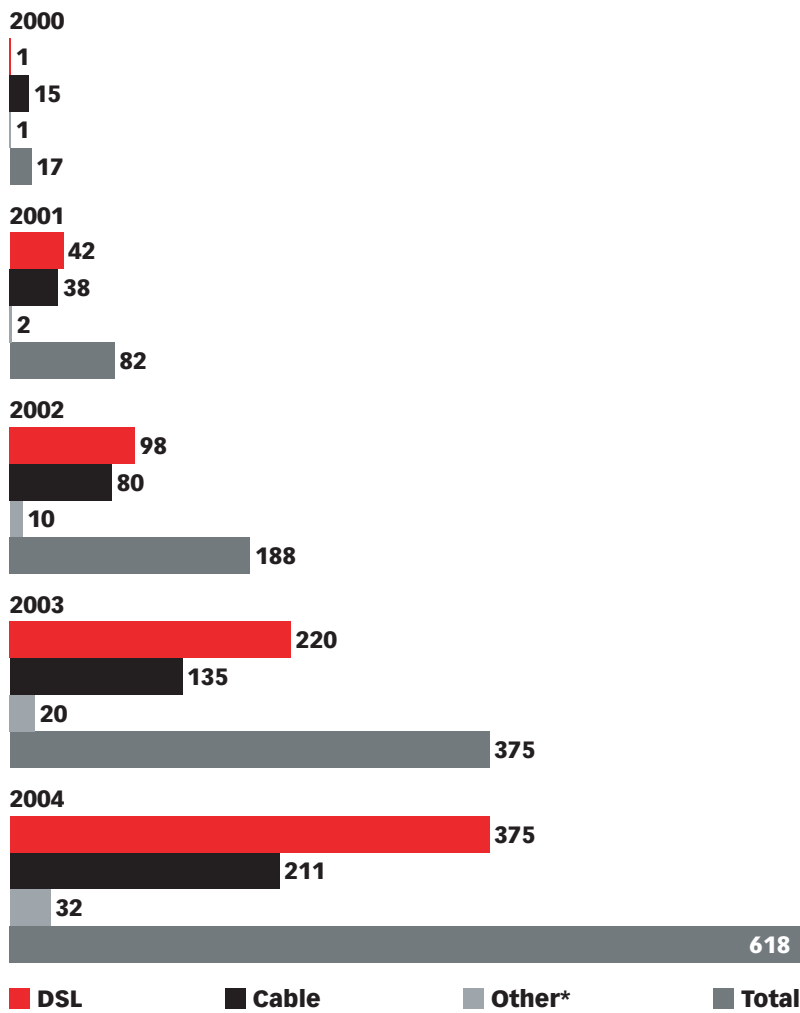
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### Broadband Households in Norway, by Access Technology, 2000-2004 (in thousands)



*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

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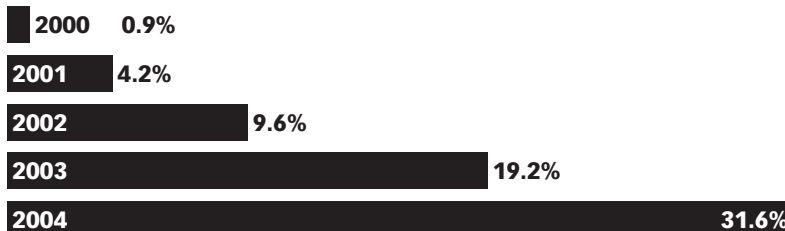
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While Norway has been a slow starter when it comes to broadband, by 2004 eMarketer expects 32% of Norwegian households will have broadband.

**Broadband Penetration in Norway, 2000-2004 (as a % of total households)**



*Note: Based on 1.955 million households at the end of 2001  
Source: eMarketer, June 2002*

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Screen Digest's estimate in December 2000 was for 675,000 broadband households in Norway by 2003. Considering Norway's slow start, however, this would seem an ambitious forecast. The OECD reported only 23,000 broadband and small business subscribers in Norway in June 2001. eMarketer has based its forward projections on data from the OECD.

**Comparative Estimates: Broadband Households in Norway, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Ovum, October 2000	46	168	248	353	479
Screen Digest/Van Dusseldorp & Partners, December 2000	50	160	400	675	-
OECD, October 2001	16	23*	-	-	-
<b>eMarketer, May 2002</b>	<b>16</b>	<b>82</b>	<b>188</b>	<b>375</b>	<b>618</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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**DSL**

Telenor, the national telco, launched a full commercial ADSL service in July 1999 targeting the business market and offering downstream speeds from 640kbps to 2,048kbps. Residential services were launched in late 2000 in the major cities of Oslo, Bergen, Trondheim and Stavanger, with further cities becoming available through 2001. As Telenor's local loop did not become available to competing providers of DSL services until April 2000, few competitors have emerged.

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Recent reports from Telenor would suggest that DSL subscriptions are now being adopted very quickly. In April 2002, Telenor reported 2,500 new subscribers per week, which would indicate that broadband in Norway is set to increase significantly.

From a slow start eMarketer forecasts there will be 100,000 DSL households in Norway in 2002 rising to 375,000 in 2004. Early forecasts from Ovum and Screen Digest predicted early growth in DSL that never materialized.

**Comparative Estimates: DSL Households in Norway, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Ovum, November 2000	21	119	205	333	521
Screen Digest/Van Dusseldorp & Partners, December 2000	20	100	300	500	-
OECD, October 2001	1	2.5*	-	-	-
Point-Topic, April 2002	-	40	-	-	-
<b>eMarketer, May 2002</b>	<b>1</b>	<b>42</b>	<b>98</b>	<b>220</b>	<b>375</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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There were 10,000 business DSL lines in service in Norway at the end of 2001 according to Point-Topic.

**DSL Subscribers in Norway, Business and Residential, End of 2001 (in thousands)**



*Source: Point-Topic, April 2002*

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**Cable**

Cable services are provided by two main operators in Norway: Telenor Avidi, controlled by the national telco, and UPC. Between them there are approximately 700,000 cable TV subscribers, and both firms have launched cable internet services. By September 2001, UPC's internet arm chello Broadband led the cable internet market with approximately 23,000 subscribers.

One of the major impediments to a rapid expansion of cable internet services in Norway is the need to upgrade a significant percentage of the cable network to allow two-way services. Since Telenor has a stake in both the cable and DSL markets, it is unlikely that it will invest in upgrading both its networks.

**Comparative Estimates: Cable Internet Households in Norway, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Ovum, November 2000	31	78	99	121	140
Screen Digest/Van Dusseldorp & Partners, December 2000	30	60	100	175	-
OECD, October 2001	15	20.5*	na	-	-
<b>eMarketer, May 2002</b>	<b>15</b>	<b>38</b>	<b>80</b>	<b>135</b>	<b>211</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000 & 2001

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**Alternative Broadband Technologies**

There is no evidence as yet that alternative broadband technologies such as those rolled-out in Sweden have had nearly the impact on near neighbor Norway. Swedish company Bredbandsbolaget (B2) has indicated its intention of offering its services in Norway and other competitors including Utfors and Tele 1 Europe have also announced plans but little activity has occurred to date.

**Broadband costs**

In late 2001, broadband access prices were very expensive according to OECD. The international body reported a 704kbps ADSL connection in Norway cost over \$100 per month. A recent announcement by Telenor indicated it is losing money on DSL services, and that it may introduce volume-based pricing to improve revenues.

**Selected Broadband Access Plans in Norway, 2002**

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge
Telenor (1)	ADSL	704/128	\$167.37	\$104.29
UPC-chello (2)	Cable	512/128	\$91.00	\$43.20

Source: (1) Organization for Economic Cooperation and Development (OECD), October 2001; (2) company reports, May 2002

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## J. Portugal

### Summary

Portugal ranks 11th in Europe and 18th globally in terms of broadband penetration of households. While Portugal Telecom controls both the largest cable network and the local loop, the prospects for competition in the broadband space are limited.

### Portugal Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
3	80	0	83	2.52%	11	18

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*

*Source: eMarketer, June 2002*

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### Internet Users

The International Telecommunication Union reported that Portugal had 3.6 million internet users at the end of 2001, up from only 1.0 million in 1999.

### Internet Users in Portugal, 1999-2001 (in millions)



*Source: International Telecommunication Union (ITU), 2000-2002*

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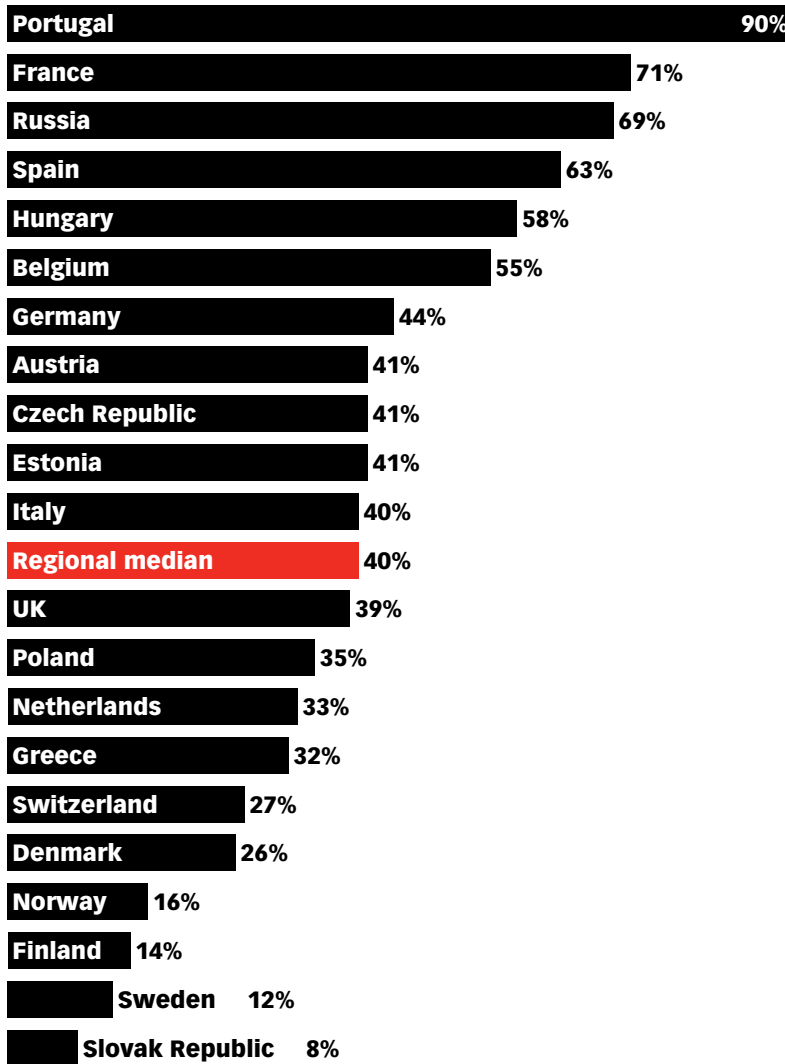
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As Portugal is one of the least mature internet markets in Europe, it has experienced explosive internet user growth since 1999.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
Source: eMarketer\*, March 2002

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## Internet Households

eMarketer estimates there were 941,000 households online in 2001 in Portugal, 858,000 of them had a dial-up connection and only 83,000 households had broadband.

### Internet Households in Portugal, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	858	26.0%
DSL	3	0.09%
Cable	80	2.4%
Other	0	0.0%
<b>Total broadband households</b>	<b>83</b>	<b>2.5%</b>
<b>Total online households</b>	<b>941</b>	<b>28.5%</b>

Note: \*based on 3.3 million households; \*\*includes ISDN

Source: eMarketer, May 2002

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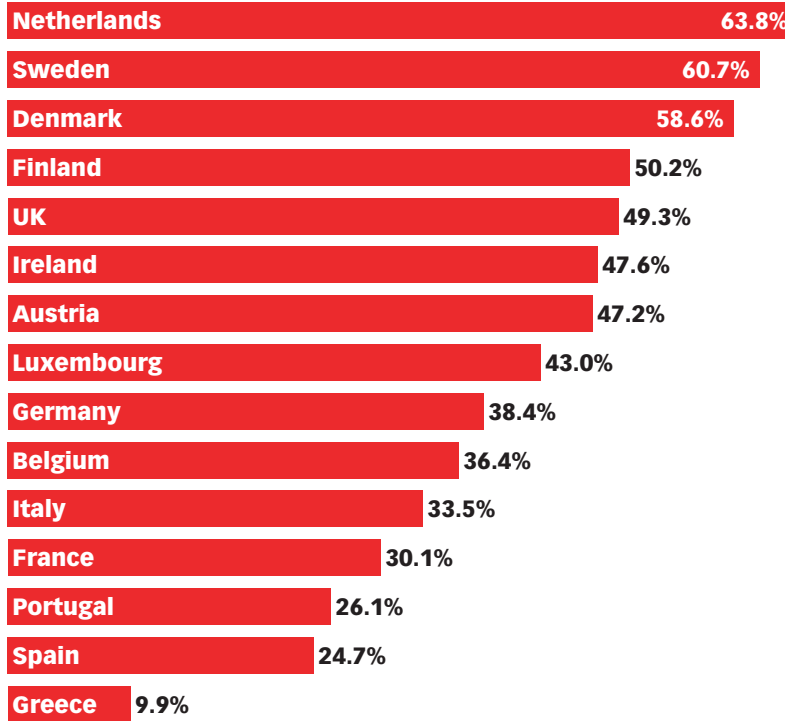
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The European Commission's internet study in December, 2001 showed 26% of Portuguese households had internet access. This estimate is slightly shy of eMarketer's estimate of 29%.

### Household Internet Penetration in the European Union, by Member State, December 2001



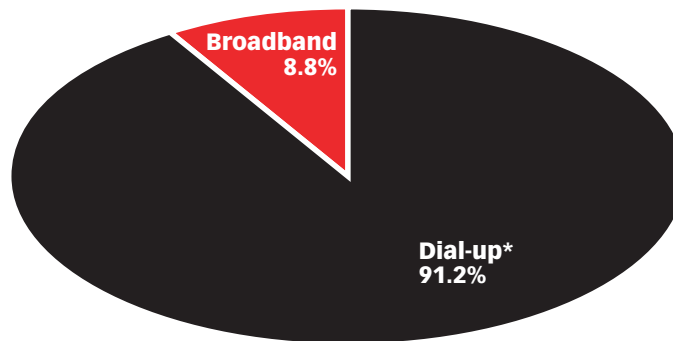
Source: European Commission, December 2001

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Dial-up dominates the internet access market in Portugal with over 91% of all households online using dial-up to access the internet.

### Percent of Portuguese Online Households, Dial-up and Broadband, End of 2001



Note: \*includes ISDN

Source: eMarketer, June 2002

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## Dial-Up

Portugal Telecom, the national telecom operator, dominates the dial-up internet market. With little penetration of broadband internet, nearly all active internet users access the internet by dial-up modem. This is not expected to change for some time.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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Portugal Telecom controls the largest cable network in Portugal as well as controlling the DSL market. Portugal Telecom deployed wholesale ADSL in early 2001, when it claimed that 70% of lines in Lisbon and 60% of lines in Oporto were DSL-ready. The Portuguese local loop market was unbundled in July 2001, when PT's ADSL offering was made available to other operators on a wholesale basis.

Portugal Telecom's cable internet arm, TV Cabo, launched cable internet services a year before it launched DSL services. It recently reported 75,000 cable internet subscribers as of March 2002.

---

### **Leading Broadband Access Provider in Portugal, 2001 & 2002 (in thousands of subscribers)**

	<b>Access technology</b>	<b>30 June 2001</b>	<b>30 March 2002</b>
TV Cabo Portugal	Cable	40.0	75.0

*Source: eMarketer, May 2002; company data, 2002*

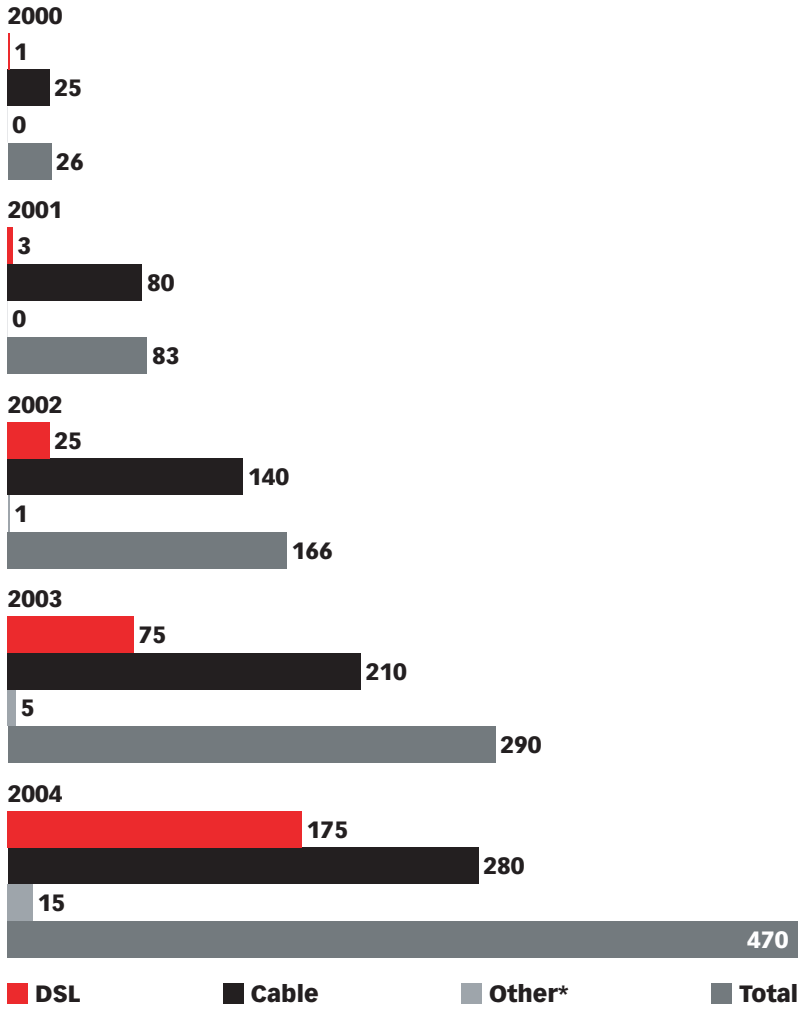
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eMarketer estimates that there will be nearly 500,000 broadband households in Portugal by 2004. Cable internet is likely to dominate the market until DSL becomes more widely available.

**Broadband Households in Portugal, by Access Technology, 2000-2004 (in thousands)**



*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

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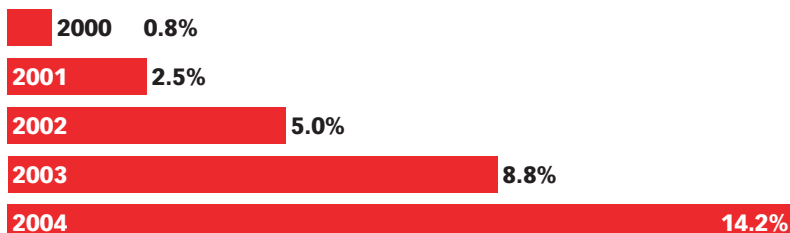
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Broadband penetration of households will only reach 14% by 2004, from 2.5% in 2001.

### Broadband Penetration in Portugal, 2000-2004 (as a % of total households)



*Note: Based on 3.3 million households at the end of 2001*

*Source: eMarketer, June 2002*

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The OECD reported 57,000 broadband residential and small business subscribers in Portugal as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. There is a reasonable amount of consensus among research firms that by 2003/2004 there will be between 300,000 and 400,000 broadband households in Portugal.

### Comparative Estimates: Broadband Households in Portugal, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	7	45	100	320	–
BDRC/EU, August 2001	30	60	109	196	–
OECD, October 2001	26	57*	–	–	–
<b>eMarketer, May 2002</b>	<b>26</b>	<b>83</b>	<b>166</b>	<b>330</b>	<b>490</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## DSL

The local loop is in the process of being unbundled, which should kick-start competition in the broadband sector. Until this happens, however, Portugal Telecom has little incentive to invest in DSL when it has its cable network to take care of. Nevertheless, eMarketer expects nearly 200,000 DSL households in Portugal by 2004, up from a few thousand in 2001.

### Comparative Estimates: DSL Households in Portugal, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	0	20	50	200	-
BDRC/EU, August 2001	0	1	3	10	-
OECD, October 2001	1	2*	-	-	-
Point-Topic, April 2002	-	2	-	-	-
<b>eMarketer, May 2002</b>	<b>1</b>	<b>3</b>	<b>25</b>	<b>75</b>	<b>175</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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Point-Topic reported that Portugal had 2,500 DSL connections in 2001. Of these, 1,000 of them were business DSL connections.

### DSL Subscribers in Portugal, Business and Residential, End of 2001 (in thousands)

Business	1.0
Residential	1.5
<b>Total</b>	<b>2.5</b>

*Source: Point-Topic, April 2002*

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## Cable

TV Cabo, Portugal Telecom's subsidiary, controls 90% of the cable market in 2000. The next largest with 7% market share is Cabovisão according to Screen Digest. To date, competition in the broadband sector has only really occurred in the cable internet space, despite TV Cabo's dominance. Cable internet will be the dominant broadband access technology for some time.

### Comparative Estimates: Cable Internet Households in Portugal, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	7	25	50	120	-
BDRC/EU, August 2001	30	60	102	175	-
OECD, October 2001	25	55*	-	-	-
<b>eMarketer, May 2002</b>	<b>25</b>	<b>80</b>	<b>140</b>	<b>210</b>	<b>280</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## Alternative Broadband Technologies

Fixed-wireless licenses were recently allocated on a tender basis, with the following operators receiving a license: Onitelecom, Sonae, Maxitel, Jazztel, Eastécnica, Teleweb, Telecel, WTS and Bragatel. Fixed wireless may provide a viable alternative to cable and DSL due to the lack of competition in those markets.

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## Broadband Costs

With little competition in the DSL market, Portugal Telecom's DSL price is very expensive at nearly \$100 per month plus additional MB charges. Cable internet, where there is a level of competition in Portugal, is reasonably priced at \$25 per month. The speed provided for this service, however, is only as high as a ISDN connection, however.

### Selected Broadband Access Plans in Portugal, 2001

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge
Portugal Telecom	DSL	768/128	\$134.79	\$92.16 + 0.03 cents per MB after 5,000MB
NetVisao	Cable	128/128	\$23.42	\$24.59 + 0.01 cent per MB after 3,000MB

Source: Organization for Economic Cooperation and Development (OECD), October 2001

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## K. Spain

### Summary

With only 3% of households with broadband at the end of 2001, Spain ranks 10th in Europe and 17th globally, according to eMarketer. With low cable penetration, DSL offered by the incumbent Telefonica is the only broadband option available to most. But recent evidence suggests Spaniards are quickly jumping on board the DSL bandwagon.

### Spain Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
305	71	0	375	3.00%	10	17

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined  
Source: eMarketer, June 2002*

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### Internet Users

The Spanish internet market is one of the fastest growing in Europe. The International Telecommunication Union reports that in 2001 Spain had 7.4 million internet users, up from 2.8 million in 1999.

### Internet Users in Spain, 1999-2001 (in millions)



*Source: International Telecommunication Union (ITU), 2000-2002*

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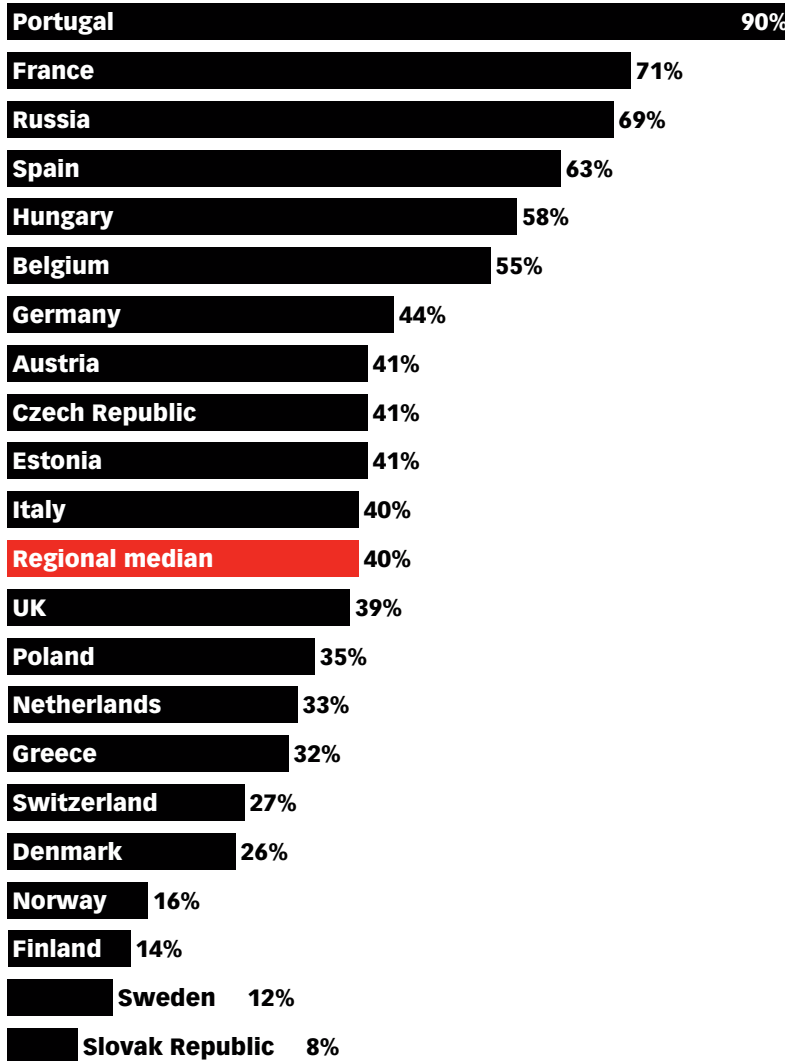
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Growth between 1999 and 2001 was 63%, which indicates as much as anything else, the fact that Spain has been slow to adopt the internet until only recently.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**

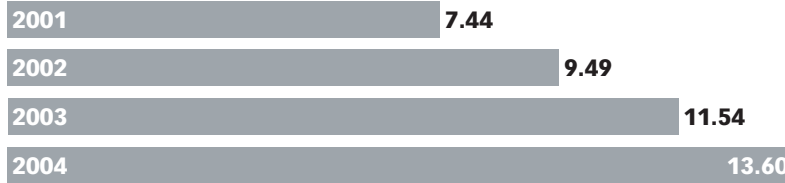


Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002

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eMarketer predicts continued strong growth for Spain in the coming years so that by 2004 there will be 13.6 million internet users.

**Internet Users in Spain, 2001-2004 (in millions)**



*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
*Source: eMarketer, 2001*

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**Internet Households**

With a household internet penetration rate of only 29%, Spain has one of the lowest penetration rates in Western Europe. eMarketer estimates that at the end of 2001, 3.1 million households had a dial-up internet connection and 375,000 households had broadband.

**Internet Households in Spain, by Access Technology, End of 2001 (in thousands and as a % of total households\*)**

	Internet households	% of total households
Dial-up**	3,187	25.5%
DSL	305	2.4%
Cable	70	0.06%
Other	0	0.0%
<b>Total broadband households</b>	<b>375</b>	<b>3.0%</b>
<b>Total online households</b>	<b>3,562</b>	<b>28.5%</b>

*Note: \*based on 12.5 million households; \*\*includes ISDN*  
*Source: eMarketer, May 2002*

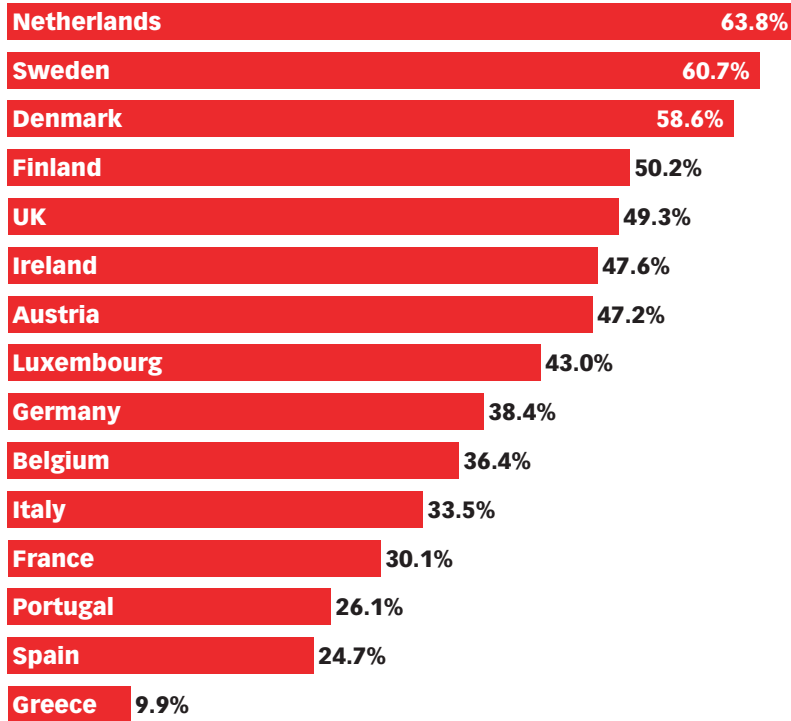
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The European Commission's internet study in December 2001 showed 25% of Spanish households had internet access. This estimate is slightly shy of eMarketer's estimate at 28%.

### Household Internet Penetration in the European Union, by Member State, December 2001



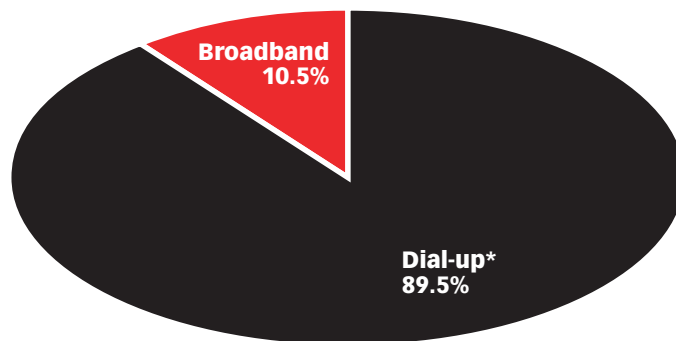
Source: European Commission, December 2001

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Only 10.5% of online households in Spain use broadband. As greater access to DSL becomes available, this ratio will change rapidly.

### Percent of Spanish Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

Telefónica, the national telecom, largely controls the “last mile” in Spain, and its slow rollout of DSL has made dial-up internet access the only option for most. The incumbent’s internet arm, Terra Networks, is the largest ISP in Spain with over 2.7 million subscribers.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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At the end of 2001, Telefonica reported ADSL coverage exceeded 16.2 million lines and that new DSL installations were occurring at over 2,000 lines per day. The development of cable networks has been relatively recent in Spain, with approximately 10%-15% of Spanish homes passed, according to the OECD. Most of the cable network, however, is two-way ready so cable internet subscriptions will grow reasonably quickly in those areas with access.

Telefonica reported 375,000 DSL subscriptions at the end of 2001. Cable provider ONO Group reported 49,000 cable internet subscribers in March 2002.

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### **Leading Broadband Access Providers in Spain, 2001 & 2002 (in thousands of subscribers)**

	<b>Access technology</b>	<b>End of 2001</b>	<b>30 March 2002</b>
ONO Group	Cable	37.2	49
Telefonica	DSL	375	–

*Source: company data, 2002*

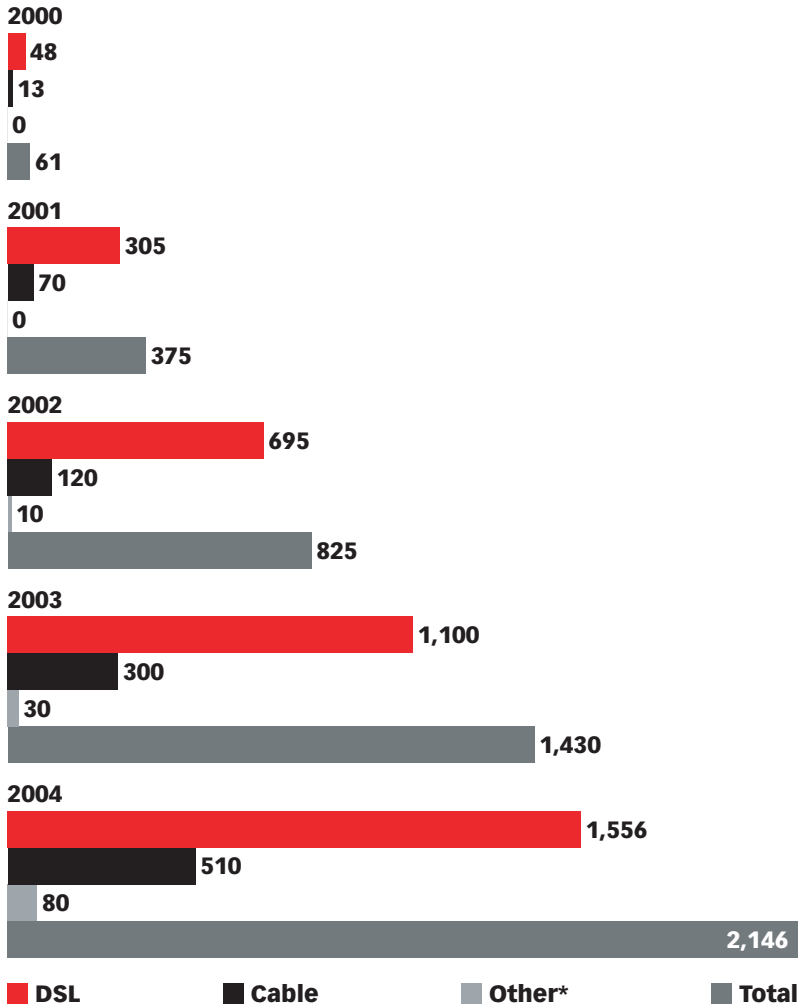
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eMarketer forecasts rapid growth, particularly in DSL, over the next two years. By 2004, eMarketer expects 2.1 million broadband households in Spain, up from 375,000 broadband households in 2001.

**Broadband Households in Spain, by Access Technology, 2000-2004 (in thousands)**



Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

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The OECD reported 184,000 broadband residential and small business subscribers in Spain as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. eMarketer's projections are the highest among the comparative estimates. One of the reasons for this is that there has been particularly strong broadband growth in the later part of 2001 and early in 2002. Those research firms forecasting in early 2001 did not have the luxury of being privy to this development.

## Comparative Estimates: Broadband Households in Spain, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	116	299	514	922	-
BDRC/EU, August 2001	59	131	357	731	-
Jupiter Media Metrix, October 2001	-	168	422	810	1,221
OECD, October 2001	61	184*	-	-	-
<b>eMarketer, May 2002</b>	<b>61</b>	<b>375</b>	<b>825</b>	<b>1,430</b>	<b>2,146</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

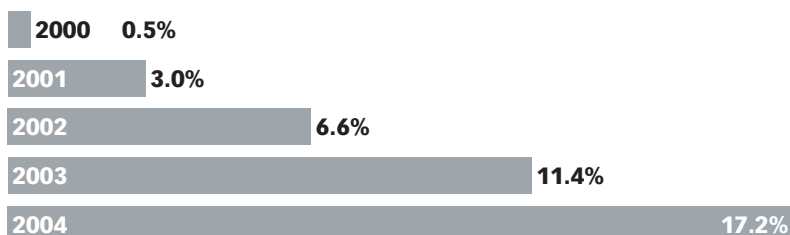
*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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eMarketer estimates 17% of Spanish households will have broadband in 2004, up from only 3% in 2001.

## Broadband Penetration in Spain, 2000-2004 (as a % of total households)



*Note: Based on 12.5 million households at the end of 2001*

*Source: eMarketer, June 2002*

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## DSL

According to the OECD, Telefonica has passed 74% of Spanish households with access at 2Mbps. A further 58% of households have 4Mbps capability and 53% have 6Mbps capability. Telefonica reports a total of 16.2 million lines are DSL capable in Spain as of December 2001. Competitors to Telefonica include Jazztel, and the Auna group of companies through ISP Eresmas and ADSL provider Retevisión.

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eMarketer estimates there will be 1.6 million DSL households at the end of 2004. Considering Telfonica has set a goal of 1 million DSL subscribers by 2002/2003, this estimate would not seem too optimistic, despite it being higher than the other comparative estimates.

**Comparative Estimates: DSL Households in Spain, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	40	150	250	500	-
BDRC/EU, August 2001	25	58	213	464	-
Jupiter Media Metrix, October 2001	-	135	277	481	651
OECD, October 2001	48	158*	-	-	-
Point-Topic, April 2002	-	301	-	-	-
<b>eMarketer, May 2002</b>	<b>48</b>	<b>305</b>	<b>695</b>	<b>1,100</b>	<b>1,556</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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Point-topic reported Spain had 75,000 business DSL subscribers as of December 2001.

**DSL Subscribers in Spain, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>75.2</b>
<b>Residential</b>	<b>300.7</b>
<b>Total</b>	<b>375.8</b>

*Source: Point-Topic, April 2002*

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**Cable**

The cable market in Spain is relatively immature, with less than 15% of Spanish homes passed and only 12% of these homes taking cable TV services. However, as the cable infrastructure is quite new, the network is ready for two-way internet services. There are 12 operational cable companies operating in different regions throughout the country, according to Screen Digest. Incumbent national telco Telefónica has recently acquired a cable license. Cable modem services are offered by a number of providers across the country.

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Forecasts for cable modem subscribers in Spain in 2003 range from 211,000 – 422,000. eMarketer’s estimate of 300,000 corresponds closely with Jupiter’s estimate. Note Jupiter’s estimates are traditionally quite conservative.

**Comparative Estimates: Cable Internet Households in Spain, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	76	149	264	422	–
BDRC/EU, August 2001	34	67	123	211	–
Jupiter Media Metrix, October 2001	–	32	135	304	526
OECD, October 2001	13	26*	–	–	–
<b>eMarketer, May 2002</b>	<b>13</b>	<b>70</b>	<b>120</b>	<b>300</b>	<b>510</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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**Alternative Broadband Technologies**

In March 2000, the Spanish government awarded fixed-wireless licenses to six consortiums: Abranet, Alo 2000, FirstMark Communications, Banda 26, Broadnet and Sky Point.

Satellite television is popular in Spain, with Via Digital (Telefónica) and CanalSatelite (CanalPlus) being the two largest operators. While internet services are not widespread, the number of satellite dishes suggests there may be a viable business in bundled internet services in the future.

With low cable penetration, such as in Italy, there may be an opportunity for a service such as B2 in Sweden or FastWeb in Italy to succeed in Spain.

**Comparative Estimates: Alternative Broadband Households in Spain, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	0	6	21	56	–
Jupiter Media Metrix, October 2001	–	1	10	25	44
<b>eMarketer, May 2002</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>30</b>	<b>80</b>

*Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology*

*Source: eMarketer, May 2002; various, as noted, 2001*

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## Broadband Costs

The OECD reported in October 2001 very high prices for broadband in Spain. ADSL prices are particularly well above the European or global average.

### Selected Broadband Access Plans in Spain, 2001

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge	Mbytes included
Telonica	ADSL	512/128	\$193.55	\$91.41	–
ONO	Cable	512 downstream	\$65.46	\$75.24	1,500

Source: Organization for Economic Cooperation and Development (OECD), October 2001

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The high price of ADSL is confirmed by a European Commission study released in December 2001. Cable internet prices, however, are the lowest in Europe according to the study.

### Monthly Access Costs for ADSL and Cable Modem Internet Access in Selected European Countries, December 2001

	ADSL	Cable modem
Austria	€58.53	€45.82
Belgium	€29.14	€28.21
Denmark	€29.70	€16.79
Finland	€43.63	€13.86
France	€38.65	€38.84
Germany	€24.09	€33.63
Italy	€63.70	–
Netherlands	€37.61	€61.55
Portugal	€106.40	€55.95
Spain	€90.73	€11.31
Sweden	€40.45	€17.04
UK	€67.18	€40.30

Note: Lowest monthly cost at 1 Megabit/sec. Euros at purchasing price parity excluding value added tax

Source: European Commission, December 2001

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## L. Sweden

### Summary

Sweden is one of the leading broadband countries in the world with a variety of broadband access options available to wide sections of the population. With a broadband penetration rate of over 13% of households, Sweden leads Europe and ranks 5th globally. The unique characteristic of Sweden's broadband market is the large number of subscribers to alternative broadband technologies other than cable modems and DSL.

### Sweden Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
190	167	185	542	13.38%	1	5

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*

*Source: eMarketer, June 2002*

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### Internet Users

Sweden had 4.6 million internet users in 2001 according to the International Telecommunication Union, up from 3.7 million in 1999.

### Internet Users in Sweden, 1999-2001 (in millions)

1999	3.7
2000	4.0
2001	4.6

*Source: International Telecommunication Union (ITU), 2000-2002*

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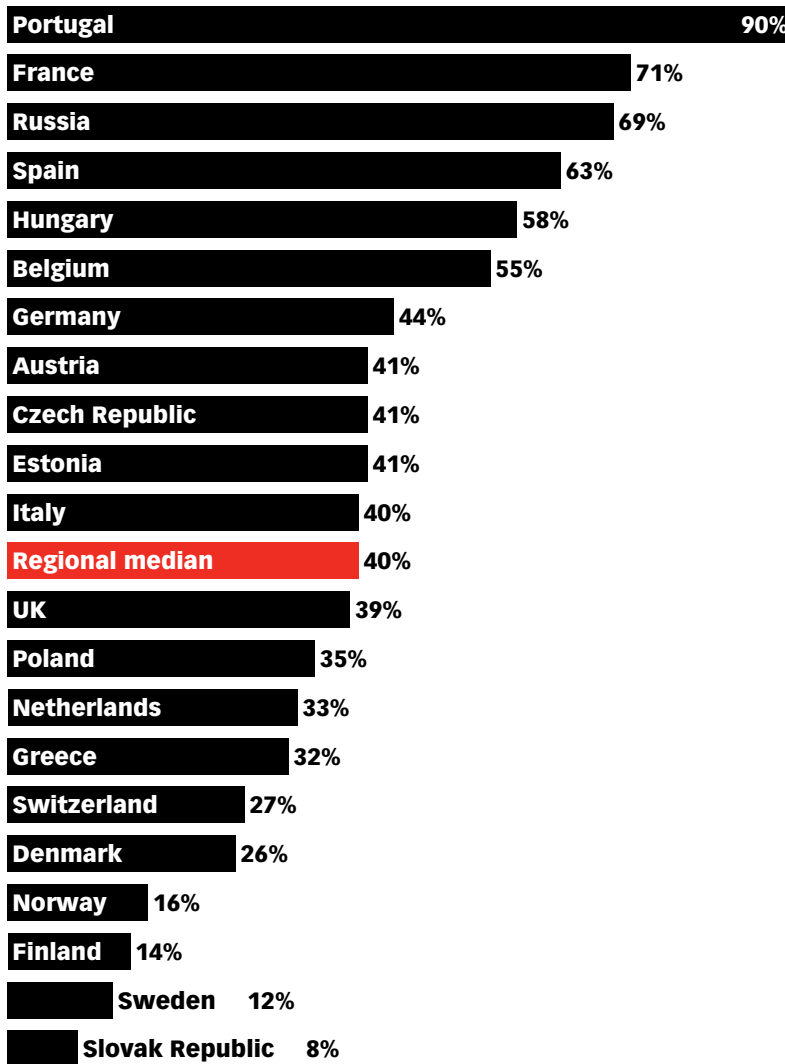
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Early adoption of the internet has meant the internet user growth has slowed well below the European average at the end of 2001.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
Source: eMarketer\*, March 2002

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eMarketer expects the vast majority of Swedes will be internet users by 2004, numbering 5 million in 2002.

## Internet Users in Sweden, 2001-2004 (in millions)



*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
*Source: eMarketer, May 2002*

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## Internet Households

eMarketer estimates nearly 2.6 million Swedish households (62%) had internet access at the end of 2001. Dial-up (including ISDN) continues to dominate the internet market despite the rapid growth of broadband. DSL, cable internet and fiber/Ethernet solutions are all approaching 200,000 subscribers.

## Internet Households in Sweden, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	1,976	50.6%
DSL	190	4.7%
Cable	167	4.1%
Other	185	4.6%
<b>Total broadband households</b>	<b>542</b>	<b>13.4%</b>
<b>Total online households</b>	<b>2,590</b>	<b>62.1%</b>

*Note: \*based on 4.05 million households; \*\*includes ISDN*  
*Source: eMarketer, May 2002*

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The Swedish National Posts and Telecom Agency reported Sweden had 2.43 million home internet subscribers in June 2001. They have broken down the subscribers by technology and the data indicates that dial-up subscribers, including ISDN, continue to grow. Broadband technologies, particularly DSL and 'other fixed access' grew particularly strongly.

### Swedish Home Internet Subscribers, by Access Technology, June 2000-June 2001 (in thousands)

	June 2000	December 2000	June 2001
<b>Total home internet customers</b>	<b>1,856</b>	<b>2,126</b>	<b>2,430</b>
PSTN (Modems up to 56kbps)	1,736	1,873	1,967
ISDN	63	73	76
GSM	10	16	24
xDSL	4	22	116
Cable TV	41	63	115
Other fixed access	2	79	132

Source: National Posts and Telecom Agency - SE, November 2001

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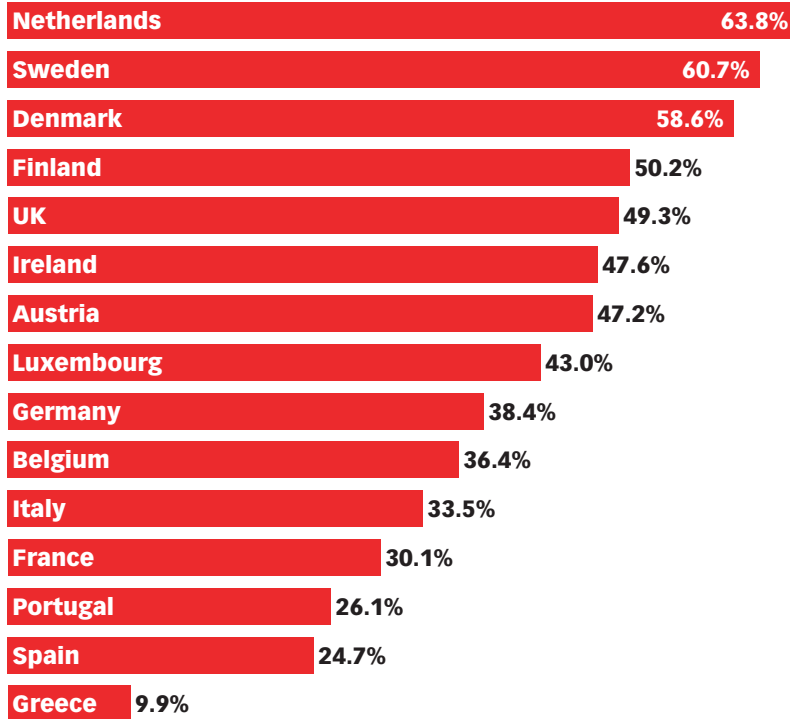
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The European Commission's internet study in December 2001 showed 61% of Swedish households had internet access. This estimate corresponds closely with with eMarketer and Swedish Telecom Agency data.

### Household Internet Penetration in the European Union, by Member State, December 2001



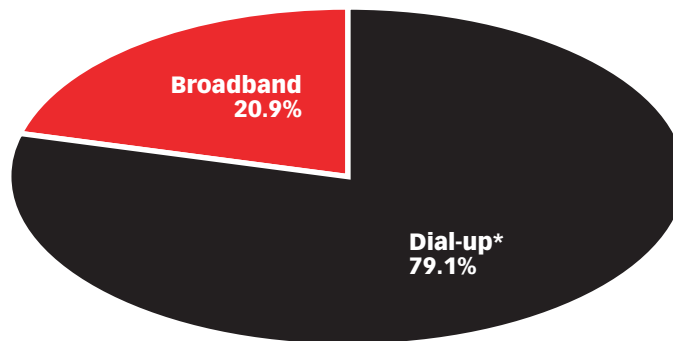
Source: European Commission, December 2001

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Of the 2.6 million online households in Sweden, 21% were broadband at the end of 2001. This ratio is very similar to the US at the same time.

### Percent of Swedish Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN

Source: eMarketer, June 2002

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## Dial-Up

As has been mentioned, dial-up continues to grow despite the variety of broadband options available. This trend is unlikely to last for much longer. The national telco, Telia, dominates the dial-up market with upwards of 650,000 internet subscribers. Telia's competitors are Tele2, Telenordia and Utfors, among 100 other smaller ISPs.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

---

With a high cable penetration, liberalized telecommunications market and alternative broadband access technologies becoming available, over 30% of Swedish households will have a broadband connection by 2004.

In the first quarter of 2002, Telia reported 233,000 broadband subscribers using ADSL and LAN and 52,000 using cable internet. Cable provider UPC reported 44,000 cable internet subscribers as of September, 2001. B2, the company which is connecting apartment blocks with optical fiber and then individual apartments with Ethernet, has over 30,000 subscribers.

### **Leading Broadband Access Providers in Sweden, 2001 & 2002 (in thousands of subscribers)**

	<b>Access technology</b>	<b>30 June 2001</b>	<b>End of 2001</b>	<b>30 March 2002</b>
UPC-chello	Cable	–	44*	–
B2	Fiber/Ethernet	38	–	–
Telia	Cable	38	48	52
Telia	ADSL/LAN	92	194	233

*Note: \*as of 30 September 2001*

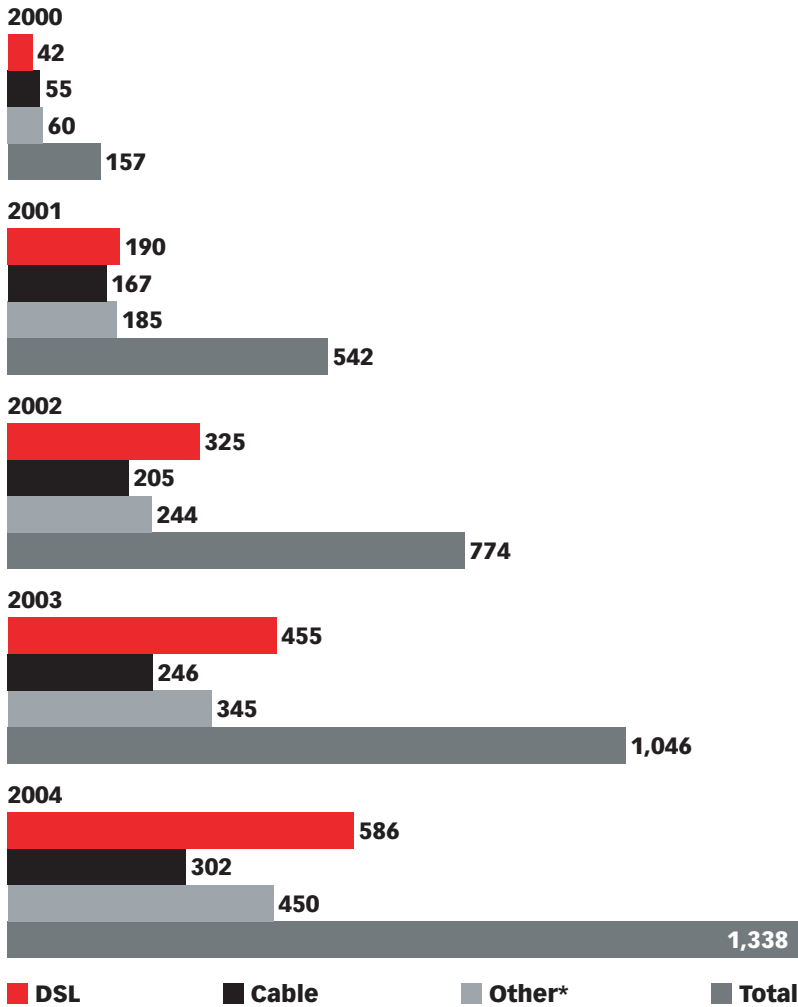
*Source: company data, 2002*

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eMarketer forecasts 1.3 million broadband households in Sweden in 2004. DSL will be the most popular technology, but both cable internet and fiber/Ethernet solutions will garner significant subscribers.

**Broadband Households in Sweden, by Access Technology, 2000-2004 (in thousands)**



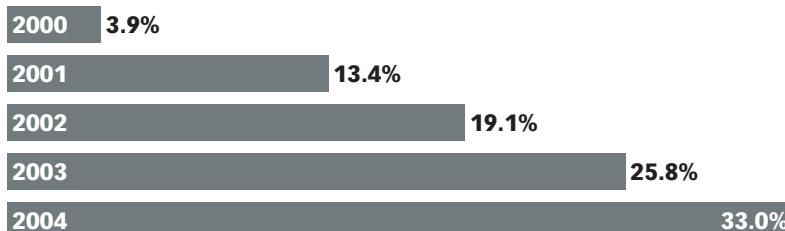
Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002



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From a household penetration of 13.4% at the end of 2001, eMarketer expects 33% of Swedish households to have broadband by 2004.

**Broadband Penetration in Sweden, 2000-2004 (as a % of total households)**



Note: Based on 4.05 million households at the end of 2001  
 Source: eMarketer, June 2002

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There is a reasonable amount of consensus among the research firms forecasting for broadband in Sweden. The OECD reported 399,000 broadband residential and small business subscribers in Sweden as of 30 June 2001. eMarketer has based its forward projections on data from the OECD.

**Comparative Estimates: Broadband Households in Sweden, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	69	275	590	1,200	-
BDRC/EU, August 2001	85	276	536	966	-
Jupiter Media Metrix, October 2001	-	357	743	1,083	1,371
OECD, October 2001	107	399*	-	-	-
National Post & Telecom Agency, November 2001	-	363*	-	-	-
<b>eMarketer, May 2002</b>	<b>107</b>	<b>542</b>	<b>774</b>	<b>1,046</b>	<b>1,338</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000 & 2001

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## DSL

The Swedish telecom market is one of the most liberalized in Europe. National telco Telia competes with Tele2 and Telenordia as well as a number of other national and international companies. According to Telia, over 90% of the Swedish population lives within 3 kilometers of a telephone exchange, suggesting that DSL services are well suited to the country. Telia has introduced an ADSL offering in the major Swedish cities, and Tele 1 Europe and KPNQwest intend to target particular segments of the Swedish business and residential market.

eMarketer believes there will be nearly 600,000 DSL households in Sweden in 2004. In contrast, Jupiter predicts only 163,000.

### Comparative Estimates: DSL Households in Sweden, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	30	200	400	-	-
BDRC/EU, August 2001	26	123	239	417	-
Jupiter Media Metrix, October 2001	-	116	129	144	163
OECD, October 2001	42	122*	-	-	-
National Post & Telecom Agency, November 2001	-	116*	-	-	-
Point-Topic, April 2002	-	183	-	-	-
<b>eMarketer, May 2002</b>	<b>42</b>	<b>190</b>	<b>325</b>	<b>455</b>	<b>586</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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Point-Topic, one of the leading DSL research firms, reported in April 2002 that Sweden had 183,000 residential DSL subscribers at the end of 2001 and 11,000 business DSL subscriptions.

### DSL Subscribers in Sweden, Business and Residential, End of 2001 (in thousands)

<b>Business</b>	<b>11.1</b>
<b>Residential</b>	<b>182.9</b>
<b>Total</b>	<b>194.0</b>

Source: Point-Topic, April 2002

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Total business internet connections in Sweden numbered 337,000 as of June 2001. Broadband technologies such as DSL are not figuring prominently in the business market as yet, which is somewhat surprising.

**Swedish Business Internet Subscribers, by Access Technology, 2000-2001 (in thousands)**

	June 2000	December 2000	June 2001
<b>Total business internet customers</b>	<b>251</b>	<b>281</b>	<b>337</b>
PSTN (modems up to 56 kbps)	167	178	209
ISDN	45	53	63
GSM	30	39	50
xDSL	1	4	7
Cable TV	0	0	0
Other fixed access	8	7	8

Source: National Posts and Telecom Agency - SE, November 2001

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**Cable**

Over two-thirds of Swedish households are passed by cable, and 98% of homes that are passed take cable TV services, according to Screen Digest. While much of the cable network requires upgrading to allow for two-way services, a number of cable internet offerings are available. Com Hem, Telia's cable division, controls approximately 60% of the cable market according to the OECD. UPC's chello broadband and Tele2 also offer cable internet services.

Cable internet will grow steadily but will lose market share to DSL and alternative broadband access technologies as these technologies become more widely available.

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Jupiter Research suggests that cable internet will be the dominant broadband technology in Sweden in 2004 with over 700,000 subscribers. In contrast, BDRC/EU and eMarketer share the view that cable internet will garner approximately 250,000 – 300,000 in 2003 and 2004.

**Comparative Estimates: Cable Internet Households in Sweden, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	39	75	190	500	–
BDRC/EU, August 2001	29	93	172	290	–
Jupiter Media Metrix, October 2001	–	187	387	562	706
OECD, October 2001	55	78*	–	–	–
National Post & Telecom Agency, November 2001	–	115*	–	–	–
<b>eMarketer, May 2002</b>	<b>55</b>	<b>167</b>	<b>205</b>	<b>246</b>	<b>302</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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**Alternative Broadband Technologies**

The Swedish government says it expects that 98% of Swedish households will be able to access broadband services by 2005, and that a large proportion of these households will connect through fiber. Stockholm-based Bredbandsbolaget (B2) launched services in 1999 after signing agreements with major housing associations. Its goal is to connect upwards of 350,000 households in the next 12 months, with individual apartments able to connect to the network at speeds of 10 Mbps. Video on demand, IP telephony and a variety of multimedia services are also planned. B2 has also partnered with MetroWeb and FastWeb in Italy to roll out its services throughout Europe.

Apart from B2, Utfors, Tele 1 Europe and Telia are constructing broadband networks across Sweden. Municipal authorities, power suppliers and even private individuals are also constructing fiber networks in regions throughout the country.

All estimates indicate that alternative broadband access technologies such as the fiber/Ethernet solution being offered by B2 and others, will account for a large proportion of the total number of broadband households in Sweden in years to come. There is a reasonable amount of consensus that by 2004 there will be between 400,000 and 500,000 households connected to broadband technologies other than DSL or cable.

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In this instance, eMarketer has used the Swedish government's estimate of 132,000 alternative broadband households in June 2001 as its baseline estimated going forward, rather than the OECD number of 199,000. The reason for this is that the Swedish government's number is more recent and only measures residential connections.

### Comparative Estimates: Alternative Broadband Households in Sweden, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	27	60	125	259	–
Jupiter Media Metrix, October 2001	–	54	227	377	502
OECD, October 2001	60	199*	–	–	–
National Post & Telecom Agency, November 2001	–	132*	–	–	–
<b>eMarketer, May 2002</b>	<b>60</b>	<b>185</b>	<b>244</b>	<b>345</b>	<b>450</b>

*Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology; \*subscribers as of 30 June 2001*  
*Source: eMarketer, May 2002; various, as noted, 2001*

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### Broadband Costs

High-speed internet in Sweden is reasonably priced compared with other countries in Europe and globally. Broadband through cable is available at approximately \$30 per month and DSL and fiber/Ethernet at approximately \$26 per month according to the OECD.

### Selected Broadband Access Plans in Sweden, 2001

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge
Telia	DSL	512/400	\$153.19	\$26.41
B2	Fiber (Ethernet LAN)	10Mbps/10Mbps	–	\$25.00 (approx.)
ComHem	Cable	512/128	\$142.62	\$31.17
UPC-chello	Cable	512/128	\$48.3	\$29.16

*Source: Organization for Economic Cooperation and Development (OECD), October 2001*

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.  
[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

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**“We purchased your ‘Benefits of Broadband’ report and have enjoyed it a lot. Finally — a report which summarizes the analysts’ forecasts and focuses on the benefit side through the applications”**

– Jon Bohmer, Chairman, Proto TV AS

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## M. Switzerland

### Summary

With a broadband household penetration of only 3.3% at the end of 2001, Switzerland ranks 9th in Europe and 16th globally according to eMarketer. While cable internet is widely available, a lack of competition in the DSL market is providing no incentive for dominant incumbent Swisscom to drive its DSL service.

### Switzerland Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
35	64	2	101	3.31%	9	16

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International Telecommunication Union reported that Switzerland had 2.9 million internet users at the end of 2001, up from only 1.8 million in 1999

### Internet Users in Switzerland, 1999-2001 (in millions)



Source: International Telecommunication Union (ITU), 2000-2002

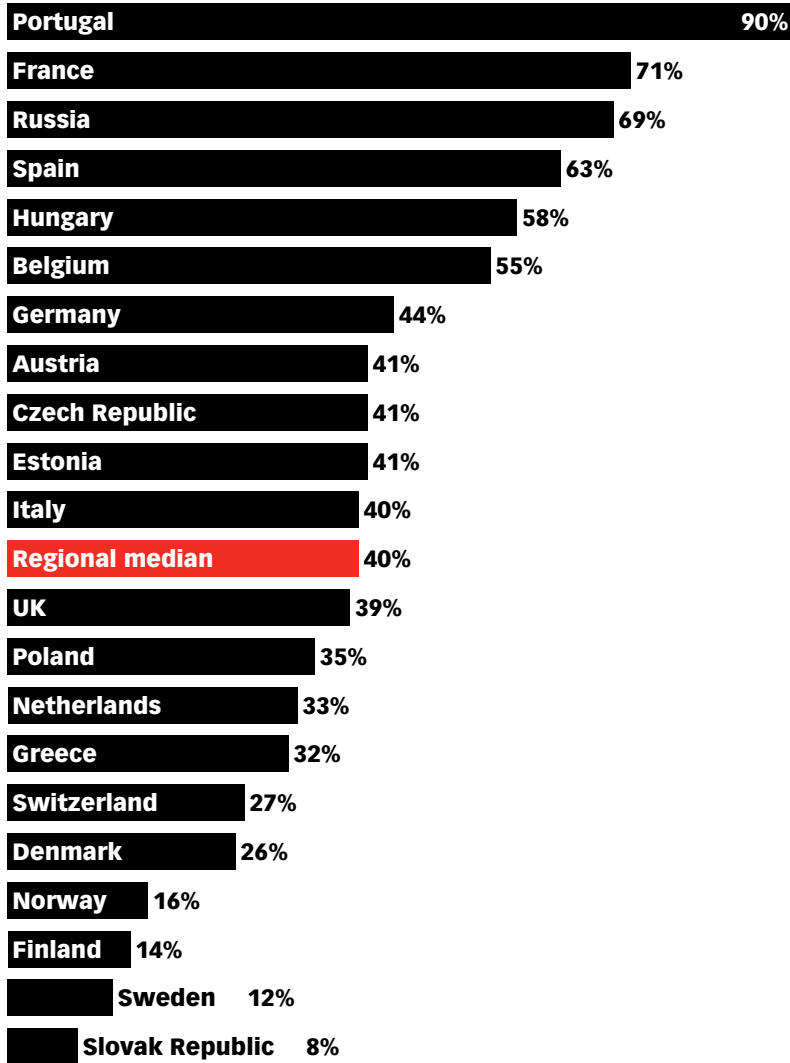
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As Switzerland is a relatively mature internet market, internet user growth between 1999 and 2001 has been lower than the regional mean. eMarketer analysis indicates that the number of Swiss internet users grew 27% between 1999 and 2001.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002



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## Internet Households

Household penetration of the internet in Switzerland at the end of 2001 was 49% according to eMarketer. Total online households numbered 1.49 million, and of these, 1.39 million had a dial-up internet connection. eMarketer estimates there were only about 100,000 broadband households in Switzerland in 2001.

### Internet Households in Switzerland, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	1,385	45.4%
DSL	35	1.1%
Cable	64	2.1%
Other	2	0.07%
<b>Total broadband households</b>	<b>101</b>	<b>3.3%</b>
<b>Total online households</b>	<b>1,486</b>	<b>48.7%</b>

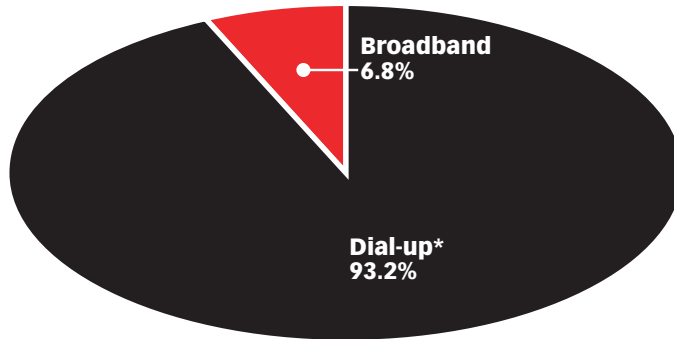
Note: \*based on 3.05 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

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Dial-up dominates the internet market in Switzerland with 93.2% of all internet households connecting to the internet this way.

### Percent of Swiss Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

Incumbent operator Swisscom's internet subsidiary, BlueWin, is the leading ISP in the country. ISPs Datacom, CompuServe and SwissOnline also have substantial market shares.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

---

Switzerland has a well developed cable network with the OECD reporting 72% of Swiss households are passed by it. Swisscom launched its own DSL service in October 2000 and is steadily expanding its coverage area. Since Swisscom has divorced itself from its former cable network, DSL and cable internet platforms are able to compete head-to-head. This has led to price reductions and more affordable broadband offerings.

At the end of 2001 the leading cable operator, Cablecom had over 50,000 cable internet subscribers. Swisscomm reported having 40,000 DSL customers at the same time.

---

### **Leading Broadband Access Providers in Switzerland, End of 2001 (in thousands of subscribers)**

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	<b>Access technology</b>	<b>End of 2001</b>
Swisscom	DSL	40
Cablecom	Cable	46+

*Source: company data, May 2002*

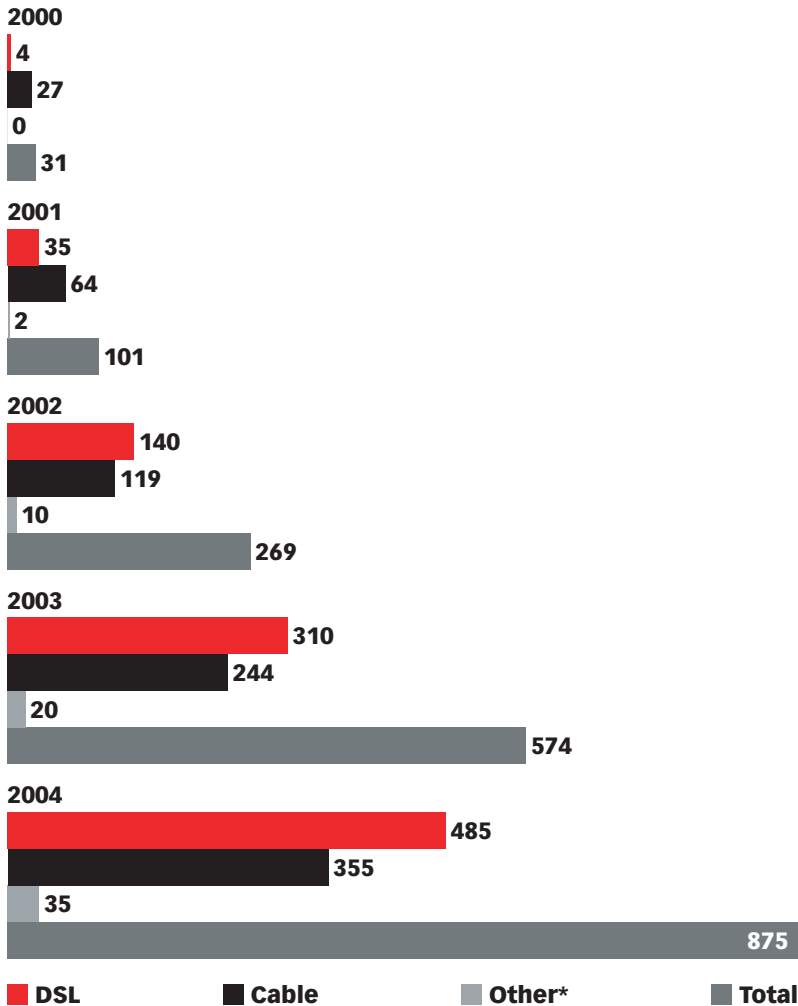
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eMarketer estimates that by 2004, there will be 875,000 broadband households in Switzerland. Cable internet and DSL will battle it out over the next few years for the lion's share of broadband subscribers, but it is likely that DSL will win eventually.

**Broadband Households in Switzerland, by Access Technology, 2000-2004 (in thousands)**



*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

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In 2001, eMarketer estimated that only 3.3% of Swiss households had broadband. This should rise to over 28% by 2004.

## Broadband Penetration in Switzerland, 2000-2004 (as a % of total households)



*Note: Based on 3.05 million households at the end of 2001*

*Source: eMarketer, June 2002*

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The OECD reported 64,000 broadband residential and small business subscribers in Switzerland as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. There are few comparative estimates available for broadband in Switzerland, although Screen Digest's estimate is similar to eMarketer's.

## Comparative Estimates: Broadband Households in Switzerland, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	44	107	265	530	–
OECD, October 2001	31	64*	–	–	–
<b>eMarketer, May 2002</b>	<b>31</b>	<b>101</b>	<b>269</b>	<b>574</b>	<b>875</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## DSL

While Swisscom has been ordered to open up its local loop to competition, it is doing everything in its power to prevent this from happening. There is little current competition in the DSL market and it may be sometime before serious competition is felt.

### Comparative Estimates: DSL Households in Switzerland, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	10	50	150	300	-
OECD, October 2001	4	18*	-	-	-
Point-Topic, April 2002	-	32	-	-	-
<b>eMarketer, May 2002</b>	<b>4</b>	<b>35</b>	<b>140</b>	<b>310</b>	<b>485</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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## Cable

Cablecom, owned by UK-based NTL, controls the largest cable network in Switzerland with over 51% of the market. The remaining share of the market is divided among 270 small cable companies in various regions throughout the country. Cablecom has reported having over 46,000 cable internet subscribers in mid 2001.

eMarketer estimates there will be 355,000 cable internet subscribers in 2004, from 64,000 in 2001.

### Comparative Estimates: Cable Internet Households in Switzerland, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	34	57	115	230	-
OECD, October 2001	27	46*	-	-	-
<b>eMarketer, May 2002</b>	<b>27</b>	<b>64</b>	<b>119</b>	<b>244</b>	<b>355</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000 & 2001*

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## Alternative Broadband Technologies

National fixed-wireless licenses were auctioned in early 2000. The winners of the three national licenses were UPC, FirstMark Communications and Callino.

NTL, which owns Cablecom and 25% of Swedish broadband service provider Bredbandsbolaget (B2), has announced plans to offer fiber to the home in Switzerland at some stage. To date, not much activity has occurred in this area.

## Broadband Costs

In late 2001 the OECD reported Swisscom's ADSL service at 512kbps cost \$66.91 per month. Cablecom's cable internet service was considerably cheaper at \$39 per month.

### Selected Broadband Access Plans in Switzerland, 2001

Company	Access technology	Speed down-stream/up-stream (Kbps)	Initial charge	Monthly charge	Mbytes included	Additional cost per Mbyte
Swisscom	DSL	512/128	\$91.46	\$66.91	3,000	\$0.06
Cablecom	Cable	256/64	-	\$39.29	Unlimited	0

Source: Organization for Economic Cooperation and Development (OECD), October 2001

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## N. United Kingdom

### Summary

The UK ranks last in Western Europe and 22nd globally in terms of broadband penetration of households. High broadband prices, limited availability and lack of demand has prevented the broadband sector in the UK from gaining any momentum. A recent price cut by British Telecom for its DSL service may provide the catalyst for future growth.

### UK Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
60	225	10	295	1.32%	14	22

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 14 countries examined; (3) Global rank of 27 countries examined  
Source: eMarketer, June 2002*

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### Internet Users

The International Telecommunication Union reported the UK had 24 million internet users in 2001, which is almost double the number it had in 1999.

### Internet Users in the UK, 1999-2001 (in millions)

1999	12.5
2000	18.0
2001	24.0

*Source: International Telecommunication Union (ITU), 2000-2002*

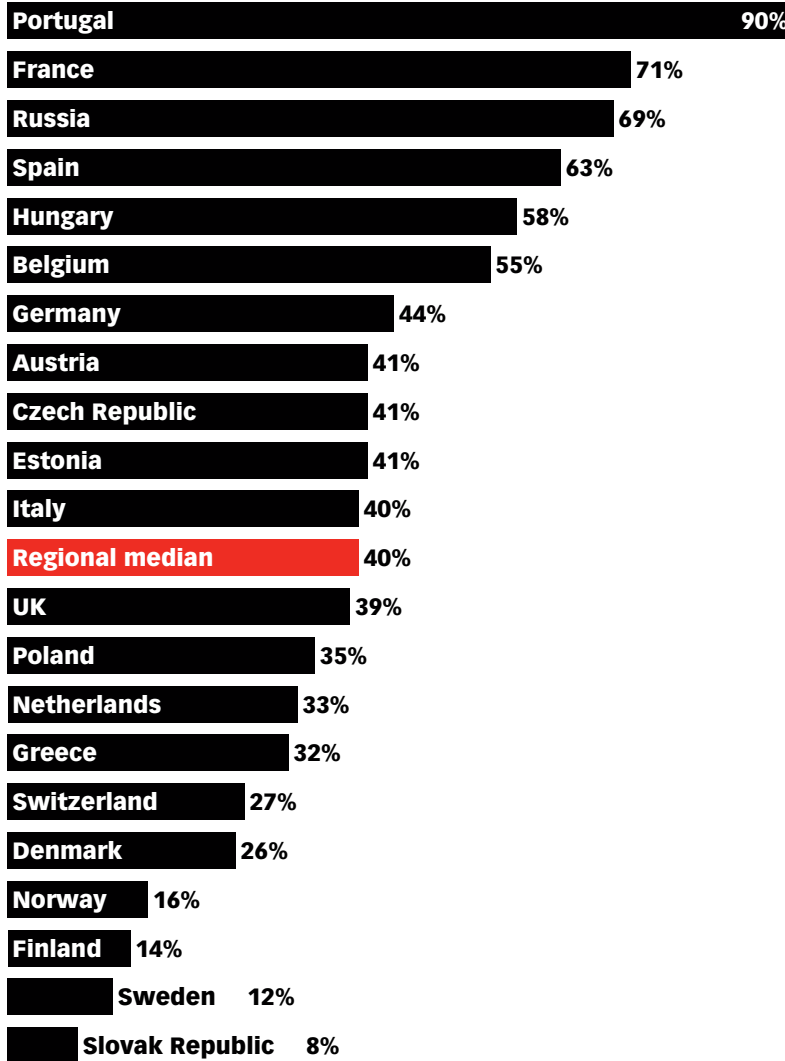
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Analysis by eMarketer shows that the annual growth rate in internet users between 1999 and 2001 has been at 39%, which is slightly below the regional average.

**Compound Annual Growth Rate (CAGR) of Internet Users in Selected European Countries, 1999-2001**



Note: \*based on ITU internet user statistics for 1999-2001  
 Source: eMarketer\*, March 2002



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eMarketer expects the number of internet users in the UK to grow to over 32 million in 2004.

## Internet Users in the UK, 2001-2004 (in millions)

<b>2001</b>	<b>24.0</b>
<b>2002</b>	<b>28.6</b>
<b>2003</b>	<b>31.4</b>
<b>2004</b>	<b>32.6</b>

*Note: eMarketer's year 2001 baseline is from the International Telecommunication Union's estimate of internet users aged 2 years and older, who have accessed the internet within the previous 30 days*  
 Source: eMarketer, May 2002

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## Internet Households

There were nearly 11 million households online in the UK at the end of 2001, according to eMarketer. The vast majority of these online households are dial-up households, with less than 300,000 households using a broadband connection.

## Internet Households in the UK, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	10,680	47.7%
DSL	60	0.3%
Cable	225	1.0%
Other	10	0.04%
<b>Total broadband households</b>	<b>295</b>	<b>1.3%</b>
<b>Total online households</b>	<b>10,975</b>	<b>49.0%</b>

*Note: \*based on 22.4 million households; \*\*includes ISDN*  
 Source: eMarketer, May 2002

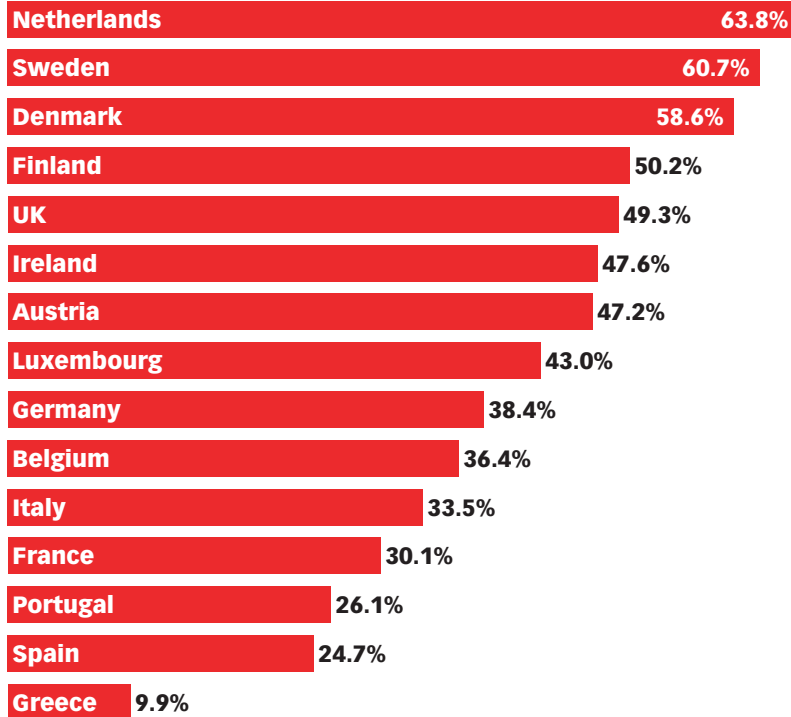
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The European Commission's internet study in December, 2001 showed 49% of UK households had internet access. This estimate corresponds closely with eMarketer's.

### Household Internet Penetration in the European Union, by Member State, December 2001



Source: European Commission, December 2001

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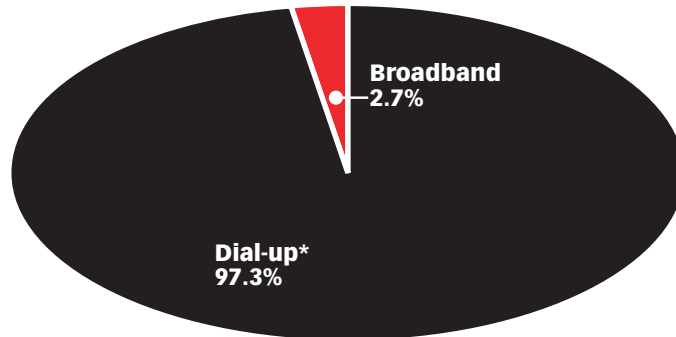
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Less than 3% of online households at the end of 2001 used a broadband connection. Dial-up will continue to remain the dominant internet access technology for some time in the UK.

### Percent of UK Online Households, Dial-Up and Broadband, End of 2001



*Note: \*includes ISDN*

*Source: eMarketer, June 2002*

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A study by the UK Office of Telecommunications (OfTel) indicated that in February 2002, 88% of home internet users used a dial-up connection and only 8% used ADSL or cable modems. The data shows that between November 2001 and February 2002, home internet users accessing the internet with a dial-up connection grew 5 percentage points while home internet users using broadband only rose 1 percentage point. Internet users using ISDN to connect to the internet fell 6 percentage points between November 2001 and February 2002. This data clearly indicates that dial-up continues to be more attractive for new internet users than does broadband.

### Dial-Up

With over 24 million active internet users, the UK is a massive internet market. Freeserve, now owned by France Telecom's internet subsidiary Wanadoo, is the largest ISP in the UK, with major competition coming from VirginNet, AOL UK, Compuserve, BT Internet, Demon Internet, ITG and 400 or so other ISPs scattered around the country. There are a variety of pay-as-you-go and unmetered packages that are available in the UK. According to the UK's National Statistics office, 37% of internet subscriptions are free access, a further 29% are paid at a fixed rate and have unmetered access, 18% had billed access for call minutes and the remaining subscriptions use a mixture.

**“Extreme delays in rolling out broadband services, particularly ADSL, have left Britain lagging notably behind other countries in terms of both availability and the speed of services offered.”**

*– Tom Steinberg, Research Fellow at Institute of Economic Affairs, Feb 2001*

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## Broadband Access

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eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.

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According to Oftel, cable networks pass approximately 50% of UK households and cable modem services are available to around 38% of households, as of February 2002. Telewest services are available to 4.9 million homes, of which 95% are broadband capable. NTL services are available to 8.4 million homes, of which 56% are broadband capable. This equates to around 9 million homes.

Oftel reports 60% of UK consumers and businesses are within the area of a DSL enabled telephone exchange. Of these, 90% can receive ADSL services. Digital TV offers one-way broadband that is available to 99% of households.

**“Take-up of broadband in the UK is still low, but is growing substantially with an increase of over 500% of users over last year.”**

– OFTEL, Feb 2002

Recent financial reports show that British Telecom had 170,000 DSL subscribers as of March 2002, up from 70,000 six months previously. Telewest and NTL each have over 120,000 cable internet subscribers.

---

### Leading Broadband Access Providers in the UK, 2001 & 2002 (in thousands of subscribers)

	Access technology	30 June 2001	End of 2001	30 March 2002
Telewest	Cable	21	107	126
British Telecom	DSL	70	127	170
NTL	Cable	92	118	–

Source: company data, 2002

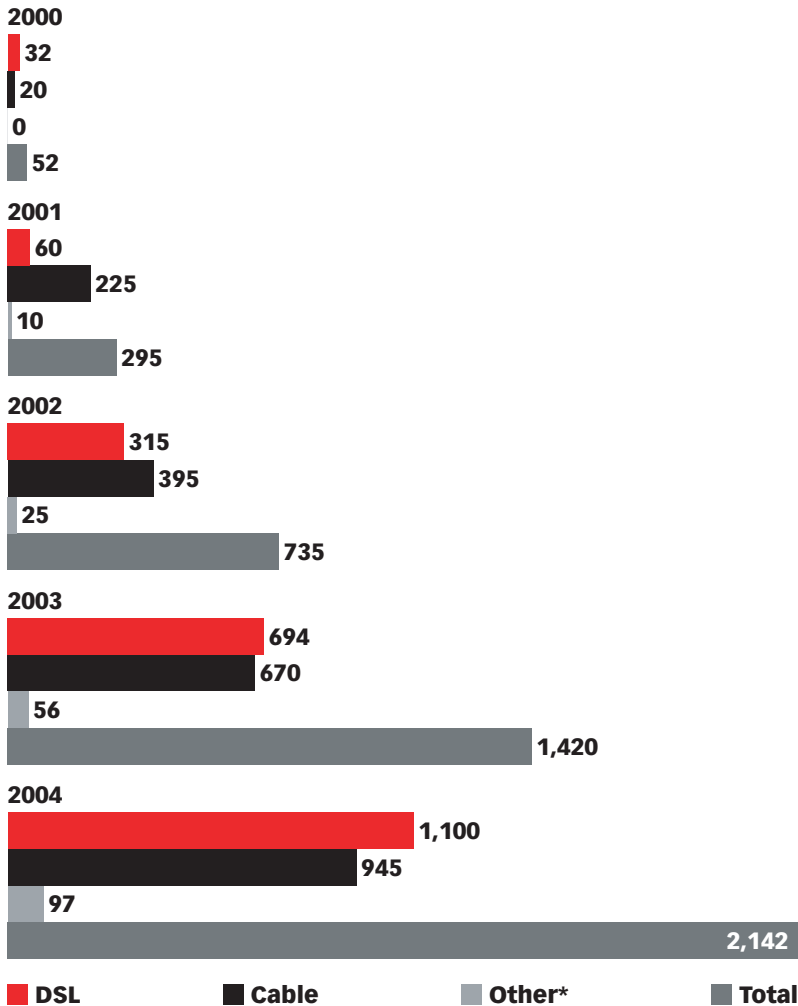
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eMarketer estimates there were nearly 300,000 broadband households in the UK at the end of 2001. This will grow to over 2.1 million in 2004. DSL is likely to dominate the broadband landscape in the coming years as this technology becomes more widely available and as further competition emerges.

**Broadband Households in the UK, by Access Technology, 2000-2004 (in thousands)**



*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

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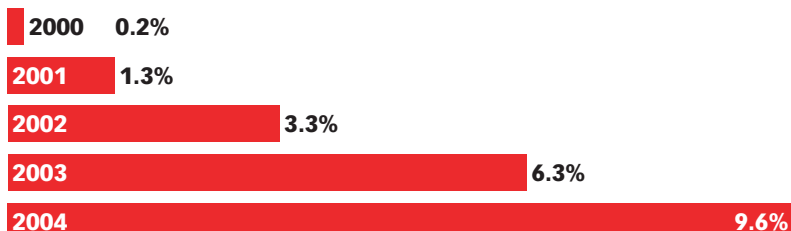
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If broadband does not grow more quickly than it has done in the past in the UK, less than 10% of households will have broadband by 2004. British Telecom's new price offering for DSL may be the catalyst for rapid growth, which may make eMarketer's projections too conservative.

### Broadband Penetration in the UK, 2000-2004 (as a % of total households)



Note: Based on 22.4 million households at the end of 2001

Source: eMarketer, June 2002

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Judging from the variety of estimates for broadband in the UK, eMarketer's estimate of 2.1 million broadband households in 2004 looks in line with other estimates. Jupiter, for example, predicts slightly less than 2 million broadband households by 2004.

### Comparative Estimates: Broadband Households in the UK, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	60	350	1,000	1,800	-
BDRC/EU, August 2001	69	328	1,057	2,071	-
OECD, October 2001	52	164*	-	-	-
Jupiter Media Metrix, October 2001	-	201	600	1,125	1,972
Gartner, February 2002	-	200	-	-	-
<b>eMarketer, May 2002</b>	<b>52</b>	<b>295</b>	<b>735</b>	<b>1,420</b>	<b>2,142</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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## DSL

British Telecom (BT) began offering ADSL services to UK consumers in late 2000. BT hoped to connect 1 million customers by the end of 2001. They realized only about 60,000 residential customers at that date and a further 90,000 business customers.

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BT Wholesale sells DSL based broadband solutions to other UK network operators and service providers. BT Wholesale has signed up around 200 wholesale customers according to Point-Topic research. BT Wholesale had upgraded 1,010 exchanges for ADSL services by the end of March 2002. These exchanges serve 60 per cent of UK households (some 15 million homes) and 70% of current internet users in the UK. BT Wholesale plans to upgrade a further 100 exchanges by the end of May, which will increase broadband ADSL coverage to 66% of the UK.

The major development in the DSL market over the last few months has been BT's wholesale price cut. In February 2002, BT Wholesale announced that the wholesale price of its 'consumer' product to service providers would drop from £30 (\$45.90) a month for the engineer installed version (BT IPStream 500), and £25 (\$38.27) a month for the self-install version (BT IPStream Home), to £14.75 (\$22.58) for both. The wholesale price changes came into effect on 1 April 2002. According to Point-Topic, however, some service providers decreased their retail prices ahead of this, and as a result demand increased from 3,000 to 4,000 orders a week to over 8,000 in March and continues to accelerate.

BT competitor Kingston Communications introduced its wholesale ADSL product RapidTime on 4 October 2001. According to Oflel, Kingston has approximately 10,000 DSL customers.

It will be interesting to see the effect of the price cut on DSL subscriber growth over the coming months. eMarketer estimates there will be 315,000 DSL households by the end of 2002, rising to over 1.1 million in 2004. Jupiter predicts half this number of DSL households in 2004. Screen Digest and BDRC/EU, however, both predict near 1 million DSL subscribers by 2004.

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Recent data from British Telecom and Point-Topic indicates that residential broadband subscribers in the UK at the end of 2001 numbered approximately 60,000 while there were considerably more business DSL subscribers at the same time. The OECD figure of 81,000 DSL subscribers as of 30 June 2001 measures small business subscribers as well residential subscribers, and as such, eMarketer has taken this into account when using the OECD figure as its baseline going forward.

**Comparative Estimates: DSL Households in the UK, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	30	200	600	1,000	-
BDRC/EU, August 2001	39	154	487	896	-
OECD, October 2001	32	81*	-	-	-
Jupiter Media Metrix, October 2001	-	150	239	349	505
Office of Telecommunications (OfTel), January 2002	-	157	-	-	-
Point-Topic, April 2002	-	53	-	-	-
<b>eMarketer, May 2002</b>	<b>32</b>	<b>60</b>	<b>315</b>	<b>694</b>	<b>1,100</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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Point-Topic reports that in the UK there were actually more business DSL lines in service at the end of 2001 than there were residential subscriptions. This is a clear indication of the high prices for DSL services.

**DSL Subscribers in the UK, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>89.3</b>
<b>Residential</b>	<b>52.7</b>
<b>Total</b>	<b>142.0</b>

*Source: Point-Topic, April 2002*

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## Cable

The two main cable operators in the UK are NTL and Telewest. According to Oftel around 50% of UK homes are passed by cable, and only 26% of these subscribe to cable services. Both operators have launched cable internet services and currently lead ADSL as the most popular broadband internet access technology in the country. Financial problems have beset NTL in 2001 and with only 56% of its cable network two-way capable, it may be sometime before NTL has some spare cash to complete its network upgrade. This will inevitably slow the growth of its cable internet business.

There is a reasonable amount of consensus among research firms forecasting cable internet in the UK. Most research firms estimate approximately 200,000 cable internet subscribers in 2001, rising to approximately 1 million subscribers by 2004. Jupiter Research estimates that cable internet subscribers will actually outnumber DSL subscribers by 2004.

### Comparative Estimates: Cable Internet Households in the UK, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Screen Digest/Van Dusseldorp & Partners, December 2000	30	150	400	800	-
BDRC/EU, August 2001	30	166	540	1,025	-
OECD, October 2001	20	84*	-	-	-
Jupiter Media Metrix, October 2001	-	51	361	776	1,467
Office of Telecommunications (Oftel), February 2002	-	196	-	-	-
<b>eMarketer, May 2002</b>	<b>20</b>	<b>225</b>	<b>395</b>	<b>670</b>	<b>945</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2000-2002*

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## Alternative Broadband Technologies

Tele2 (UK) is currently offering a voice and data service using fixed-wireless technology in the limited areas in the UK. Other fixed-wireless licensees include Energis and Norweb, Faultbasic, Broadnet, Chorus Communication and Eircom, who collectively cover 60% of the UK population according to Oftel.

BSkyB's satellite TV services, owned by Rupert Murdoch's News Corp., are extremely popular in the UK. A satellite internet service is not part of its bundled suite of content and interactive services at the moment, but BSkyB will no doubt offer some innovative services over the TV when a greater percentage of households have access to DSL. Since satellite internet access in the past has been restricted by having to use the telephone line as a return path, satellite downstream and DSL upstream may open up further interactive possibilities for BSkyB.

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## Broadband Costs

Broadband costs in the UK are now in line with most other countries in Europe and the US, at approximately \$44/month for 512kbps downstream. Twelve months ago, however DSL was particularly expensive and was a major barrier to broadband growth.

### Selected Broadband Access Plans in the UK, 2002

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge
NTL	Cable	512/128	\$109.5	\$77.4
Telewest	Cable	512/128	\$73.0	\$43.8
BT	DSL	500/128	\$124.00	\$43.8

Source: company reports, 2002

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.  
[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

**“We purchased your ‘Benefits of Broadband’ report and have enjoyed it a lot. Finally — a report which summarizes the analysts’ forecasts and focuses on the benefit side through the applications”**

– Jon Bohmer, Chairman, Proto TV AS

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The countries examined within Asia-Pacific cover the full gamut of the broadband sector. South Korea, Hong Kong, Taiwan and Singapore ranked in the top 6 countries globally in terms of broadband penetration. China and India are at the bottom and Australia and Japan are in the middle of the pack with excellent potential.

South Korea is something of a broadband phenomenon, topping the ranking in both DSL penetration of households and cable internet penetration of households. A combination of factors has contributed to the massive broadband growth in that country, but one of the main ones has been a very competitive broadband market.

Hong Kong, Taiwan and Singapore are geographically small countries with high population densities, so making broadband widely available is less difficult and less expensive than in larger countries. Broadband penetration will be high in these countries.

Japan has been slow to roll-out broadband networks, but as of mid-2002 cable internet, DSL and fiber-to-the-home are becoming widely available and affordable and broadband adoption is rapid.

Australia's broadband sector is suffering from the incumbent telecom operator largely controlling both the local loop and the cable TV network. This is preventing competition in the major metropolitan areas. Regional broadband players are springing up, however, which may provide the catalyst for further competition.

China is currently investing heavily in telecommunications infrastructure. Optical fiber networks are being built in various parts of the country, cable TV networks are being upgraded to allow two-way internet access, and new apartment buildings are being wired with fiber. Broadband growth should be significant over the next five years.

India will need to improve its telecommunications infrastructure if broadband is to become widely available. There are few prospects, in the short term, for broadband in India.

**Asia-Pacific Broadband Snapshot, End of 2001 (in thousands and household penetration)**

	DSL	Cable	Other*	Total	Household penetration	Regional rank	Global rank**
South Korea	4,650	2,815	35	7,500	51.72%	1	1
Hong Kong	310	170	65	545	25.95%	2	2
Taiwan	910	215	0	1,125	18.15%	3	4
Singapore	50	80	5	135	11.74%	4	6
Japan	1,250	1,300	20	2,570	5.76%	5	12
Australia	35	105	5	145	2.00%	6	20
China	150	40	300	490	0.14%	7	26
India	15	40	0	55	0.03%	8	27
<b>Total</b>	<b>7,370</b>	<b>4,765</b>	<b>430</b>	<b>12,565</b>			

Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; \*\*Global rank of 27 countries examined  
 Source: eMarketer, June 2002

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China, Japan, South Korea and Taiwan will be the leading broadband countries in Asia-Pacific in 2004 in terms of sheer numbers of broadband households. China is something of a wild card. While information is difficult to come by regarding China's broadband sector, there are indications to suggest that China is creating an environment that will support many millions of broadband subscribers. eMarketer has speculated that by 2004, China will have 17 million broadband households and lead Asia-Pacific in numbers of broadband subscribers.

**Broadband Households in the Asia-Pacific Region, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Australia	78	145	300	567	940
China	103	490	1,600	5,900	17,000
Hong Kong	342	545	749	927	1,115
India	0	55	122	285	620
Japan	635	2,570	5,620	8,495	12,450
Singapore	93	135	254	362	466
South Korea	4,350	7,500	9,125	10,650	12,005
Taiwan	224	1,125	2,355	3,745	5,011
<b>Total</b>	<b>5,825</b>	<b>12,565</b>	<b>20,125</b>	<b>30,931</b>	<b>49,607</b>

Source: eMarketer, June 2002

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## A. Australia

### Summary

With the dominant incumbent controlling consumer DSL and cable internet markets, Australians have few choices when it comes to broadband access. Ranked 6th in the Asia-Pacific and 20th globally behind countries such as France, Portugal and Taiwan, Australians have been slow to embrace broadband. There are signs, however, that regional broadband providers may provide the competition and service offerings that will make broadband more attractive and affordable in the future.

### Australia Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
35	105	5	145	2.00%	6	20

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 8 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

Australia is one of the most wired countries in Asia-Pacific. The International Telecommunication Union (ITU) reports Australia had 7.2 million internet users in 2001, up from 5.6 million in 1999.

### Internet Users in Australia, 1999-2001 (in millions)

1999	5.6
2000	6.6
2001	7.2

Source: International Telecommunication Union (ITU), 2000-2002

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## Internet Households

eMarketer estimates there were 3.78 million households online in Australia at the end of 2001. This equates to 52% of all households online.

Broadband households totaled approximately 145,000 at the end of 2001, according to eMarketer.

### Internet Households in Australia, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	3,636	50.1%
DSL	35	0.5%
Cable	105	1.4%
Other	5	0.07%
<b>Total broadband households</b>	<b>145</b>	<b>2.0%</b>
<b>Total online households</b>	<b>3,781</b>	<b>52.1%</b>

Note: \*based on 7.26 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

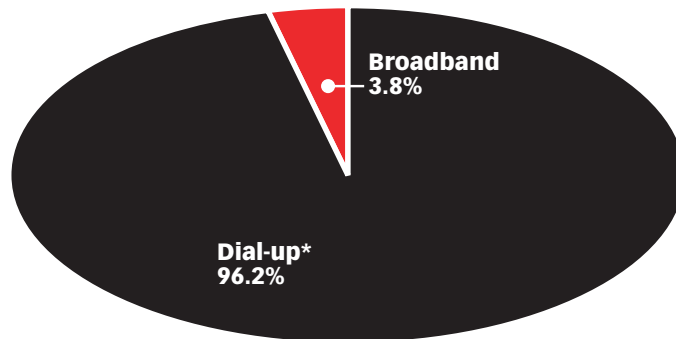
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The Australian Bureau of Statistics reported that at the end of September 2001 there were 4.3 million internet subscribers in Australia. Of these, 3.7 million were household subscribers and 544,000 were business and government subscribers. This corresponds closely to eMarketer's analysis of the market.

Despite Australia's high internet penetration, less than 4% of households online are broadband, according to eMarketer.

### Percent of Australian Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

eMarketer estimates that over 95% of all current Australian residential internet users access the internet through dial-up modem, and the vast majority do so through the national telecom's (Telstra) internet subsidiary Big Pond. As of March 2002, Telstra had 1.4 million internet subscribers across consumer, business and broadband. Other major internet service providers include Optus (now owned by Singapore Telecom) with 322,000 subscribers at the end of 2001, and pure-play ISP OzEmail with over 300,000 subscribers. According to the Australian Bureau of statistics, there are six ISPs in Australia with over 100,000 subscribers who control over 60% of the internet market.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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According to the OECD Australia was one of the first countries in the world to have two alternative broadband networks in its three largest cities. Despite this fact broadband adoption has been very slow. Australia's telecommunications market has long been a duopoly with the former national telecom – Telstra receiving most of its competition from its rival Optus (now owned by Singapore Telecom). Both companies have laid a hybrid fiber-coax network across the main cities of Australia, but their focus has been on acquiring PayTV subscribers rather than high-speed internet customers.

Telstra has been relatively slow to deploy DSL, as there has been little incentive for it to do so, but by the end of 2001 over 75% of Australian homes have DSL available.

One encouraging sign in the Australian broadband market is the emergence of a number of regional broadband providers who are rolling out their own broadband networks. TransACT in the nation's capital, Neighbourhood Cable in regional Victoria and Bright Telecommunications in Western Australia all offer the potential to provide competition to Telstra and Optus.



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Telstra reported recently it had 135,000 broadband customers across its cable- internet and DSL services. Optus reported over 40,000 cable internet customers at the end of 2001.

**Leading Broadband Access Providers in Australia, 2001 & 2002 (in thousands of subscribers)**

	<b>Access technology</b>	<b>30 June 2001</b>	<b>End of 2001</b>	<b>30 March 2002</b>
Optus (SingTel)	Cable	30	40+	–
Telstra BigPond	Various	70	122	135

*Source: Optus (Singtel), Telstra BigPond, 2002*

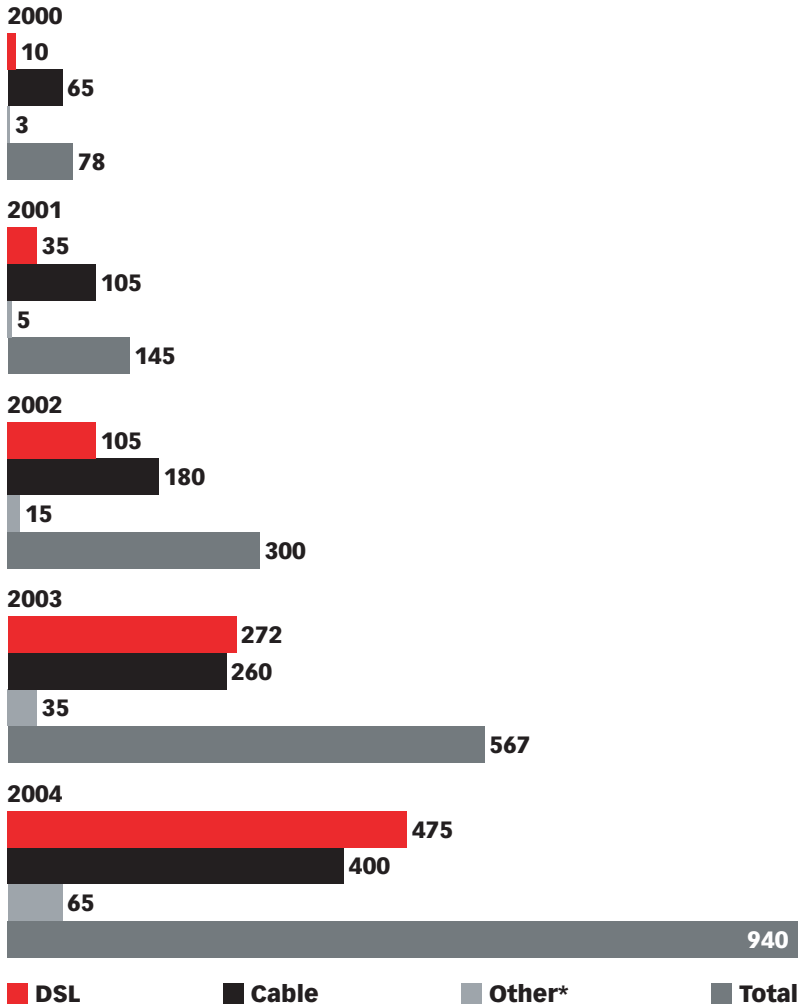
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eMarketer estimates there will be 940,000 broadband households in Australia by 2004. While cable internet has taken an early lead, it is likely that DSL will be the favored broadband technology in the years to come as a result of its future widespread availability.

**Broadband Households in Australia, by Access Technology, 2000-2004 (in thousands)**

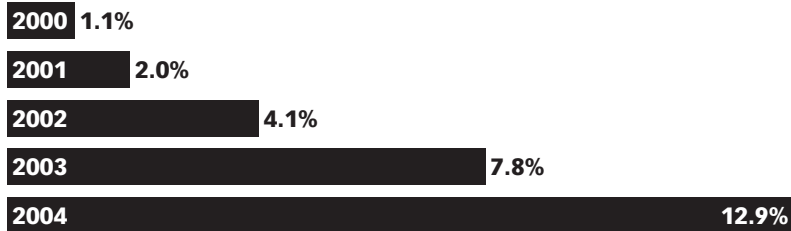


Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

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Broadband penetration in Australia stood at 2% of households in 2001. eMarketer expects this to increase to 13% of households by 2004.

### Broadband Penetration in Australia, 2000-2004 (as a % of total households\*)



Note: \*based on 7.26 million households at the end of 2001  
Source: eMarketer, May 2002

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**“Despite the efforts of policy-makers and governments, the residential market for broadband services remains small. This explanation for this is primarily economic: it is estimated that the cost of broadband infrastructure alone exceeds AUD\$2,000 per household.”**

– Dr Kim Jackson, Department of the Parliamentary Library, April 2002

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The OECD reported 112, 000 broadband residential and small business subscribers in Austria as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. The Australian Competition and Consumer Commission broadband study of June, 2001 also closely corresponds with the OECD data. International research firm IDC, predict 4.4 million broadband households in Australia by 2005. This equates to approximately 60% of all households at that time. This projection is considerably greater than that of eMarketer or the Yankee Group.

**Comparative Estimates: Broadband Households in Australia, 2000-2005 (in thousands)**

	2000	2001	2002	2003	2004	2005
OECD, October 2001	78	112*	-	-	-	-
Yankee Group, 2002	-	293	442	667	957	1,311
Australian Competition & Consumer Commission, 2002	-	108*	193**	-	-	-
International Data Corporation (IDC), 2002	71	-	-	-	-	4,403
<b>eMarketer, May 2002</b>	<b>78</b>	<b>145</b>	<b>300</b>	<b>567</b>	<b>940</b>	<b>-</b>

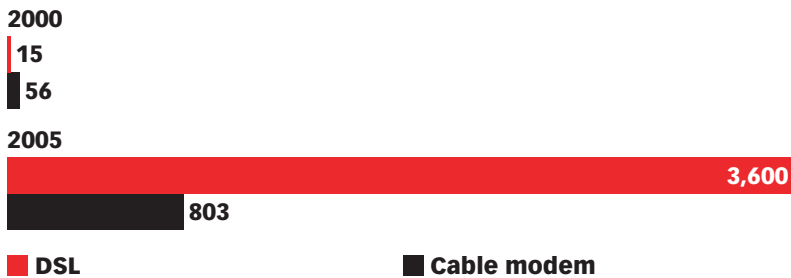
*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001; \*\*subscribers as of 31 March 2002*  
*Source: eMarketer, May 2002; various, as noted, 2001 & 2002*

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IDC's estimate indicates that DSL will garner 3.6 million subscribers in Australia by 2005, with cable modems only being used by 803,000 subscribers.

**Broadband Subscribers in Australia, 2000 & 2005 (in thousands)**



*Source: International Data Corporation (IDC), 2002*

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The Australian Competition and Consumer Commission recently released a report indicating that as of March 31, 2002 there were 193,000 residential broadband subscribers in Australia and over 44,000 business broadband subscribers. Cable internet is by far the most popular residential broadband access technology in Australia at the moment, making up nearly 80% of the residential broadband market. The various flavors of DSL, however, are growing more quickly.

**Number of Residential and Business Broadband Customers in Australia, by Access Method, 31 March 2002**

	Cable	Satellite	ADSL	XDSL	Other	Total
Number of residential customers	146,800	5,100	38,100	2,900	–	192,900
Number of business customers	11,000	1,400	28,500	3,300	200	44,400
Unspecified	–	1,100	13,000	–	100	14,200
<b>Total</b>	<b>157,800</b>	<b>7,600</b>	<b>79,600</b>	<b>6,200</b>	<b>300</b>	<b>251,500</b>

*Note: Figures are approximate to the nearest hundred; Not all broadband providers included*

*Source: Australian Competition & Consumer Commission, March 2002*

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**DSL**

By December 2001, over 600 telephone exchanges have been provisioned for DSL covering over 75% of Australian homes. Telstra has announced that by 2003, 90% of Australian homes will be able to get its DSL or cable internet service.

There are currently only a handful of DSL subscribers in Australia. The Australian Competition and Consumer Commission reported only 18,000 residential DSL subscribers in Australia as of June, 30 2001. Point-Topic's research indicates there were 31,000 residential subscribers to DSL at the end of 2001. eMarketer expects DSL households will number 500,000 by 2004.

**Comparative Estimates: DSL Households in Australia, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004	2005
OECD, October 2001	10	27*	–	–	–	–
Australian Competition & Consumer Commission, 2002	–	18*	–	–	–	–
International Data Corporation (IDC), 2002	15	–	–	–	–	3,600
Point-Topic, April 2002	–	31	–	–	–	–
<b>eMarketer, May 2002</b>	<b>10</b>	<b>35</b>	<b>105</b>	<b>272</b>	<b>475</b>	<b>–</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2001 & 2002*

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Point-Topic reports over 20,000 Australian business use DSL in 2001. While Telstra has largely concentrated on the residential market, Optus has targeted the business market for its DSL services.

### DSL Subscribers in Australia, Business and Residential, End of 2001 (in thousands)

<b>Business</b>	<b>20.4</b>
<b>Residential</b>	<b>30.6</b>
<b>Total</b>	<b>51.0</b>

Source: Point-Topic, April 2002

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### Cable

Between the two major cable Internet services, Telstra BigPond Advance and OptusNet Cable, cable now runs past about 2.7 million Australian homes in Sydney, Melbourne, Brisbane, Adelaide and Perth, using the same infrastructure that provides pay TV.

Cable TV, or Pay TV as it is known in Australia, has grown significantly over the last 2 years from a very small base. The major cable TV provider is Foxtel, which is jointly owned by Telstra (50%), News Corp. (25%) and Publishing and Broadcasting Ltd (25%). Pay TV is also provided by Optus through its Optus Vision product and regional satellite operator Austar.

Foxtel is the dominant Pay TV provider in the country at the moment reporting 725,000 Cable TV subscribers at the end of 2001, compared to approximately 500,000 for Optus. As the Australian Pay TV market has been unprofitable since its inception, it is likely that some consolidation in the market is expected over the next 12 months.

In regional Victoria, publicly listed company Neighbourhood Cable is rolling out a HFC network which will may provide competition to Telstra and Optus in that region.

### Cable and Satellite TV Subscribers in Australia, End of 2001 (in thousands)

Company	Access technology	End of 2001
Austar	Satellite	430
Foxtel	Cable	725
Optus	Cable	500+

Source: company reports, 2002

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eMarketer expects cable internet services to grow to 400,000 households by 2004 from only 105,000 in 2001. IDC predicts 803,000 subscribers by 2005.

**Comparative Estimates: Cable Internet Households in Australia, 2000-2005 (in thousands)**

	2000	2001	2002	2003	2004	2005
OECD, October 2001	65	85*	-	-	-	-
International Data Corporation (IDC), 2002	56	-	-	-	-	803
Australian Competition & Consumer Commission, 2002	-	86*	-	-	-	-
<b>eMarketer, May 2002</b>	<b>65</b>	<b>105</b>	<b>180</b>	<b>260</b>	<b>400</b>	<b>-</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2001 & 2002*

**Alternative Broadband Technologies**

Canberra, the capital of Australia, has the highest internet penetration in the country. In 1997 the regional electricity utility, Australian Capital Territory Electricity and Water (ACTEW), in partnership with telecoms and content providers, formed a company called TransACT to develop a high-speed fiber-to-the-curb residential service. The network architecture utilizes optical fiber lines that connect to existing power poles. From the power pole, a node dedicated per household transforms the optical signals into electrical signals for the last 300- to 500-meter journey down copper wiring. As the distance between the node and the residence is very short, VDSL (Very High Speed DSL) is utilized to enhance the bandwidth capability of the copper line which provides data speeds of between 10Mbps – 55 Mbps to the home.

The end result is that TransACT is able to offer Canberrans multi-channel digital TV (including video-on-demand), telephony and a range of high-speed internet packages from a minimum 256kbps to 5Mbps downstream. The ‘triple-play’ package (including ISP charges and an internet speed of 512kbps downstream and 64kbps upstream) is available for AUD\$85 per month (US\$48).

As of June, 2002 TransACT was available to approximately 35,000 households and by the end of 2003 it is expected that 90% of Canberra households will have access to TransACT.

A similar enterprise is being developed in Perth, Western Australia where the local power company is developing a broadband network along similar lines to TransACT.

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## Broadband Costs

One of the significant barriers to broadband in Australia has been the cost of access. While monthly charges are comparable to most broadband services offered globally, the additional per megabyte charges incurred by users when they exceed their Megabyte quotas are quite high. Optus is the only company currently offering unlimited access, but there is some speculation that this will not last for much longer.

### Selected Broadband Access Plans in Australia, 2002 (US \$)

Com-pany	Access tech-nology	Speed down-stream/upstream (Kbps)	Initial charge	Monthly charge	Additional cost per Mbyte	Mbytes included
Telstra BigPond	Cable	Unlimited/128	\$143.1	\$30.35	\$0.08	300
Telstra BigPond	DSL	512/128	\$143.1	\$51.63	\$0.08	1GB
Telstra Bigpond	Satellite	<400/56	\$181.3 equipment + \$121 installation (in city)	\$51.37	\$0.15	3GB
Optus	Cable	Unlimited/128	\$237.3	\$41.45	None	Unlimited
TransACT	Fiber/VDSL	2MB/256Kbps	\$150.0	\$69.74	\$0.07	1000MB

Source: company reports, 2002

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.

[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

**“We purchased your ‘Benefits of Broadband’ report and have enjoyed it a lot. Finally — a report which summarizes the analysts’ forecasts and focuses on the benefit side through the applications”**

– Jon Bohmer, Chairman, Proto TV AS



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## B. China

### Summary

While China only ranks above India globally in terms of broadband penetration, this belies the fact that significant broadband development is taking place in the country. Fixed-line telephony services are rolling out rapidly and as many millions of Chinese reside in large apartment blocks, there is considerable potential for technologies such as Ethernet and fixed-wireless to gain a firm foothold. China will be a large broadband market in less than four years.

### China Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
150	40	300	490	0.14%	7	26

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 8 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International Telecommunication Union reported that China had 33.7 million internet users at the end of 2001 from only 8.9 million in 1999. The Chinese continue to embrace the internet in ever increasing numbers.

### Internet Users in China, 1999-2001 (in millions)

1999	8.9
2000	22.5
2001	33.7

Source: International Telecommunication Union (ITU), 2000-2002

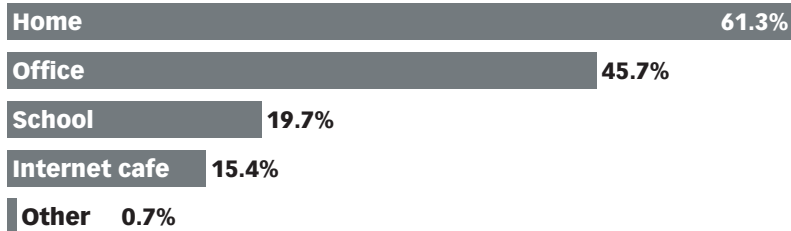
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According to the China Internet Network Information Center, 61% of Chinese internet users access the net from home. A considerable number also access the internet from work, school and internet cafés.

### Internet Access Locations in China, Second Half 2001



*Note: Multiple responses accepted*  
*Source: China Internet Network Information Center, January 2002*

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### Internet Households

eMarketer estimates there were approximately 22 million online households in China at the end of 2001. This equates to about 6% of all households. Of those online, 21 million have a dial-up connection, and about 500,000 have broadband.

### Internet Households in China, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	21,330	6.1%
DSL	150	0.04%
Cable	40	0.01%
Other	300	0.09%
<b>Total broadband households</b>	<b>490</b>	<b>0.14%</b>
<b>Total online households</b>	<b>21,820</b>	<b>6.23%</b>

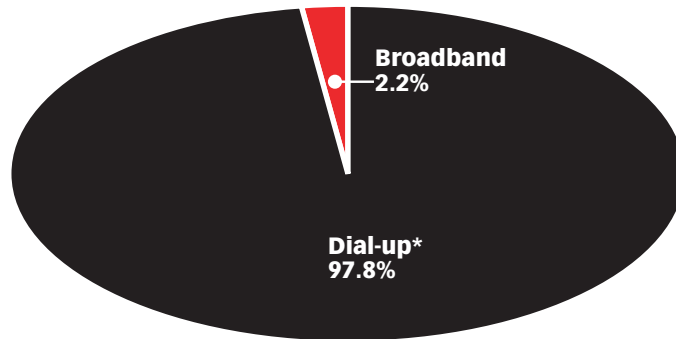
*Note: \*based on 350 million households; \*\*includes ISDN*  
*Source: eMarketer, June 2002*

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Nearly all current home internet subscribers access the internet with a dial-up connection. This will change quickly in the coming years.

### Percent of Chinese Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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### Dial-Up

According to the Chinese Ministry of Information Industry, the number of fixed line telephone subscribers reached 166.82 million as of July 31, 2001 and the ITU reports 179 million fixed line telephone subscribers at the end of 2001. This equates to approximately 14 telephone lines per 100 inhabitants. While the fixed-line penetration rate is currently low, it is growing rapidly and the dial-up market is correspondingly growing rapidly.

**“China is a large country with fragmented markets, both geographically and by industry, with each segment usually still dominated by one large player.”**

– USITO, June 2001

There are currently seven licensed telecom carriers in Mainland China including China Telecom, China Unicom, China Mobile, China Netcom, China Railcom, Jitong and China Satellite.

### Broadband Access

**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

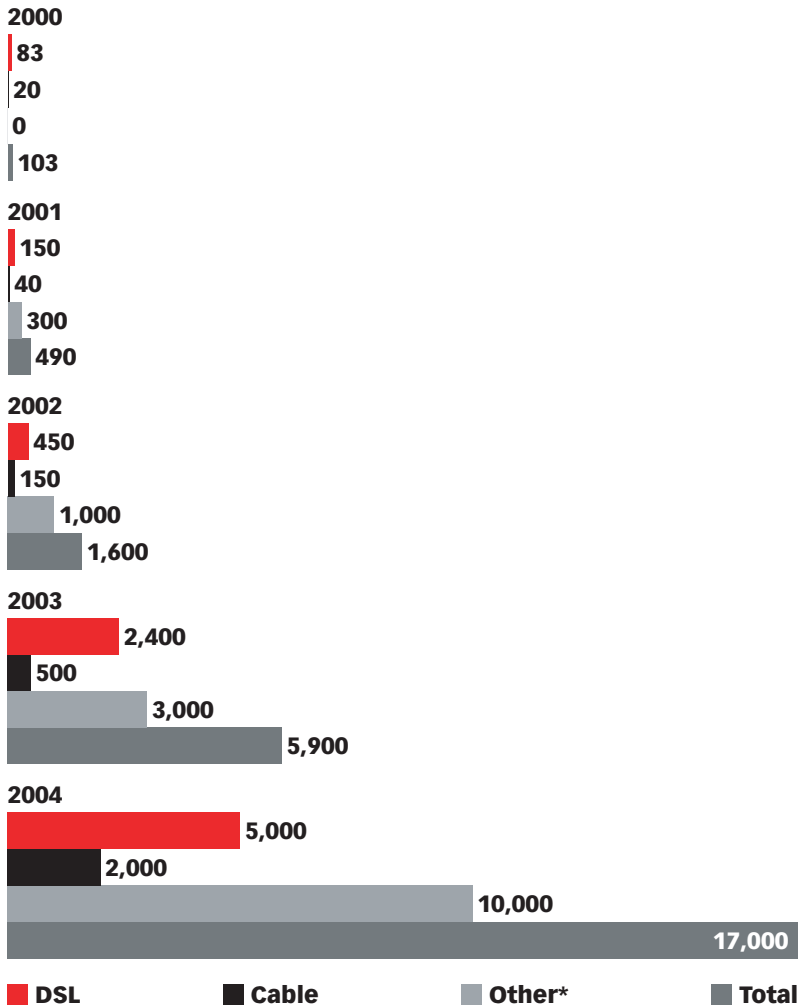
With a relatively low fixed-line infrastructure and a patchy cable network across the country, broadband internet is not widely available as yet. Ethernet to the home, DSL, cable modems and fixed-wireless (LMDS) are likely to become the four leading broadband access technologies for China.

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China's number one fixed-line telco, China Telecommunications, plans to complete a nationwide fiber-optic broadband network in 3 to 5 years, according to *China Daily*. In January 2000, China Telecom awarded a \$101 million contract to Nortel Networks for the construction of a 15,000-kilometer fiber network. Broadband networks are being built all over the country.

While information on the Chinese broadband sector is difficult to come by, eMarketer expects rapid growth in the sector over the next few years. As the fixed-line infrastructure begins to develop, DSL and cable modem services will gain in popularity. It is within the alternative technologies, however, such as fixed-wireless and fiber/Ethernet solutions where the greatest short to medium term potential lies.

**Broadband Households in China, by Access Technology, 2000-2004 (in thousands)**



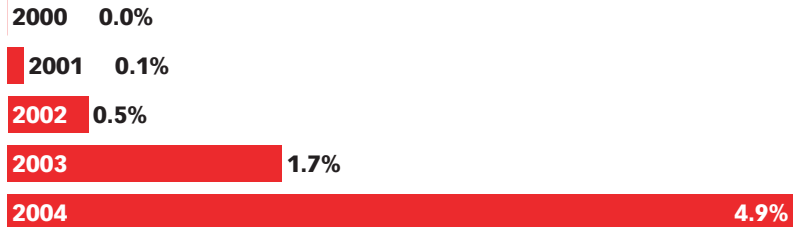
Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology

Source: eMarketer, June 2002

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eMarketer expects only 5% of Chinese households will have broadband by 2004 from less than 1% in 2001. 5% of 350 million, however, is no small number.

**Broadband Penetration in China, 2000-2004 (as a % of total households)**



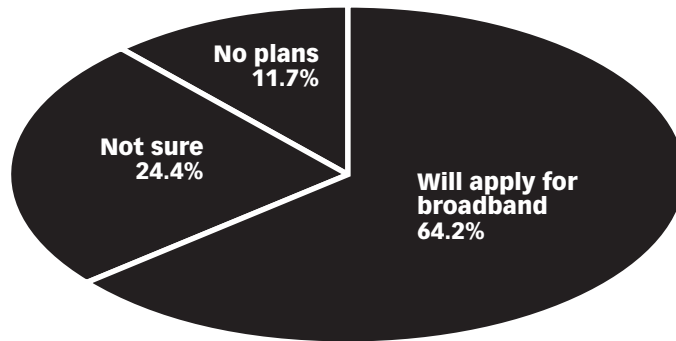
Note: Based on 350 million households at the end of 2001  
Source: eMarketer, June 2002

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A study conducted by Nielsen/NetRatings in May, 2002 would indicate that the demand for broadband currently exists in China. The study shows that 64% of Chinese internet subscribers plan on getting broadband.

**Chinese Internet Subscribers Planning to Get Broadband, 2002 (as a % of respondents)**



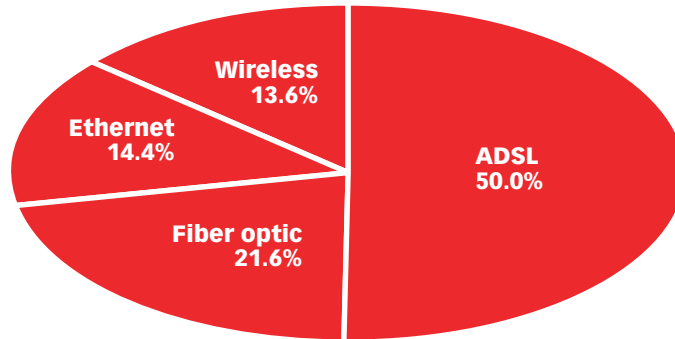
Source: Nielsen/NetRatings, May 2002

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The study also indicated that 50% of survey respondents preferred ADSL, followed by 22% favoring fiber optic.

**Preferred Type of Broadband Technology among Chinese Internet Subscribers, 2002 (as a % of respondents)**



Source: Nielsen//NetRatings, May 2002

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With such little publicly available information available, it is not surprising that the forecasts for the Chinese broadband sector are wildly divergent. IDC forecasts 8.3 million broadband subscribers in China by 2005, while Ovum predicts 3.5 million subscribers by 2004. Research firm BDA predicts 18 million broadband users by 2004. eMarketer's projections are based on sporadic news sources, Chinese government information, data from the US Information Technology Office, Gartner briefs and other related information. However, the lack of quality up-to-date information makes eMarketer's projections very speculative. As further information comes to hand, these projections are likely to change.

**Comparative Estimates: Broadband Households in China, 2000-2005 (in thousands)**

	2000	2001	2002	2003	2004	2005
Ovum, October 2000	0	165	485	1,376	3,584	-
International Data Corporation (IDC), 2001	68	437	-	-	-	8,300
BDA*, 2001	-	1,850	4,500	10,100	18,100	-
<b>eMarketer, May 2002</b>	<b>103</b>	<b>490</b>	<b>1,600</b>	<b>5,900</b>	<b>17,000</b>	<b>-</b>

Note: \*broadband users

Source: eMarketer, May 2002; various, as noted, 2000 & 2001

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## DSL

While China only has a household telephone penetration of about 12%, this equates to 42 million households. This is still a market size considerably larger than most countries. ChinaNet, China Netcom, GBNet and China Unicom are currently developing DSL services across the country. eMarketer estimates 5 million DSL households by 2004.

### Comparative Estimates: DSL Households in China, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Ovum, October 2000	–	–	87	250	686
Point-Topic, April 2002	–	141	–	–	–
<b>eMarketer, May 2002</b>	<b>83</b>	<b>150</b>	<b>450</b>	<b>2,400</b>	<b>5,000</b>

Source: eMarketer, June 2002; various, as noted, 2000 & 2002

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Point-Topic estimates a total of 235,000 DSL subscriptions in China at the end of 2001. Of these, they estimate 141,000 were residential subscriptions and 94,000 business subscriptions.

### DSL Subscribers in China, Business and Residential, End of 2001 (in thousands)

<b>Business</b>	<b>93.9</b>
<b>Residential</b>	<b>140.9</b>
<b>Total</b>	<b>234.8</b>

Source: Point-Topic, April 2002

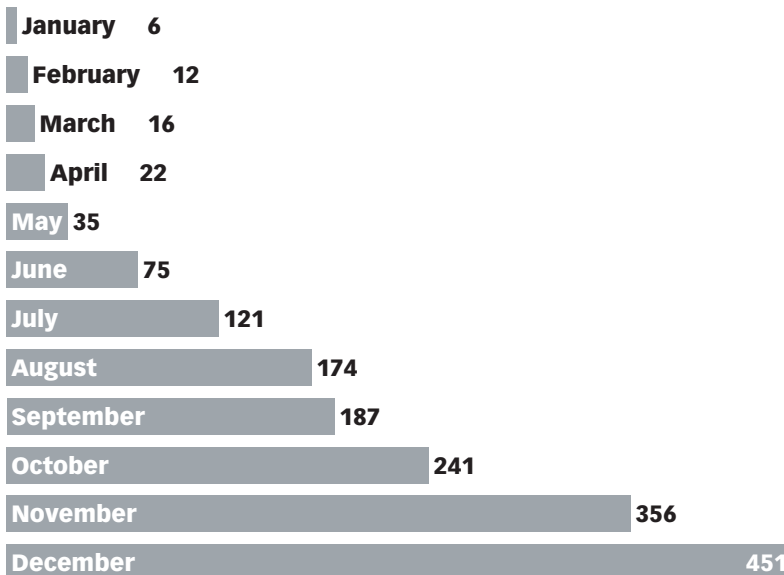
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CCID consulting shows the growth of ADSL users has been extremely rapid during 2001, from 6,000 in January to 451,000 in December.

**ADSL Users in China, January 2001-December 2001 (in thousands)**



Source: CCID Consulting, February 2002

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**Cable**

In 2000, China Cable had approximately 80 million cable TV subscribers and is expected to have between 120-150 million subscribers by 2005. According to the United States Technology Information Office (USTIO), 50% of its cable TV subscribers will be able to receive two-way internet services by 2005, which equates to a potential market of 60 million. While the potential subscriber base is enormous, eMarketer does not expect cable internet services to be widely adopted for two years while upgrading takes place.

**Comparative Estimates: Cable Internet Households in China, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Ovum, October 2000	–	178	425	1,168	2,933
<b>eMarketer, May 2002</b>	<b>20</b>	<b>40</b>	<b>150</b>	<b>500</b>	<b>2,000</b>

Source: eMarketer, June 2002; Ovum, October 2000

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## Alternative Broadband Technologies

Fixed wireless and satellite are well suited to a country in which the existing telecommunications infrastructure is underdeveloped. Since fixed-wireless solutions are quick to roll out and can service high-density residential apartment blocks well, China's potential is great.

### Ethernet

According to the EE Times, the most popular slogan in the China real estate business in 2001 was "broadband to the home." Many developers are connecting their customers nationwide in new and even older residential zones to 10-Mbit/s Ethernet. The typical network uses Category 5 unshielded twisted-pair wiring to the home combined with optical fiber to larger buildings. An Ethernet card for the customer is in the \$10 range, less expensive than ADSL or cable modems, which makes it an attractive option.

eMarketer expects the alternative broadband sector – namely fixed wireless and Ethernet – to garner millions of subscribers over the next few years.

### Alternative Broadband Households in China, 2000-2004 (in thousands)



*Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

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## Broadband Costs

A 500kbps ADSL connection from Beijing Telecom is available for \$46 per month. In Chinese dollar terms, this is relatively expensive and may be prohibitive for most. Additional usage charges are also applicable.

### Selected Broadband Access Plans in China, 2002

Company	Access technology	Speed downstream	Initial charge	Monthly charge
Beijing Telecom	ADSL	Up to 500Kbps	\$180	\$46 (200 hours online)

Source: *Beijing Telecom, 2002*

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## C. Hong Kong

### Summary

With a household penetration rate of 26%, Hong Kong ranks 2nd in Asia-Pacific and 2nd globally. The population density and geographic size of Hong Kong makes broadband an attractive business proposition. Cable, DSL and alternative broadband technologies are available to most of the population, ensuring consumers have a choice in both price and technology for their broadband.

### Hong Kong Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
310	170	65	545	25.95%	2	2

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 8 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International Telecommunication Union reports Hong Kong had 3.1 million internet users as of 2001, from 2.4 million in 1999.

### Internet Users in Hong Kong, 1999-2001 (in millions)

1999	2.4
2000	2.6
2001	3.1

Source: International Telecommunication Union (ITU), 2000-2002

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## Internet Households

eMarketer estimates 59% of the 2.1 million Hong Kong households were connected to the internet at the end of 2001. Dial-up access accounted for 700,000 households and broadband 545,000 according to eMarketer.

### Internet Households in Hong Kong, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	696	33.0%
DSL	310	14.8%
Cable	170	8.1%
Other	65	3.1%
<b>Total broadband households</b>	<b>545</b>	<b>26.0%</b>
<b>Total online households</b>	<b>1,241</b>	<b>59.1%</b>

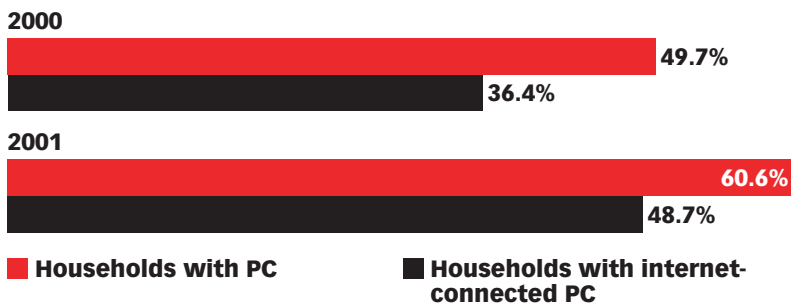
Note: \*based on 2.1 million households; \*\*This figure does not include those with both a dial-up and broadband connection in the home  
Source: eMarketer, May 2002

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The Hong Kong Census and Statistics Department reported that as of May, 2001 61% of households had a PC and 49% had an internet connected PC. This represents considerable growth over the preceding year.

### PC and PC-Internet Households in Hong Kong, 2000 & 2001 (as a % of total households)



Note: based on 2.1 million households; 2001 figure based on survey conducted in May and June 2001

Source: Hong Kong Census and Statistics Department, November 2001

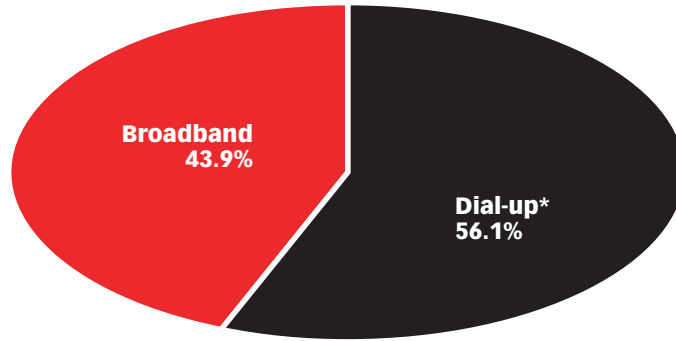
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The dial-up market is rapidly vanishing in Hong Kong with broadband households approaching 50% of all online households.

### Percent of Hong Kong Online Households, Dial-Up and Broadband, End of 2001



*Note: \*Includes ISDN*  
*Source: eMarketer, June 2002*

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### Dial-Up

Dial-up is still the favored means of internet access in Hong Kong despite its shrinking user base. This, however, is not expected to last much longer as dial-up subscribers begin to 'trade-up' to broadband. As broadband continues to be considerably more expensive than dial-up, however, there will always be that section of the internet population who do not see the value in broadband.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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Hong Kong's Office of the Telecommunications Authority (OFTA) reported that by the end of 2000, 98% of Hong Kong households and virtually all commercial buildings were covered by a broadband network. Pacific Century CyberWorks, formerly Hong Kong Telecom, is the leading telecommunications company in the country reporting 311,000 DSL subscribers at the end of 2001. I-Cable Communications is the leading cable TV company in the country, reporting 160,000 cable internet subscribers at the end of 2001.

---

### **Leading Broadband Access Providers in Hong Kong, 2001 (in thousands of subscribers)**

	<b>Access technology</b>	<b>30 June 2001</b>	<b>End of 2001</b>
PCCW	DSL	–	311
I-Cable Communications	Cable	100	160

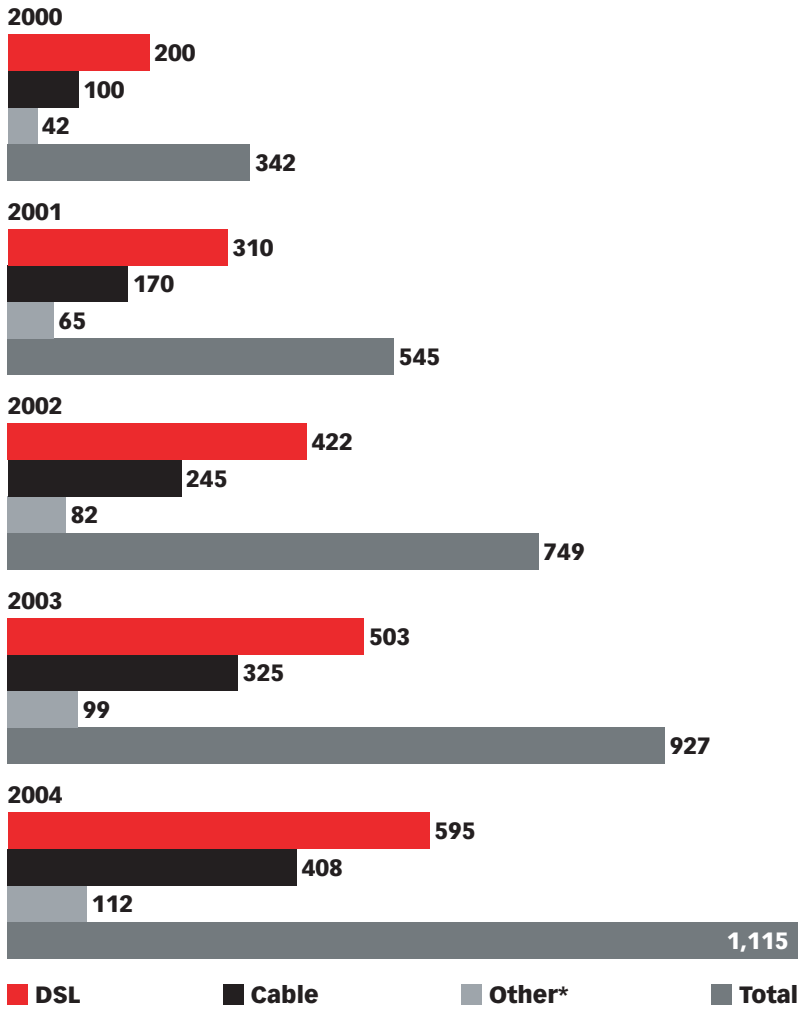
*Source: eMarketer, May 2002; company data, 2002*

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eMarketer forecasts over 1.1 million broadband households in Hong Kong by 2004, from 545,000 at the end of 2001. Cable internet, DSL, fixed wireless, fiber and Ethernet are all expected to flourish in this small market.

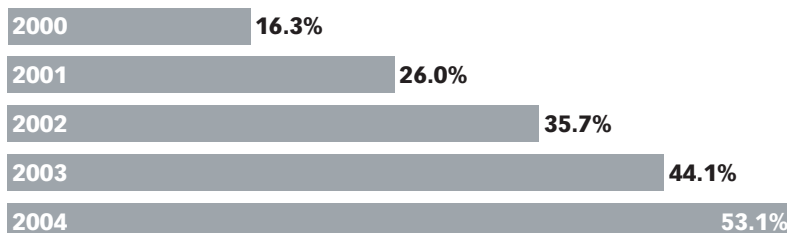
**Broadband Households in Hong Kong, by Access Technology, 2000-2004 (in thousands)**



Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002

With only 2.1 million households in Hong Kong, eMarketer expects broadband to penetrate over half of them by 2004.

### Broadband Penetration in Hong Kong, 2000-2004 (as a % of total households)



Note: Based on 2.1 million households at the end of 2001  
 Source: eMarketer, June 2002

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OFTA recently reported 623,000 broadband customer accounts across business and residential markets at the end of 2001. Its definition of broadband refers to services with downloading speed of 1Mbps or above, which is a considerably narrower definition than eMarketer's. The Yankee Group forecasts 1.3 million broadband households in 2004 from 712,000 in 2001. eMarketer's forecasts are slightly more conservative.

### Comparative Estimates: Broadband Households in Hong Kong, 2000-2005 (in thousands)

	2000	2001	2002	2003	2004	2005
International Data Corporation (IDC), 2001	383	1,230	-	-	-	2,110
Yankee Group, February 2002	-	712	-	-	1,300	-
OFTA, 2002	392	623	-	-	-	-
<b>eMarketer, May 2002</b>	<b>300</b>	<b>545</b>	<b>749</b>	<b>927</b>	<b>1,115</b>	<b>-</b>

Source: eMarketer, May 2002; various, as noted, 2001 & 2002

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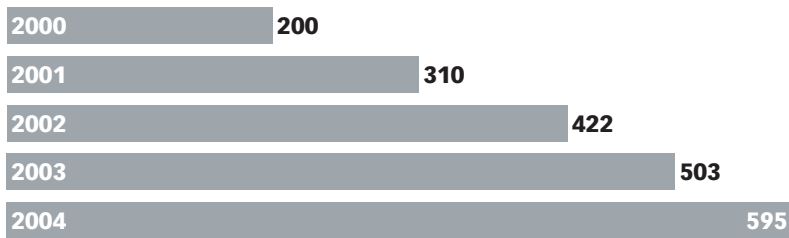
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## DSL

With a very high fixed-line network penetration combined with a population that is within close proximity to local exchanges (Central Offices), Hong Kong is well suited to DSL. The closer a user is to a local exchange, the higher the available bandwidth for DSL technology. Hong Kong Telecom offers an ADSL service throughout Hong Kong at download speeds of 1.5Mbps and upstream of 256kbps.

eMarketer forecasts 600,000 DSL households in Hong Kong in 2004, from 310,000 at the end of 2001.

### DSL Households in Hong Kong, 2000-2004 (in thousands)



Source: eMarketer, May 2002

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Point-Topic's research indicates that 75,000 businesses subscribed to DSL internet at the end of 2001 in addition to the 300,000 Hong Kong residences.

### DSL Subscribers in Hong Kong, Business and Residential, End of 2001 (in thousands)



Source: Point-Topic, April 2002

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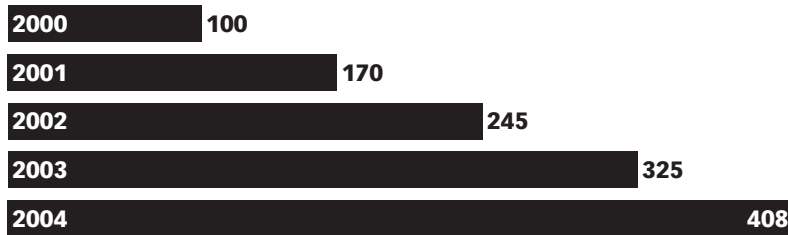
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## Cable

A recent financial report from I-Cable Communications, the leading cable TV provider, indicates that by the end of 2001, cable services were available to over 1.6 million homes. Subscribers to cable modem services for the company have grown from 50,000 in December 2000 to 160,000 in December 2001.

eMarketer forecasts cable internet households will number over 400,000 by 2004.

### Cable Internet Households in Hong Kong, 2000-2004 (in thousands)



Source: eMarketer, May 2002

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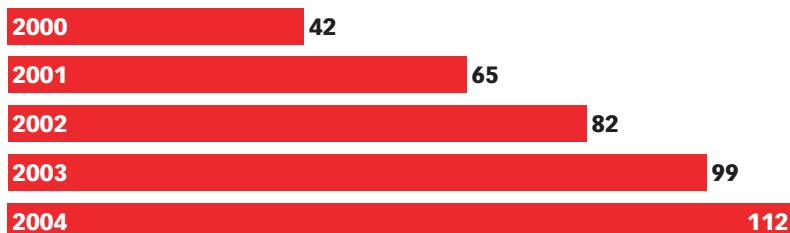
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## Alternative Broadband Technologies

In March 2000, Hong Kong's Office of the Telecommunications Authority (OFTA) awarded fixed-wireless licenses to Hong Kong Broadband Network, PSINet Hong Kong Ltd, HKNet-Teligent Co. Ltd, Eastar Technology Ltd and SmarTone Mobile Communications Ltd. Hong Kong Broadband Network announced that its service will cover 70% of the population in 3 years. Two years down the track, however, the success of fixed-wireless continues to be uncertain with only a handful of residential and business subscribers adopting the service.

Never-the-less, alternative broadband technologies such as fixed wireless, satellite, fiber and Ethernet connections are all widely available or in the process of becoming widely available in Hong Kong and are expected to flourish in the coming years.

**Alternative Broadband Households in Hong Kong, 2000-2004 (in thousands)**



*Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

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**Broadband Costs**

Broadband in Hong Kong is ultra-fast. DSL and cable modem speeds are readily available at 1.5Mbps – 3Mbps at a price comparable to services at half the speed elsewhere in the world. It is worth noting, however, that Pacific Century Cyberworks additional megabyte costs over the quota limits for its DSL service are considerable. In contrast, I-Cable’s service is unlimited.

**Selected Broadband Access Plans in Hong Kong, 2002**

Company	Access technology	Speed down-stream/upstream	Initial charge	Monthly charge	Additional cost per Mbyte	Mbytes included
Pacific Century Cyberworks (Netvigator)	DSL	3Mbps/256Kbps	\$67.95	\$38.20	\$0.25/hour	100 hours usage
i-Cable	Cable	1-10Mbps/1-3Mbps+	\$38.46	\$35.64 (includes modem rental)	0	Unlimited

Source: company reports, 2002

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## D. India

### Summary

A lack of telecommunications and cable infrastructure will prevent broadband from getting off the ground for some time in India. Ranked last among the countries examined in this report, if broadband access is to become widely available, then a considerable amount of investment needs to take place to increase broadband availability.

### India Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
15	40	0	55	0.03%	8	27

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 8 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International telecommunication Union reported India had 7 million internet users in 2001, from 2.8 million in 1999 out of a total population over 1 billion. Clearly, there is significant demand for internet in India and when access is more widely available and affordable, India will be an enormous market.

### Internet Users in India, 1999-2001 (in millions)

1999	2.8
2000	5.5
2001	7.0

Source: International Telecommunication Union (ITU), 2000-2002

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There are approximately 181 million households in India according to Zenith Media, and only about 1 million of them have internet access according to eMarketer.

**Internet Households in India, by Access Technology, End of 2001 (in thousands and as a % of total households\*)**

	<b>Internet households</b>	<b>% of total households</b>
Dial-up**	950	0.5%
DSL	15	0.01%
Cable	40	0.02%
Other	0	0.0%
<b>Total broadband</b>	<b>55</b>	<b>0.03%</b>
<b>Total online households</b>	<b>1,005</b>	<b>0.6%</b>

*Note: \*based on 181 million households; \*\*includes ISDN but does not include free ISP accounts*  
*Source: eMarketer, May 2002*

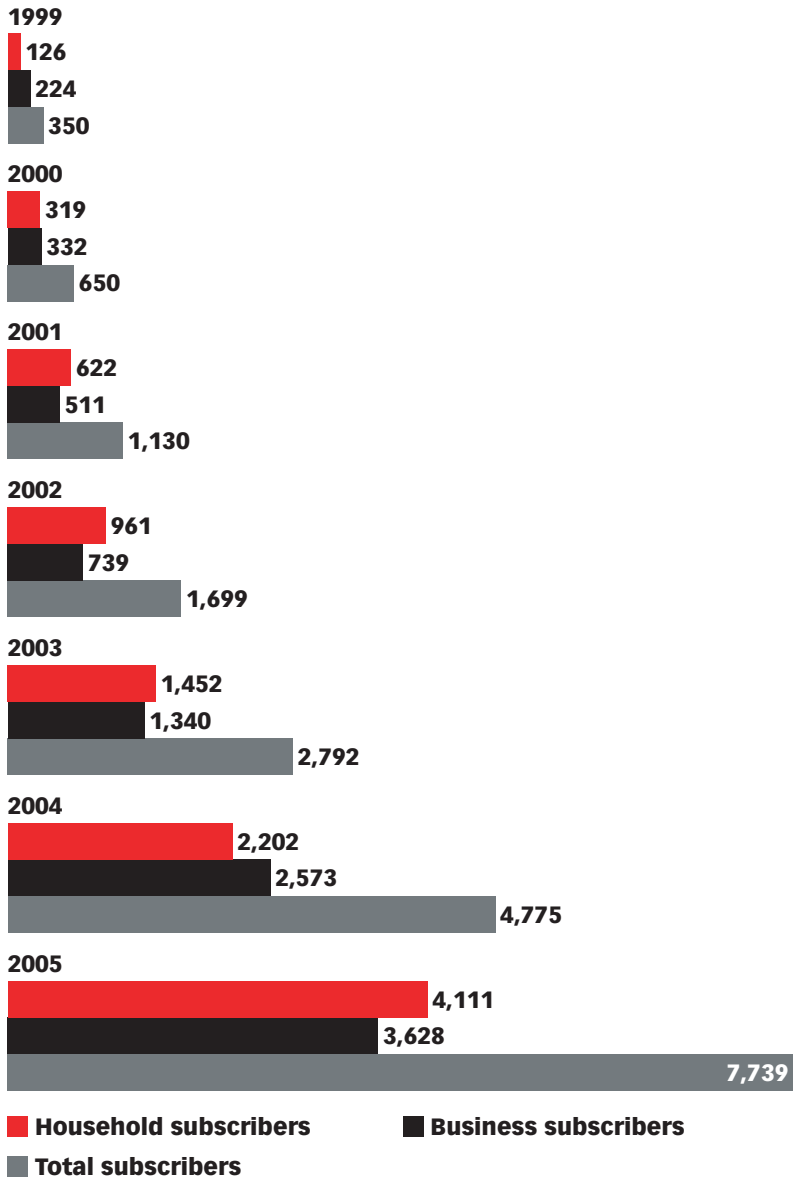
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A recent report from India's National Association of Software and Services Companies (NASSCOM) forecasts the total number of residential and business internet subscribers in India will only reach 7.7 million by 2005 from approximately 1.1 million in 2001. They predict household subscribers to only total 4.1 million in 2005 from 622,000 in 2001.

**Internet Subscribers in India, Household and Business, 1999-2005 (in thousands)**

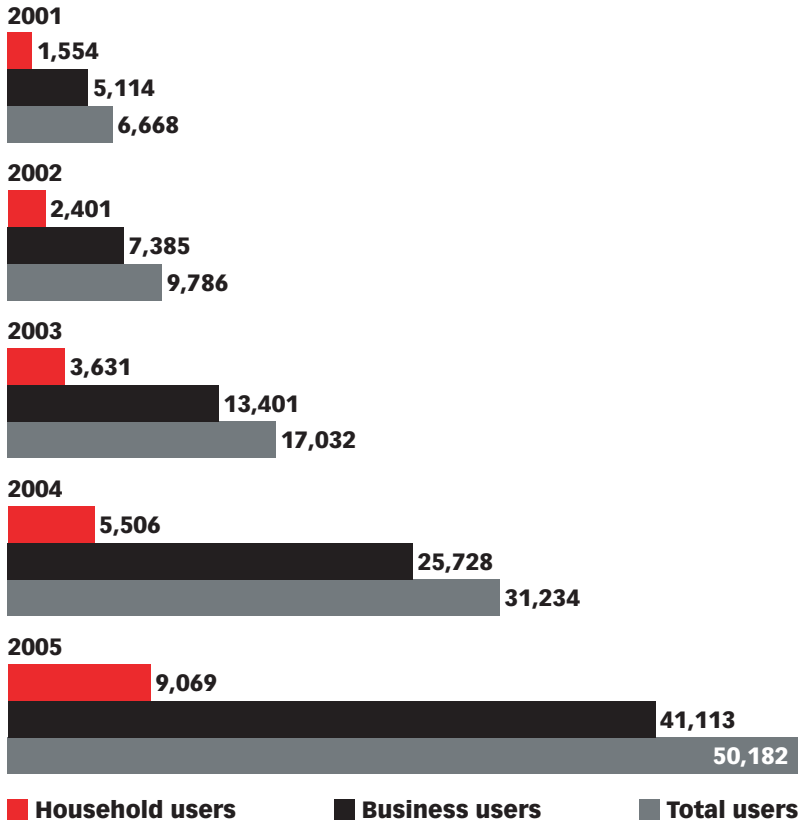


*Note: Does not include free ISP subscriptions*  
 Source: NASSCOM, 2001

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Despite the lack of household internet access, NASSCOM predicts that the number of Indian internet users will surpass 50 million by 2005, with most of the gains coming from at-work access.

**Internet Users in India, Household and Business, 2001-2005 (in thousands)**



Source: NASSCOM, 2001

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## Dial-up

According to the Indian Department of Telecommunication, Caltiger is the largest ISP in the country with over 683,000 internet subscribers as of June 2001, followed by Siffy and VSNL.

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### Top ISPs in India, by Subscriber Numbers, 30 June 2001 (in thousands)

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Caltiger	683
Satyam Infoway	501
VSNL	486
Mantra Online	245
BSNL	245

Source: Indian Department of Telecommunication, 2001

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## Broadband Access

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eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.

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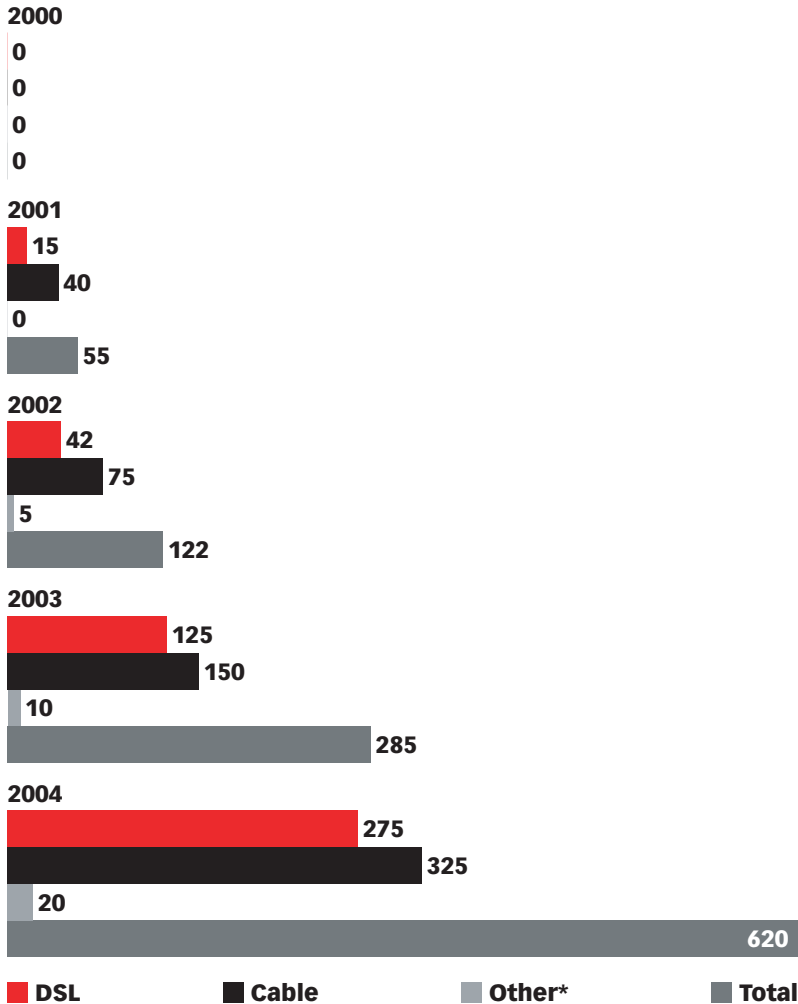
With a lack of broadband infrastructure it is difficult to foresee any significant growth in broadband internet access for the next 3 years. Given there are only 3.38 telephone lines per 100 people in India and a cable TV network that needs upgrading to allow for two-way internet services, broadband will only be available in pockets around the country.



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eMarketer estimates there will only be 620,000 broadband households in India in 2004, from 55,000 at the end of 2001. eMarketer's projections are based on sporadic news sources, and patchy second hand sources. As further information comes to hand, these projections are likely to change.

**Broadband Households in India, by Access Technology, 2000-2004 (in thousands)**

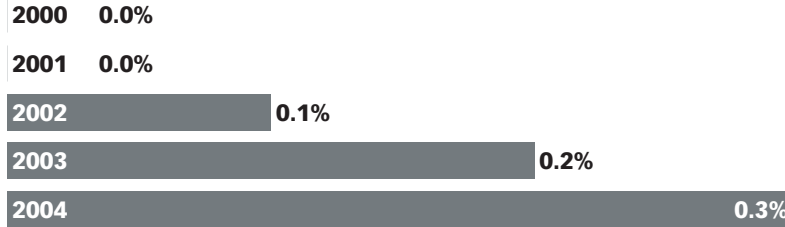


Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, June 2002

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Household penetration of broadband will not even reach 1% by 2004.

**Broadband Penetration in India, 2000-2004 (as a % of total households)**



*Note: Based on 181 million households at the end of 2001  
Source: eMarketer, June 2002*

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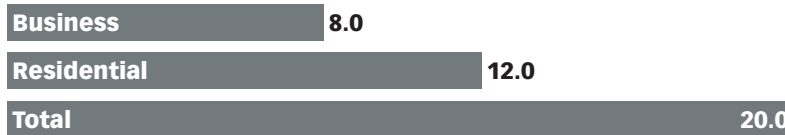
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**DSL**

India has 3.38 fixed telephone lines for every 100 citizens, according to the International Telecommunication Union (ITU). The shortage of telephone lines, coupled with the national telecom operator VSNL holding a near monopoly in India's telecom market, does not point to a rosy future for DSL services.

Dishnet DSL reported 15,000 DSL subscribers at the end of 2001. Point-Topic's research indicates India had 12,000 residential subscribers at the end of 2001.

**DSL Subscribers in India, Business and Residential, End of 2001 (in thousands)**



*Source: Point-Topic, April 2002*

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## Cable

According to the National Association of Software and Service Companies (NASSCOM), there were 37 million cable TV subscribers in India as of March 2000, a number expected to grow to 70 million by 2008. There are three major cable TV providers in India: Siti Cable with 5.4 million subscribers at the end of 2000, InCableNet with 4.3 million subscribers and Hathway with 2.5 million subscribers, according to Asia.com. While the reach of the cable network is quite extensive, the reality is that the majority of the cable network is of poor quality and needs upgrading. Cable operators' lack of capital and high cost of cable modems will limit the opportunities for cable internet for some time.

While information about the cable internet sector in India is difficult to come by, eMarketer estimates there were approximately 40,000 cable internet subscribers in the country at the end of 2001.

## Alternative Broadband Technologies

One of the leading internet service providers in the country, Siffy, is using fixed wireless technology to provide internet access to its hundreds of Cyber Cafés around India. Countries such as India, where the fixed-line infrastructure is underdeveloped are well suited to fixed-wireless and satellite technology. New technologies such as these may be important drivers for internet growth.

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## E. Japan

### Summary

At the end of 2001 Japan only ranked 5th in the Asia-Pacific and 12th globally in terms of household penetration of broadband. In the later half of 2001, however, the Japanese broadband market gained considerable momentum. The Japanese government has set aggressive plans to drive adoption of broadband. With a variety of broadband technologies available and increasing competition in the market, Japan will rival South Korea as the leading broadband market in Asia-Pacific within the next few years.

### Japan Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
1,250	1,300	20	2,570	5.76%	5	12

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 8 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

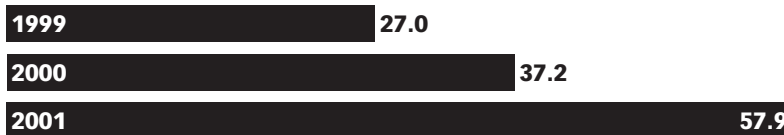
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### Internet Users

In absolute terms, Japan has the highest number of active internet users in all of Asia, with the International Telecommunication Union reporting 57.9 million users in 2001, from 27 million in 1999.

### Internet Users in Japan, 1999-2001 (in millions)



Source: International Telecommunication Union (ITU), 2000-2002

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eMarketer expects Japanese internet users will number 70 million by 2004.

### Internet Users in Japan, 2001-2004 (in millions)



Source: eMarketer, May 2002

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## Internet Households

While twice as many Japanese access the internet through their mobile phone than they do through a PC at home, the residential internet market nevertheless numbers over 21 million, according to eMarketer. There were 18.8 million dial-up subscribers in Japan at the end of 2001 and 2.6 million broadband households.

### Internet Households in Japan, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	18,800	42.2%
DSL	1,250	2.8%
Cable	1,300	2.9%
Other	20	0.04%
<b>Total broadband</b>	<b>2,570</b>	<b>5.8%</b>
<b>Total online households</b>	<b>21,370</b>	<b>48.2%</b>

Note: \*based on 44.6 million households; \*\*includes ISDN  
 Source: eMarketer, May 2002

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## Dial-Up

Broadband access is becoming more widely available in Japan, but most home Japanese users currently access the internet through a dial-up connection. ISDN, which eMarketer considers to be a 'dial-up' connection and which is typically less than 128kbps, is very popular in Japan and used in over 10 million Japanese homes, according to Nomura Research Institute. This technology, however, is likely to be phased out by the incumbent telecom operator, NTT (East & West), over the next 10 years as it concentrates its investments in DSL and fiber technologies.

The leading internet service providers in Japan are @nifty with 18% of the market and Biglobe with 14%, according to Morgan Stanley.

## Broadband Access

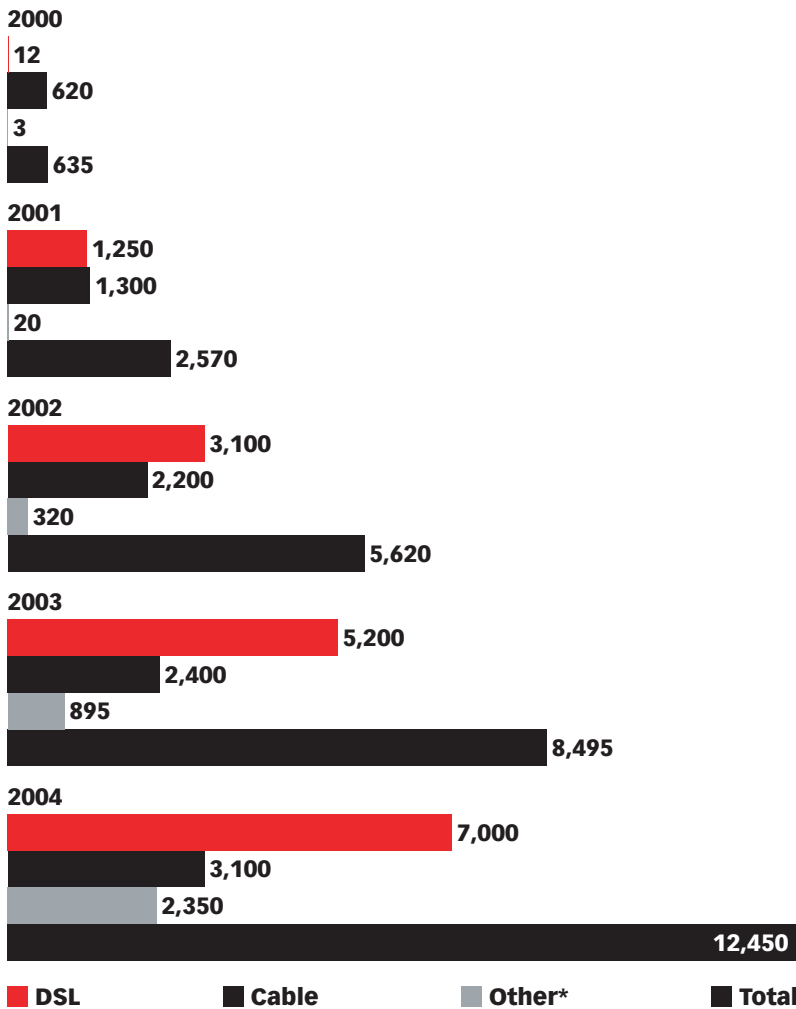
eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.

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The goal of the government’s e-Japan initiative is to reach 5 million affordable broadband subscriptions by 2002. A second benchmark will be reached in 2005 when the government plans for at least 30 million Japanese households to have “always-on” broadband access. At current growth rates eMarketer believes the first goal is eminently possible and the second goal, not out of the question.

eMarketer conservatively expects Japan will have over 12.4 million broadband households by 2004, up from 2.5 million in 2001. DSL technology will overtake cable internet as the favored means of broadband access, but post-2004, it is likely that fiber connections will also be prominent. eMarketer’s Japan forecasts do not include broadband (3G) mobile phones, which continue to garner significant numbers of subscribers.

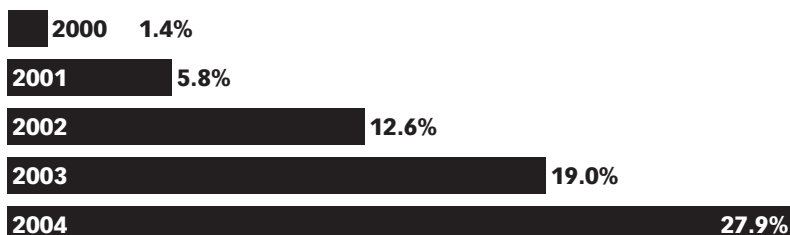
**Broadband Households in Japan, by Access Technology, 2000-2004 (in thousands)**



*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

Broadband penetration at the end of 2001 stood at approximately 6%. eMarketer forecasts by 2004 nearly one-third of Japanese households will have broadband.

### Broadband Penetration in Japan, 2000-2004 (as a % of total households)



Note: Based on 44.6 million households at the end of 2001  
 Source: eMarketer, June 2002

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The Japanese Ministry of Public Management, Home Affairs, Posts and Telecommunications has set its own forecasts and goals for broadband in the country. In 2002, it predicts 9.2 million broadband households, rising to 20 million by 2005. The data indicates that DSL technology will peak in 2003 and then drop off, to be overtaken by fiber optic technology in 2005.

### Households with Broadband Access in Japan, by Access Type, 2001-2005 (in millions)

	2001	2002	2003	2004	2005
DSL	1.6	4.8	7.5	7.2	7.0
CATV	2.1	3.2	3.9	4.2	4.3
Wireless	0.02	0.16	0.41	0.65	0.80
Fiber optics	0.07	0.97	3.4	5.9	7.7
<b>Total</b>	<b>3.8</b>	<b>9.2</b>	<b>15.1</b>	<b>18.0</b>	<b>19.8</b>

Source: Ministry of Public Management, Home Affairs, Posts and Telecommunications - Japan, October 2001

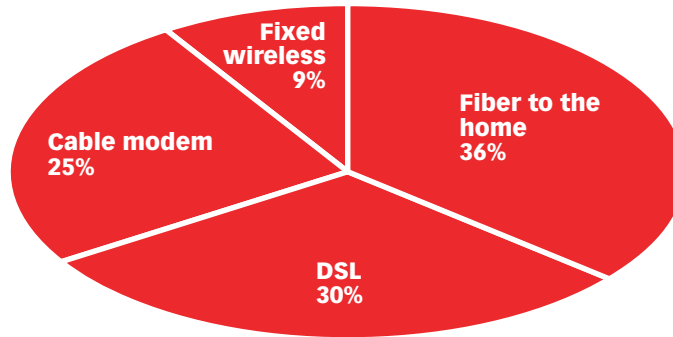
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This trend is further supported by Dewey Ballantine LLP, which also predicts that by 2005, fiber-to-the-home will dominate the broadband landscape in Japan in 2005 and beyond.

**Broadband Residential Subscribers in Japan, by Technology, 2005**



Source: Dewey Ballantine LLP/Cyberworks Japan, 2001

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The OECD reported 1.185 million broadband residential and small business subscribers in Japan as of 30 June 2001. eMarketer has based its forward projections on data from the OECD.

**Comparative Estimates: Broadband Households in Japan, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	495	1,066	2,046	3,578	–
OECD, October 2001	635	1,185*	–	–	–
Nomura Research Institute, December 2001	–	3,493	–	–	–
Ministry of Home Affairs, Posts & Telecommunications, May 2002	–	2,836	–	–	–
<b>eMarketer, May 2002</b>	<b>635</b>	<b>2,570</b>	<b>5,550</b>	<b>8,450</b>	<b>12,100</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2001 & 2002

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## DSL

The incumbent operator NTT was slow to launch DSL services preferring to focus on ISDN internet access. With NTT split into NTT East and NTT West and the unbundling of the local loop, competitive providers such as Yahoo Japan and eAccess stole significant market share in the DSL market. As of March 2002, DSL lines provided by carriers other than the incumbent operators were significantly greater in both the east and west regions of Japan according to the Ministry of Telecommunications. The current competitive environment has now caused something of a price war with NTT cutting its prices and operators offering greater bandwidth options. Cost pressures may see some consolidation in the market in the near future.

### DSL Lines in Japan Provided by NTT and Other Carriers, March 2002

	NTT West Area	NTT East Area
Lines provided by NTT East and NTT West	454,362	513,324
Lines provided by other carriers	541,772	869,337
Sub Total	996,134	1,382,661
<b>Total</b>	<b>2,378,795</b>	

*Note: lines are provided using NTT East and NTT West terminal circuits  
 Source: Ministry of Public Management, Home Affairs, Posts and Telecommunications - Japan, April 2002*

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The Ministry of Home Affairs, Posts and Telecommunications reported 1.5 million DSL subscriptions across both residential and business markets at the end of 2001. eMarketer's 2001 residential estimate coincides with Point-Topic's 1.22 million residential DSL subscriptions.

### Comparative Estimates: DSL Households in Japan, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	10	421	940	1,640	-
OECD, October 2001	12	401*	-	-	-
Nomura Research Institute, December 2001	-	1,848	-	-	-
Probe Research, February 2002	-	1,500	-	-	-
Point-Topic, April 2002	-	1,220	-	-	-
Ministry of Home Affairs, Posts & Telecommunications-Japan, May 2002	10	1,524	-	-	-
<b>eMarketer, May 2002</b>	<b>12</b>	<b>1,250</b>	<b>3,100</b>	<b>5,200</b>	<b>7,000</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2001 & 2002*

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Point-Topic reported Japan had 1.5 million DSL subscriptions at the end of 2001. Of these 305,000 were business subscriptions.

**DSL Subscribers in Japan, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>304.9</b>
<b>Residential</b>	<b>1,219.7</b>
<b>Total</b>	<b>1,524.6</b>

Source: Point-Topic, April 2002

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**Cable**

The penetration of cable TV networks has been steadily increasing over recent years. A few years ago, there were over 400 cable TV networks scattered across Japan. Consolidation has occurred recently but many networks are struggling to reach profitability. The largest cable operator in the country is J-Com Broadband. As of December 2001, J-Com Broadband (a merger between Jupiter Telecommunications and Titus Telecommunications) had passed 5.5 million homes and had 1.3 million customers receiving at least one service of TV, phone or internet and had 350,000 cable internet households.

The OECD reported Japan had 784,000 cable internet subscribers as of June 2001. eMarketer estimates the country had 1.3 million cable internet households at the end of 2001. This estimate coincides with the Ministry of Post and Telecommunications' estimate.

**Comparative Estimates: Cable Internet Households in Japan, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	480	625	985	1,528	-
OECD, October 2001	620	784*	-	-	-
Nomura Research Institute, December 2001	-	1,561	-	-	-
Ministry of Home Affairs, Posts & Telecommunications Japan, May 2002	625	1,300	-	-	-
<b>eMarketer, May 2002</b>	<b>620</b>	<b>1,300</b>	<b>2,200</b>	<b>2,400</b>	<b>3,100</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2001 & 2002

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## Alternative Access Technologies

According to incumbent NTT, it plans to roll out very high speed (10 Mbps – 100 Mbps) fiber optic connections to end users in major cities by March 2003 and small cities by 2005. The Ministry of Posts and Telecommunications reported there were approximately 7,000 fiber optic households in Japan in 2001 and about 2,000 fixed wireless households. They have forecast (or set a goal) that by 2005, 7.7 million households will connect to the internet with a fiber optic connection and 800,000 will use fixed-wireless.

### Households with Broadband Access in Japan, by Access Type, 2001-2005 (in millions)

	2001	2002	2003	2004	2005
DSL	1.6	4.8	7.5	7.2	7.0
CATV	2.1	3.2	3.9	4.2	4.3
Wireless	0.02	0.16	0.41	0.65	0.80
Fiber optics	0.07	0.97	3.4	5.9	7.7
<b>Total</b>	<b>3.8</b>	<b>9.2</b>	<b>15.1</b>	<b>18.0</b>	<b>19.8</b>

Source: Ministry of Public Management, Home Affairs, Posts and Telecommunications - Japan, October 2001

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eMarketer's estimate of 2.4 million alternative broadband households in 2004 may prove conservative if fiber optic services become as widespread and affordable as the Japanese government hopes.

### Comparative Estimates: Alternative Broadband Households in Japan, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
BDRC/EU, August 2001	5	20	121	410	–
Nomura Research Institute, December 2001	–	85	–	–	–
Ministry of Home Affairs, Posts & Telecommunications-Japan, May 2002	–	12	–	–	–
<b>eMarketer, May 2002</b>	<b>3</b>	<b>20</b>	<b>320</b>	<b>895</b>	<b>2,350</b>

Note: Alternative broadband includes fixed wireless, satellite, fiber, Ethernet and powerline technology

Source: eMarketer, May 2002; various, as noted, 2001 & 2002

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## Broadband Costs

With a competitive marketplace for broadband access, Japanese consumers have choices between different providers, different technologies and different access plans. One characteristic of recent Japanese broadband offerings has been that greater speeds are being offered and prices are coming down. ISP eAccess, for example, recently offered a residential plan of 8Mbps for approximately \$55 per month.

### Selected Broadband Access Plans in Japan, 2002

Company	Access technology	Speed down-stream/upstream	Initial charge	Monthly charge
Yahoo Japan	ADSL	2Mbps down-stream	\$68.64	\$17.78
NTT (ACCA)	ADSL	1.5Mbps/512Kbps	\$182.11	\$53.79
J-Com	Cable	2Mbps/128Kbps	0	\$49.64

*Source: Point-Topic, April 2002; Organization for Economic Cooperation and Development (OECD), October 2001*

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer's April 2002, Benefits of Broadband Report for this aspect of the industry.  
[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

**“We purchased your ‘Benefits of Broadband’ report and have enjoyed it a lot. Finally — a report which summarizes the analysts’ forecasts and focuses on the benefit side through the applications”**

– Jon Bohmer, Chairman, Proto TV AS

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## F. Singapore

### Summary

Ranked 4th in Asia-Pacific and 6th globally, Singapore has one of the highest broadband penetration rates in the world. With a sophisticated telecommunications infrastructure and widespread access to broadband networks, broadband users will quickly surpass dial-up users in the coming years.

### Singapore Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
50	80	5	135	11.74%	4	6

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 8 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The total number of internet users in Singapore reached 2.5 million in 2001 according to the International Telecommunication Union.

### Internet Users in Singapore, 1999-2001 (in millions)



Source: International Telecommunication Union (ITU), 2000-2002

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## Internet Households

eMarketer estimates 633,000 households in Singapore have internet access. Nearly 500,000 use a dial-up connection, and 80,000 have cable internet and 50,000 get online via DSL.

### Internet Households in Singapore, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	498	43.3%
DSL	50	4.3%
Cable	80	7.0%
Other	5	0.4%
<b>Total broadband households</b>	<b>135</b>	<b>11.7%</b>
<b>Total online households</b>	<b>633</b>	<b>55.0%</b>

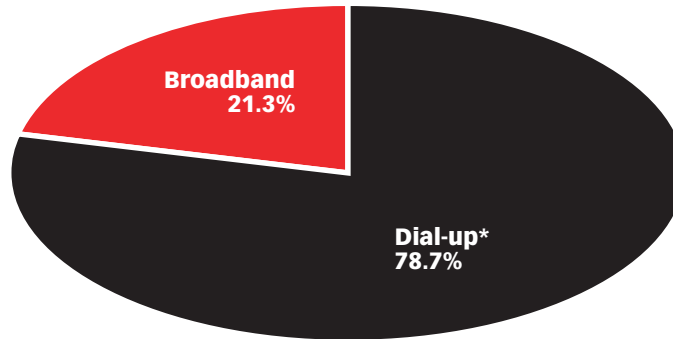
Note: \*based on 1.15 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

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Of those households online, 21% had a broadband connection at the end of 2001, similar to the proportion in the US.

### Percent of Singaporean Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

Liberalization of the telecommunications market has brought further competition to the telecoms sector, but national telecom SingTel still dominates the dial-up internet market.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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The Singapore government launched the Singapore ONE project in 1998, using fibre backbones, and a combination of fibre, DSL and cable for last mile access throughout the country. With 85% of Singapore's 4.3 million inhabitants living on just 28 square miles of island, the laying of hybrid-fiber coaxial broadband network has not been as challenging as in other countries. With one of the highest PC and internet penetration rates in Asia and a proactive government, broadband usage is on the rise.

The leading telecommunications company in Singapore is SingTel. They reported 80,000 DSL subscribers as of May, 2002, up from 40,000 in June 2001. The leading cable company - Singapore Cable Vision - reported 78,000 cable internet subscriptions in December 2001.

---

### **Leading Singapore Broadband Access Providers, 2001 (in thousands of subscribers)**

	<b>Technology</b>	<b>June 30, 2001</b>	<b>End of 2001</b>
SingTel Magix	DSL	40	80*
Singapore Cable Vision	Cable	53	78

*Note: \*As of May 2002*

*Source: Company data, 2002*

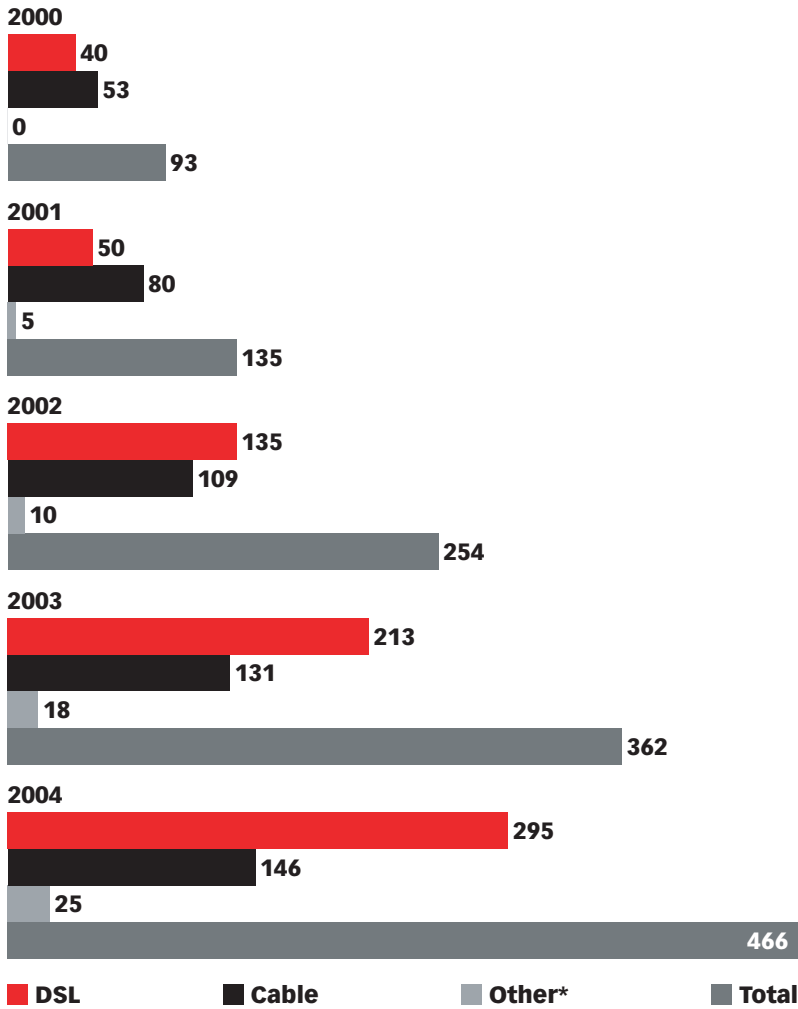
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eMarketer estimates there will be nearly 500,000 broadband households in Singapore by 2004. DSL will outpace cable and make up over 60% of all broadband households.

**Broadband Households in Singapore, by Access Technology, 2000-2004 (in thousands)**



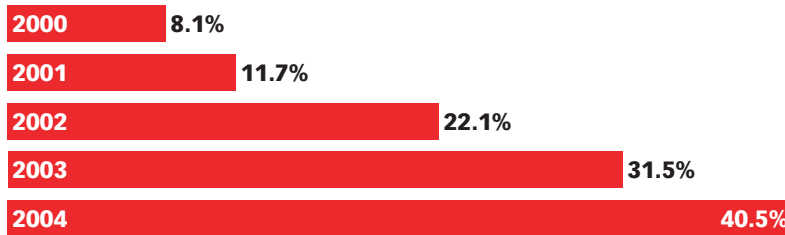
Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, May 2002



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By 2004, 41% of all Singapore households will have broadband access, if current broadband growth is maintained.

**Broadband Penetration in Singapore, 2000-2004 (as a % of total households)**



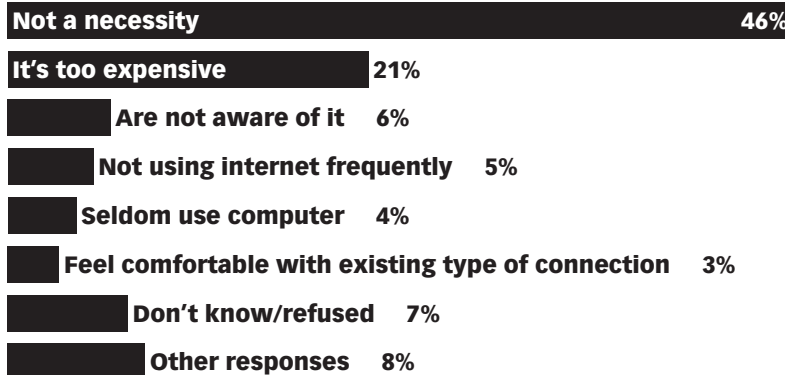
*Note: Based on 1.15 million households at the end of 2001  
Source: eMarketer, June 2002*

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A Singapore government study recently published, indicates that nearly 50% of Singapore residents have no intention of subscribing to broadband, despite access being available. This would seem to put a cap on the potential broadband audience in Singapore.

**Reasons Non-Broadband Subscribers Are Not Intending to Subscribe to Broadband Services in Singapore, 2001 (as a % of non-broadband subscribers)**



*Source: iDA Singapore, April 2002*

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There is a considerable range of estimates for broadband in Singapore. An early forecast by Ovum estimates only 231,000 subscribers by 2004. Gartner Dataquest is more optimistic, forecasting 607,000 at that time.

**Comparative Estimates: Broadband Households in Singapore, 2000-2005 (in thousands)**

	2000	2001	2002	2003	2004	2005
Ovum, October 2000	82	144	171	200	231	-
Gartner Dataquest, 2001	-	-	-	-	607	-
International Data Corporation (IDC), 2001	253	-	-	-	-	1,340
NetValue, June 2002	-	71	-	-	-	-
<b>eMarketer, June 2002</b>	<b>93</b>	<b>135</b>	<b>254</b>	<b>362</b>	<b>466</b>	<b>-</b>

Source: eMarketer, June 2002; various, as noted, 2001 & 2002

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**DSL**

Singapore was one of the first countries in the world to offer DSL services in 1997. SingTel operates Magix, which offers residential high-speed access to the Singapore ONE fiber backbone via ADSL or ATM. Due to its early rollout, DSL is expected to be a more popular last-mile solution than cable.

**Comparative Estimates: DSL Households in Singapore, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Ovum, October 2000	82	163	249	413	601
Gartner Dataquest, 2001	-	-	-	-	421
Point-Topic, April 2002	-	45	-	-	-
<b>eMarketer, June 2002</b>	<b>40</b>	<b>50</b>	<b>135</b>	<b>213</b>	<b>295</b>

Source: eMarketer, June 2002; various, as noted, 2000-2002

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Point-Topics research indicates that of the 56,000 DSL connections in Singapore in 2001, 11,000 of them were business connections.

**DSL Subscribers in Singapore, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>10.6</b>
<b>Residential</b>	<b>45.4</b>
<b>Total</b>	<b>56.0</b>

Source: Point-Topic, April 2002

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## Cable

Singapore Cable Vision (SCV) was granted exclusivity in the provision of pay television services until June 2002, in recognition of its nationwide cabling effort. It is currently the sole pay-TV player in Singapore, according to the Singapore Broadcasting authority. eMarketer forecasts 146,000 cable internet subscribers in 2004, up from 80,000 in 2001.

### Comparative Estimates: Cable Internet Households in Singapore, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Ovum, October 2000	20	27	30	34	39
Gartner Dataquest, 2001	-	-	-	-	186
<b>eMarketer, June 2002</b>	<b>53</b>	<b>80</b>	<b>109</b>	<b>131</b>	<b>146</b>

Source: eMarketer, June 2002; various, as noted, 2000 & 2001

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## Alternative Broadband Technologies

A number of recent developments by international property developers suggest that many apartments and condominiums in the future will be completely wired with high-speed fiber connections. While these condos will be available to only a very small and rich percentage of the Singapore population, 90% of Singaporeans live in government-built Housing Development Board (HDB) accommodations, making this technology quite suitable.

## Broadband Costs

Broadband access, both cable and ADSL, is competitively priced in Singapore in global terms. At \$43 per month for a 512kbps connection, this is not dissimilar to prices offered in the US and in Europe.

### Selected Broadband Access Plans in Singapore, 2002

	Access technology	Speed downstream/upstream (kbps)	Initial Charge	Monthly charge	Additional cost per Mbyte (US\$)	Mbytes included
SingTel	ADSL	512 kbps downstream	\$60 + modem	\$42.45	0	Unlimited
SCV	Cable	Up to 1.5Mbps downstream	\$29.43	\$43.00	0	Unlimited

Source: company reports, June 2002

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## G. South Korea

### Summary

South Korea leads the Asia-Pacific region and the world in terms of broadband penetration at over 51% of all households. Substantial government investment, competition in both the cable-internet and DSL markets, supply meeting demand, as well as unique geographic and cultural factors all contribute in explaining the phenomenal broadband growth in South Korea.

### South Korea Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
4,650	2,815	35	7,500	51.72%	1	1

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 8 countries examined; (3) Global rank of 27 countries examined*

*Source: eMarketer, June 2002*

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### Internet Users

According to the International Telecommunication Union, the number of internet users in South Korea more than doubled between 1999 and 2001 from 10.9 million to 24.4 million. With such widespread and affordable broadband available, most new internet users in South Korea go straight to broadband and avoid the dial-up stage altogether.

### Internet Users in South Korea, 1999-2001 (in millions)

1999	10.9
2000	19.0
2001	24.4

*Source: International Telecommunication Union (ITU), 2000-2002*

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## Internet Households

eMarketer estimates there was approximately 8.3 million households online in South Korea at the end of 2001. Of these, 7.5 million used a broadband connection and only 765,000 households used a dial-up connection.

### Internet Households in South Korea, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	765	5.3%
DSL	4,650	32.1%
Cable	2,815	19.4%
Other	35	0.2%
<b>Total broadband households</b>	<b>7,500</b>	<b>51.7%</b>
<b>Total online households</b>	<b>8,265</b>	<b>57.0%</b>

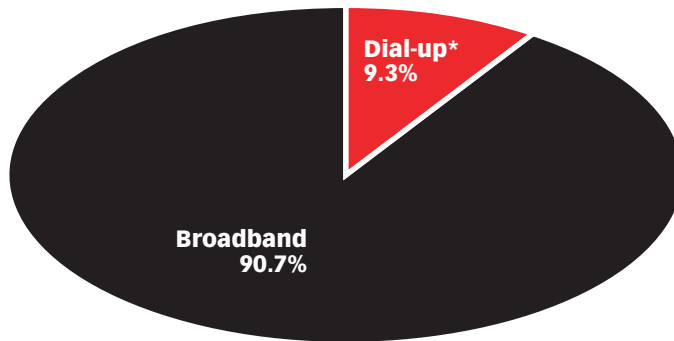
Note: \*based on 14.5 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

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While eMarketer estimates that only 57% of all households in South Korea are online, of those that are online, over 90% have a high-speed internet connection. No other country in the world has anywhere near this level of broadband penetration.

### Percent of South Korean Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

The dial-up internet market is rapidly vanishing in South Korea. The demand for broadband over the last 18 months has propelled broadband to a household penetration rate exceeding 51%.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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There are a number of reasons why South Korea has so readily embraced high-speed internet. One important reason is the government's pro-active involvement and ambitious rollout of optical fiber networks across all of the main centers of Korea. The project was originally due to be completed in 2005 but is already complete. The Korean government estimates the cost of developing the broadband technology, building the infrastructure and marketing it, will be \$30 billion between 2000 and 2005.

Moreover, South Korea has:

- a high penetration rate of cable TV and fixed-line services
- a highly competitive telecoms market
- affordably priced broadband access
- a population that has embraced the internet.

**“There was growing demand, responsive supply and appropriate government policy. These three elements created synergism to prompt explosive growth.”**

*– Lee Sang Chul, President of Korea Telecom*

The International Telecommunication Union identified that, in countries where broadband demand has taken off, there are a number of broadband applications and services that have come to the fore. Korea provides a good example of this:

- Education - in Korea, broadband access for the internet is considered an important family investment
- Entertainment – games and streaming media are particularly popular in Korea
- IP Telephony – internet protocol telephony is considered a bonus to Korean broadband users, and with the ITU estimating over 7.6 million IP telephony users at the beginning of 2001, the service is increasingly popular; flat-rate broadband makes IP telephony very attractive

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Additionally there are some unique cultural characteristics that may provide some insight into the explosive growth of broadband in South Korea.

Ryan Smith, a Senior Consultant at BF Solutions, a technology consultancy based in South Korea, identifies several factors that have influenced South Korea's broadband growth.

**The "GookMin" Computer:** The "People's computer" was a policy started by the Kim YoungSam administration several years ago. The purpose was to provide cheap or affordable computers to increase computer literacy, and connect Koreans to the internet. The program was a massive success and increased computer literacy in the country phenomenally. Without this program, the adoption of broadband connections in Korea would most likely either have failed or at the minimum, would not be anywhere near as successful as it has been.

**"BaliBali" or "quickly, quickly"** is the way everything in Korea works. Have an idea? Do it... yesterday. Whereas in western society, more time is taken to investigate and prepare, Korean society functions by simply getting things done; whether it's done right or not is not always relevant. The speed of development in the Korean broadband industry is a good example: accomplished in record time, with numerous problems for most connections.

**Resource scarcity and government policy:** Korea is not rich in mineral deposits, farmland, oil, lumber or any other natural resource. Accordingly, Korea cannot compete with other countries on the basis of resources. The IT sector, however, is an area where South Korea can compete and government grants for software companies are some of the most generous in the country.

**"Cyber-cafes"** - Called "PC Rooms" in Korea, these are a major source of internet access for those who either do not have computers at home, do not have broadband access, or simply prefer to play games in a networked environment. At rates between \$0.50 and \$1.50 USD per hour (most often about \$0.75 USD), these are extremely affordable for people who do not have a large amount of cash on-hand to lay out for computers and internet access. PC rooms are extremely common and there is always at least one within walking distance of virtually anywhere in the country.

**Population density** - Korea's dense population makes it very cheap to reach a very large number of potential subscribers very easily. With apartment mega-plexes that can easily have 5 to 10 thousand units, that's a large potential customer base, and distance restrictions on DSL are less of a factor.

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**Individuality and the group:** The anonymity provided by the web facilitates each person being able to express themselves without appearing rude as when in a group. Internet chat in Korea is extremely common and a broadband connection is ideal for real-time chat.”

The major broadband access provider in the country is Korea Telecom with nearly 50% of the market, followed by Hanaro Telecom and Korea Thrunet. Digital Subscriber Line (DSL) is currently the broadband technology favored by the majority of broadband households.

**Top Three Broadband Access Providers in Korea, 30 June 2001 & End of 2001 (in millions of subscribers)**

	<b>Major access technology</b>	<b>Subscribers as of 30 June 2001</b>	<b>Subscribers as of end of 2001</b>
Korea Thrunet	Cable	0.96	1.38
Hanaro Telecom	DSL	1.50	2.45
Korea Telecom	DSL	2.60	3.80
<b>Total</b>		<b>5.06</b>	<b>7.63</b>

Source: eMarketer, March 2002; company reports, 2002

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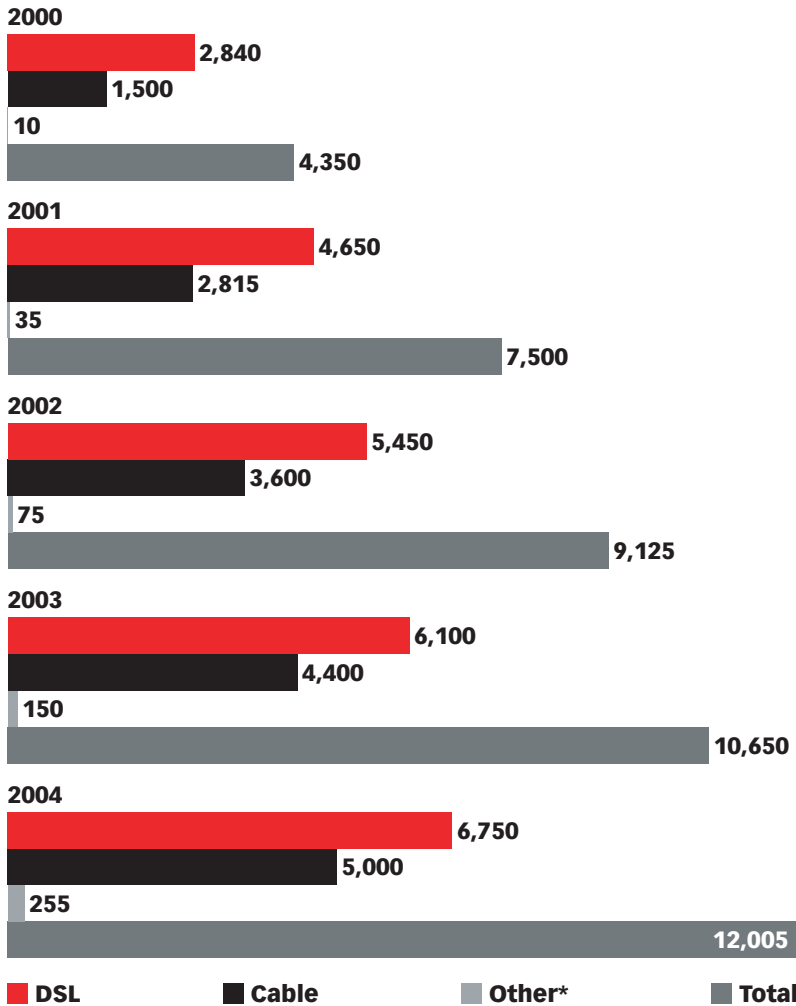
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eMarketer estimates that by 2004 there will be in excess of 12 million broadband households in the country from 7.5 million at the end of 2001. Both DSL and cable internet will expand rapidly, as will alternative broadband technologies such as fiber and Ethernet over the next few years.

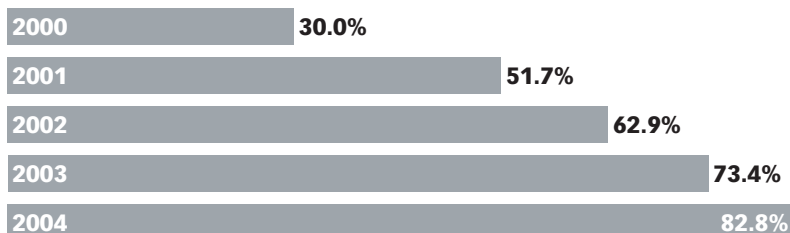
**Broadband Households in South Korea, by Access Technology, 2000-2004 (in thousands)**



*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology*  
 Source: eMarketer, May 2002

At current growth rates, over 82% of all South Korean households will have a broadband connection by 2004, according to eMarketer.

### Broadband Penetration in South Korea, 2000-2004 (as a % of total households)



Note: Based on 14.5 million households at the end of 2001  
 Source: eMarketer, June 2002

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The OECD reported 6.5 million broadband residential and small business subscribers in South Korea as of 30 June 2001. eMarketer has based its forward projections on data from the OECD. Recent figures from the government statistical department – Korean Network Information Center – as well as IDC corresponds closely with eMarketer's 2001 broadband estimate.

### Comparative Estimates: Broadband Households in South Korea, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004	2005
MIC Korea, December 2000	3,870	5,475*	-	-	-	-
OECD, October 2001	4,350	6,500**	-	-	-	-
International Data Corporation (IDC), 2001	4,390	7,500	-	-	-	21,800
Korea Network Information Center, January 2002	-	7,503	-	-	-	-
<b>eMarketer, May 2002</b>	<b>4,350</b>	<b>7,500</b>	<b>9,125</b>	<b>10,650</b>	<b>12,500</b>	<b>-</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers to 30 April 2001; \*\*subscribers to 30 June 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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## DSL

While Korea Telecom, the national telecommunications provider, continues to lose market share to competitors within the local telephone market, they still dominate this sector. Korea Telecom's major competition in the DSL market is Hanaro Telecom, which began offering high-speed internet in April 1999 and recently passed 1 million subscribers by the end of 2001. Hanaro Telecom provides both DSL and cable modem services and has approximately 1 million residential subscribers to each of its DSL and cable modem offerings. Hanaro's early competition has had the effect of spurring Korea Telecom to action, and at the end of 2001, Hanaro led the market with over 2.6 million DSL subscribers.

There is considerable consensus among the comparative estimates of research firms. The OECD reported South Korea had 4.2 million residential and small business subscribers to DSL as of 30 June 2001. Point-Topic's residential estimate and the Korean government's statistical agency also correspond closely with eMarketer's estimate.

eMarketer has based its forward projections on data from the OECD and expects DSL to continue to dominate the broadband landscape, but at a slightly lower growth rate than over the last two years.

### Comparative Estimates: DSL Households in South Korea, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
MIC Korea, December 2000	2,542	-	-	-	-
OECD, October 2001	2,840	4,205*	-	-	-
Korea Network Information Center, January 2002	-	4,600	-	-	-
Point Topic, April 2002	-	4,661	-	-	-
<b>eMarketer, May 2002</b>	<b>2,840</b>	<b>4,650</b>	<b>5,450</b>	<b>6,100</b>	<b>6,750</b>

Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers to June 30, 2001

Source: eMarketer, May 2002; various, as noted, 2000-2002

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Point-Topic reports there are over 500,000 business DSL subscribers in South Korea compared to 4.66 million residential subscribers.

### DSL Subscribers in South Korea, Business and Residential, End of 2001 (in thousands)

<b>Business</b>	<b>517.8</b>
<b>Residential</b>	<b>4,660.5</b>
<b>Total</b>	<b>5,178.3</b>

Source: Point-Topic, April 2002

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## Cable

Cable penetration is high in South Korea, with Ovum estimating the number of cable television lines to be over 8 million, or approximately 60% of the 14.5 million households in South Korea. The major cable internet service provider is Korea Thrunet, which reported 1.38 million cable internet subscribers at the end of 2001. The other major cable internet service provider in South Korea is Hanaro Telecom (Hananet). It reported 991,000 cable modem subscribers as of January 2002.

eMarketer forecasts 5 million cable modem households in 2004 from 2.8 million at the end of 2001.

### Comparative Estimates: Cable Internet Households in South Korea, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
MIC Korea, December 2001	1,319	-	-	-	-
OECD, October 2001	1,500	2,310*	-	-	-
Korea Network Information Center, January 2002	-	2,900	-	-	-
<b>eMarketer</b>	<b>1,500</b>	<b>2,815</b>	<b>3,600</b>	<b>4,400</b>	<b>5,000</b>

*Note: eMarketer's year 2000 baseline is from the Organization for Economic Cooperation and Development (OECD); \*subscribers as of 30 June 2001*

*Source: eMarketer, May 2002; various, as noted, 2001 & 2002*

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## Alternative Broadband Technologies

The Korean government has set a target of broadband connections ranging from 155 Mbps to 5 Gbps to be nationally available by 2005. This will inevitably mean that typical ADSL services will not be sufficient and optical fiber and other alternative broadband technologies with more bandwidth will begin to be offered over the coming years.

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## Broadband Costs

South Korea has some of the most affordable high-speed internet services in the world. According to the OECD, an ADSL or cable internet connection at speed of 1.5Mbps is available for only \$28 per month.

### Selected Broadband Access Plans in South Korea, 2001

Company	Access technology	Speed down-stream/upstream	Initial charge	Monthly charge	Mbytes included
Korea Telcom	ADSL	1.5Mbps/64Kbps(minimum) 8Mbps/640Kbps (maximum)	\$28.53	\$38.04	Unlimited
Thrunet	Cable	500Kbps-1.5Mbps down-stream	\$28.29	\$32.85	Unlimited

Source: Organization for Economic Cooperation and Development (OECD), October 2001

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## H. Taiwan

### Summary

Ranked 3rd in Asia-Pacific and 4th globally, few impediments stand in the way to Taiwan becoming one of the largest broadband markets in Asia. Over the last 12 months DSL subscribers have grown particularly quickly, numbering over 1 million subscribers in early 2002.

### Taiwan Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
910	215	0	1,125	18.15%	3	4

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 8 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The total number of internet users in Taiwan was estimated at 7.8 million at the end of 2001, according to the International Telecommunication Union, up from 4.5 million in 1999.

### Internet Users in Taiwan, 1999-2001 (in millions)

1999	4.5
2000	6.3
2001	7.8

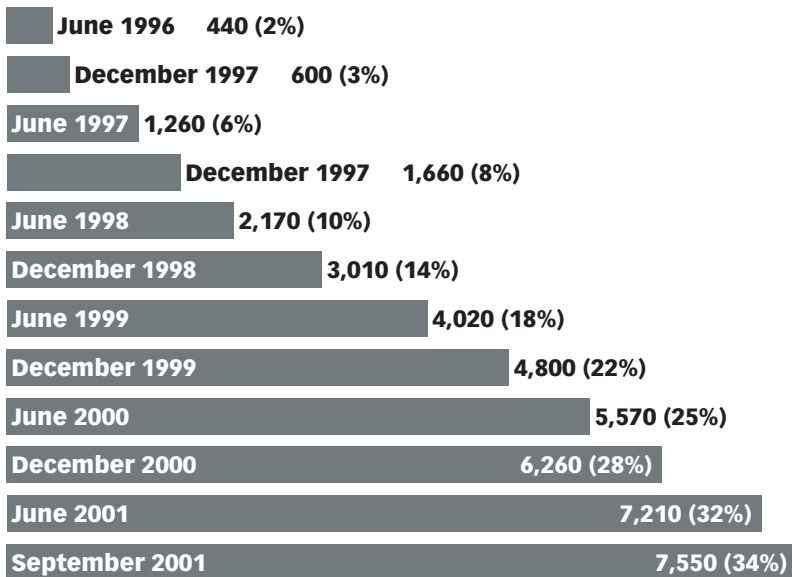
Source: International Telecommunication Union (ITU), 2000-2002

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The rapid growth in the internet sector is well illustrated with data from the Institute of Information Industry in Taiwan. Between June 2000 and September 2001, there was an increase of 2 million internet users.

**Internet Users in Taiwan, 1996-2001 (in thousands and penetration rate)**



Source: Institute for Information Industry - Taiwan, December 2001

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**Internet Households**

eMarketer estimates there are 2.6 million online households in Taiwan, or 42% of all households. Of these households online, 1.5 million use a dial-up connection and 1.1 have broadband.

**Internet Households in Taiwan, by Access Technology, End of 2001 (in thousands and as a % of total households\*)**

	Internet households	% of total households
Dial-up**	1,479	23.9%
DSL	910	14.7%
Cable	215	3.5%
Other	0	0.0%
<b>Total broadband households</b>	<b>1,125</b>	<b>18.1%</b>
<b>Total online households</b>	<b>2,604</b>	<b>42.0%</b>

Note: \*based on 6.2 million households; \*\*includes ISDN

Source: eMarketer, June 2002

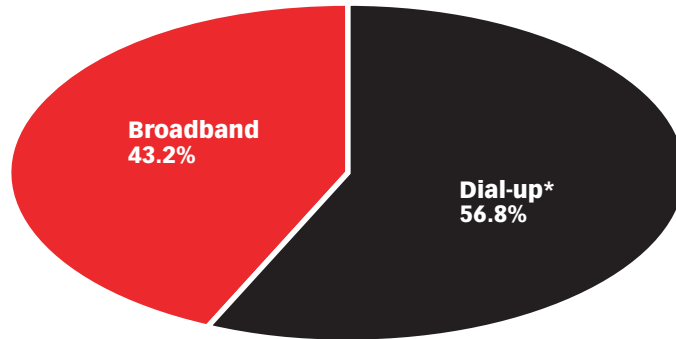
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Broadband households will overtake dial-up households in the next twelve months if the growth rate of DSL continues. At the end of 2001, 43% of all online households were broadband.

**Percent of Taiwanese Online Households, Dial-Up and Broadband, End of 2001**



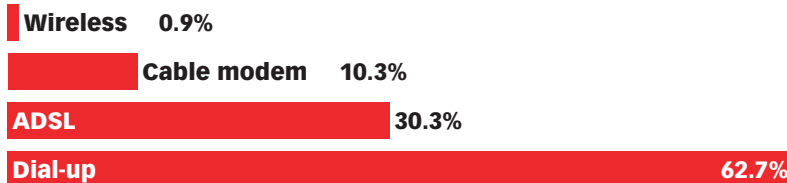
*Note: \*includes ISDN*  
*Source: eMarketer, June 2002*

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According to a report published in December, 2001 by The Institute for Information Industry (III) in Taiwan, 62.7% of households still access the internet through dial-up. This corresponds closely to eMarketer’s end of 2001 estimate.

**Household Internet Access Technologies Used in Taiwan, 2001**



*Note: multiple responses accepted*  
*Source: Institute for Information Industry - Taiwan, December 2001*

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**Dial-Up**

HiNet, the subsidiary of ChuangHwa Telecom, is the market leader in the overall dial-up and broadband internet markets in Taiwan. Other major ISPs in the market include SeedNet (the number two ISP), AsiaPacific Online and newly established fixed-line telecom carriers SaveCom Infocommunication, Taiwan Fixed Network and New Century InfoCom.



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## Broadband Access

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eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.

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Both cable internet and DSL is available to the vast majority of the Taiwanese population. Leading Telecom, Chunghwa Telecom, reported 900,000 DSL subscribers at the end of 2001, up from 350,000 six month previously. Gigamedia, one of the leading ISPs offering a variety of broadband technologies, reported 100,000 broadband subscribers at the end of 2001.

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### Leading Broadband Access Providers in Taiwan, 2001 (in thousands of subscribers)

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	Technology	30 June 2001	End of 2001
Gigamedia	Various	70	100
Chunghwa Telecom	DSL	350	900

Source: company data, 2002

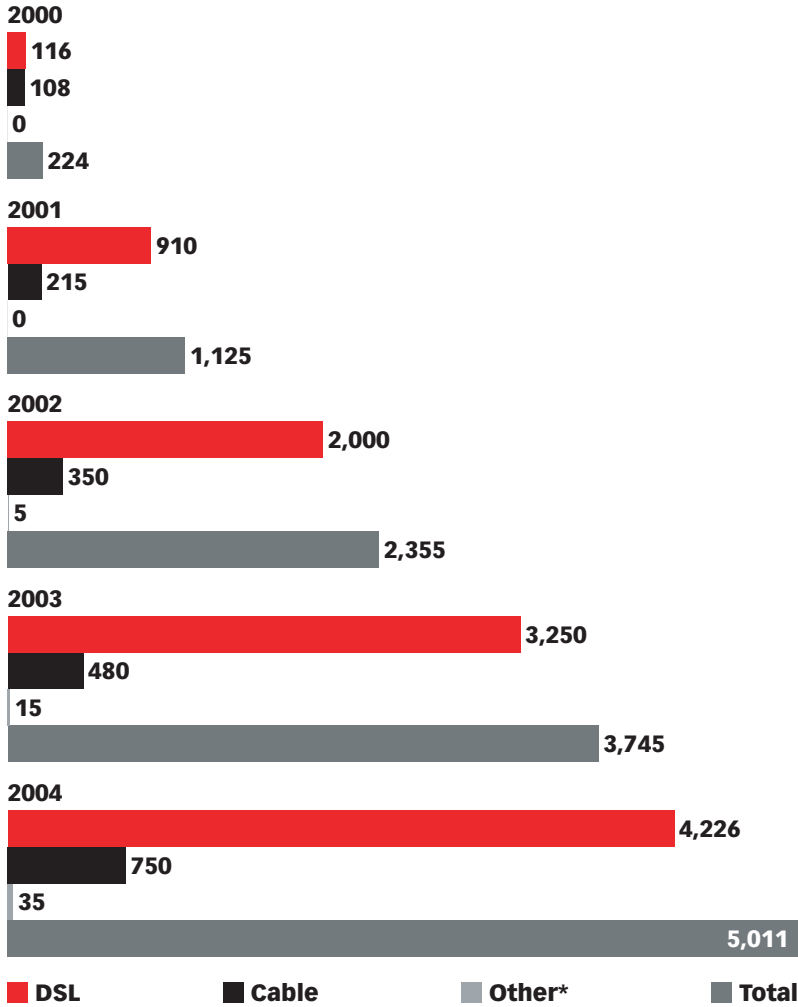
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eMarketer forecasts the number of broadband households in Taiwan to reach 5 million by 2004, with DSL connections making up the bulk of all broadband connections.

**Broadband Households in Taiwan, by Access Technology, 2000-2004 (in thousands)**



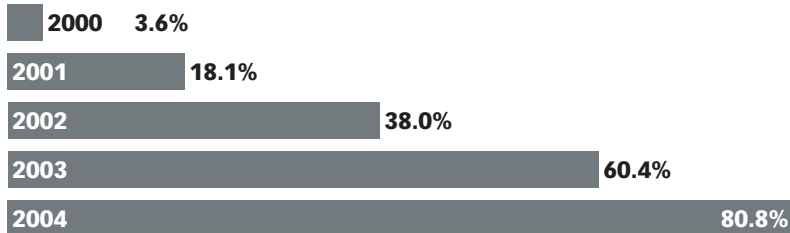
Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology

Source: eMarketer, June 2002

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Taiwan will rival South Korea in terms of broadband penetration in the coming years, as eMarketer forecasts that over 80% of households will have a broadband connection in 2004, from less than 20% at the end of 2001.

**Broadband Penetration in Taiwan, 2000-2004 (as a % of total households)**



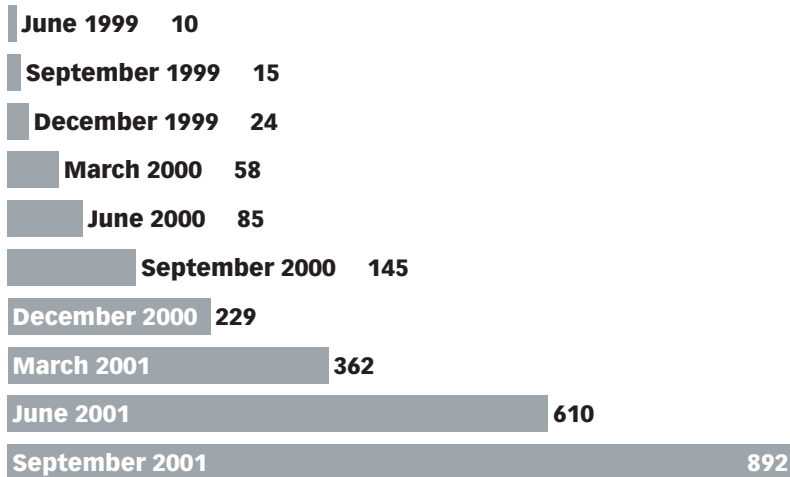
*Note: Based on 6.2 million households at the end of 2001  
Source: eMarketer, June 2002*

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One is able to see the recent growth in broadband subscriptions in the graph following. It shows that between March 2001 and September 2001, broadband subscriptions have almost trebled from 362,000 to 892,000.

**Broadband Subscribers in Taiwan, 1999-2001 (in thousands)**



*Source: Institute for Information Industry - Taiwan, December 2001*

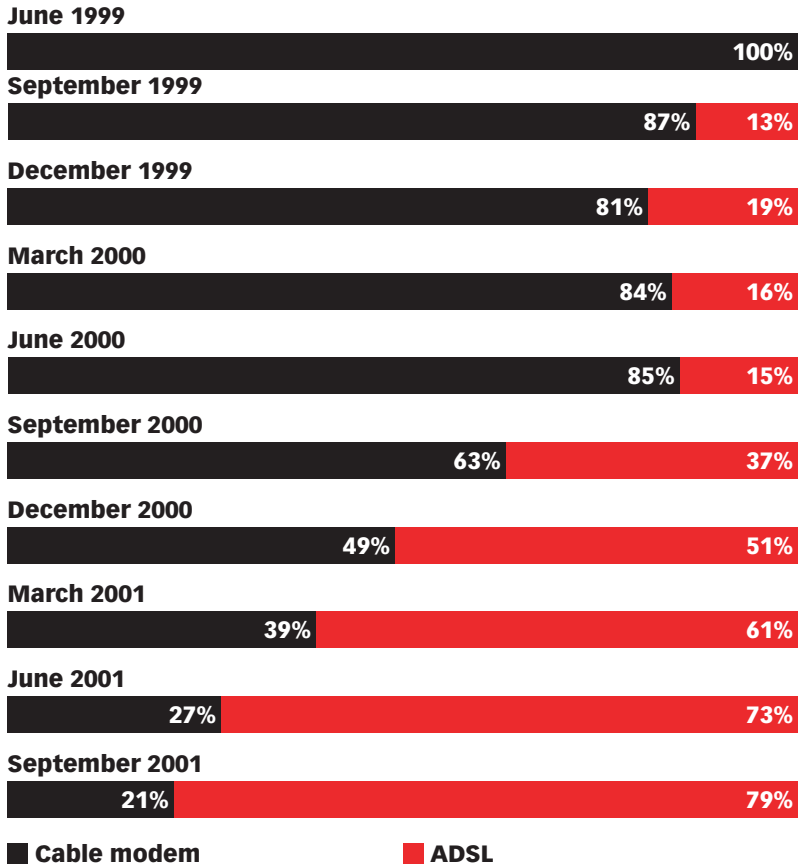
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While cable modems took an early lead in the broadband sector in 1999 and 2000, by September 2001, 80% of all broadband connections were DSL according to III.

**Distribution of Broadband Subscribers in Taiwan, 1999-2001**



Source: Institute for Information Industry - Taiwan, December 2001

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Recent reports from the Institute of Information Industry would suggest that Gartner's forecast of 476,000 broadband households in Taiwan in 2001 is a little low. It is likely that there will be 2 million broadband subscribers by the end of 2002, yet Gartner does not forecast 2 million broadband subscribers until past 2004.

**Comparative Estimates: Broadband Households in Taiwan, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Gartner Dataquest, 2001	164	476	994	1,484	1,906
Institute of Information Industry, January 2002	-	1,100	-	-	-
<b>eMarketer, June 2002</b>	<b>224</b>	<b>1,125</b>	<b>-</b>	<b>-</b>	<b>-</b>

Source: eMarketer, June 2002; various, as noted, 2001 & 2002

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**DSL**

DSL subscriptions have exploded over the last 12 months, from virtually nothing in 2000 to over 1 million subscribers in early 2002. HiNet will dominate the DSL market with the Institute for Information Industry forecasting that it will control 80% of the market. Major competitors to HiNet in the DSL market will be SeedNet, Infoserve Technology and AsiaPacific Online.

**Comparative Estimates: DSL Households in Taiwan, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Gartner Dataquest, 2001	92	340	780	1,180	1,496
Institute of Information Industry, January 2002	-	880	1,800	-	-
Point-Topic, April 2002	-	968	-	-	-
<b>eMarketer, June 2002</b>	<b>116</b>	<b>910</b>	<b>2,000</b>	<b>3,250</b>	<b>4,226</b>

Source: eMarketer, June 2002; various, as noted, 2001 & 2002

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Point-Topic reported 108,000 business DSL subscriptions in Taiwan at the end of 2001, in addition to the 968,000 residential subscriptions they estimated at that time.

**DSL Subscribers in Taiwan, Business and Residential, End of 2001 (in thousands)**



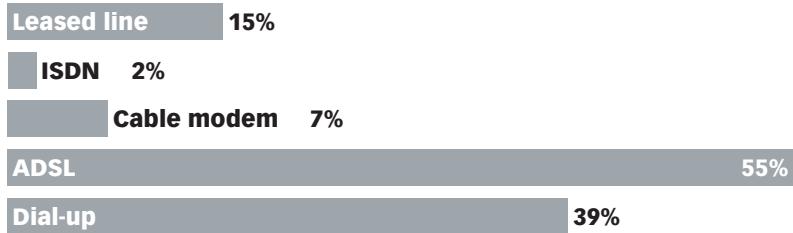
Source: Point-Topic, April 2002

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According to III, DSL is now the most popular internet access technology favored by businesses in Taiwan, surpassing dial-up and leased lines.

**Types of Internet Access Technologies Used by Online Businesses in Taiwan, 2001**



Note: multiple responses accepted

Source: Institute for Information Industry - Taiwan, December 2001

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## Cable

Taiwan has a competitive cable TV market. There are over 3.5 million cable TV subscribers, and the top two cable internet providers—GigaMedia and Eastern International Network Corp.—each have approximately 40,000 subscribers to their internet services. DSL is expected to be the broadband access technology of choice for the majority of broadband households but cable internet will provide some excellent competition. eMarketer forecasts there will be 750,000 cable internet households in Taiwan in 2004, from 215,000 in 2001. Gartner is less optimistic, forecasting 410,000 in 2004.

### Comparative Estimates: Cable Internet Households in Taiwan, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
Gartner Dataquest, 2001	72	136	214	304	410
Institute of Information Industry, January 2002	-	210	-	-	-
<b>eMarketer, June 2002</b>	<b>108</b>	<b>215</b>	<b>350</b>	<b>480</b>	<b>750</b>

Source: eMarketer, June 2002; various, as noted, 2001 & 2002

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## Alternative Broadband Technologies

It is likely that if Taiwan follows the lead of its Asian neighbors such as South Korea, Hong Kong or Japan, fiber optic, Ethernet, fixed-wireless and other alternative broadband technologies will become available in the next few years and will attract significant numbers of subscribers. To date, however, cable modems and DSL are the most widely available broadband options.

## Broadband Costs

At \$37 per month, Chunghwa's DSL offering is proving attractive to thousands of Taiwanese householders. This price is comparable to similar services offered in other regions of the world.

### Selected Broadband Access Plans in Taiwan, 2002

Company	Access technology	Speed downstream/upstream (Kbps)	Initial charge	Monthly charge	Mbytes included
Chunghwa Telecom (HiNet)	DSL	512/64	\$48.65	\$37.18	Unlimited

Source: Point-Topic, April 2002

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	<b>A. Argentina</b>	<b>300</b>
	<b>B. Brazil</b>	<b>308</b>
	<b>C. Mexico</b>	<b>315</b>
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It will be some time before the Latin American broadband sector reaches any sort of critical mass. According to analysis conducted by DSL Prime, the top three markets in Latin America – Argentina, Brazil and Mexico – represent approximately 80% of all telephone lines installed. It is therefore likely that these three countries will dominate the DSL landscape within the region in the years to come.

Argentina, with its high cable TV penetration, on paper, seems to have the greatest potential for broadband, but over the last 12 months very little has happened to suggest broadband is gaining any traction there. Mexico is encumbered by a lack of infrastructure and a monopoly telecom. Brazil, however, is showing signs of broadband growth.

Of the countries examined for this report, only China and India ranked below the Latin American countries in terms of broadband penetration of households.

**Latin America Broadband Snapshot, End of 2001 (in thousands and household penetration)**

	DSL	Cable	Other*	Total	Household penetration	Regional rank	Global rank**
Argentina	70	58	0	128	1.28%	1	23
Brazil	195	76	25	296	0.66%	2	24
Mexico	3	135	0	138	0.60%	3	25
<b>Total</b>	<b>268</b>	<b>269</b>	<b>25</b>	<b>562</b>			

Note: \*Other includes, fixed wireless, satellite, fiber, Ethernet and powerline technology; \*\*Global rank of 27 countries examined  
 Source: eMarketer, June 2002

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eMarketer forecasts that there will be 3.2 million broadband households in Latin America in 2004, up from 562,000 at the end of 2001. Brazil will make up nearly two thirds of all broadband households in Latin America in 2004.

**Broadband Households for Selected Countries in Latin America, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
Argentina	40	128	178	278	443
Brazil	87	296	684	1,211	2,010
Mexico	12	138	312	529	755
<b>Total</b>	<b>139</b>	<b>562</b>	<b>1,174</b>	<b>2,018</b>	<b>3,208</b>

Source: eMarketer, June 2002

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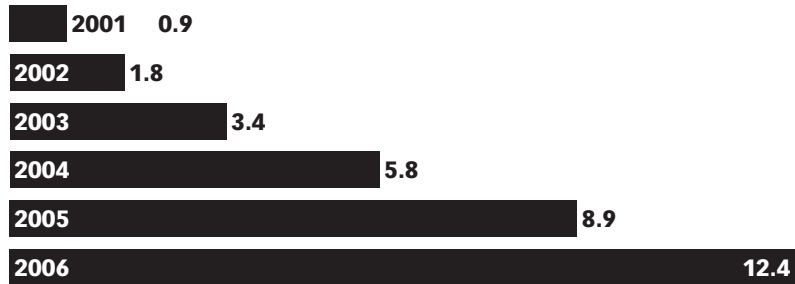
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Informa Media Group is more optimistic than eMarketer, forecasting 5.8 million broadband households in 2004.

### Broadband\* Households in Latin America, 2001-2006 (in millions)



*Note: \*broadband includes DSL, cable modem, FTTH, satellite and 3G*

*Source: Informa Media Group, March 2002*

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## A. Argentina

### Summary

Beset by the downturn in the telecom sector and its own economic difficulties, the broadband sector in Argentina has stalled. While Argentina has the highest cable TV penetration in Latin America and cable internet services have been available for some years, there has been little demand for the current broadband offerings.

### Argentina Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
70	58	0	128	1.28%	1	23

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 3 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

Argentina had 3 million internet users at the end of 2001, according to the International Telecommunication Union.

### Internet Users in Argentina, 1999-2001 (in millions)



Source: International Telecommunication Union (ITU), 2000-2002

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## Internet Households

There were 1.1 million households online at the end of 2001, according to eMarketer. Of these, eMarketer estimates 985,000 were dial-up households, 70,000 used DSL and 58,000 used cable modems.

### Internet Households in Argentina, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	985	9.9%
DSL	70	0.7%
Cable	58	0.6%
Other	0	0.0%
<b>Total broadband households</b>	<b>128</b>	<b>1.3%</b>
<b>Total online households</b>	<b>1,113</b>	<b>11.1%</b>

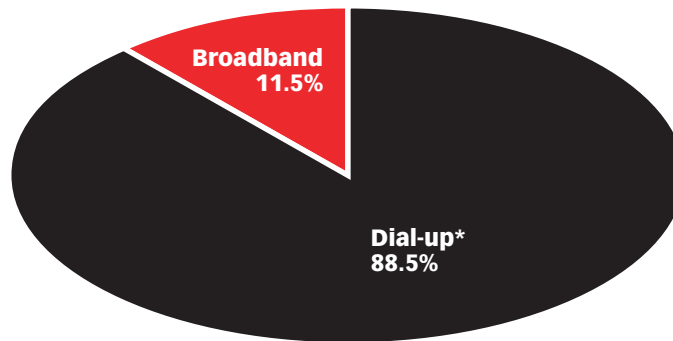
Note: \*based on 10 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

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eMarketer estimates nearly 12% of online households in Argentina are broadband. It is likely dial-up will continue to be the predominant home internet access technology for some time until broadband becomes more attractive and affordable.

### Percent of Argentinean Online Households, Dial-Up and Broadband, End of 2001



Note: \*includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

Dial-up internet in South America does not come cheap. Not only do most internet users have to pay their ISP a monthly fee (unless, of course, it is a free ISP), but they are also charged per minute by the telephone company. While the Argentinean government mandates that there be a 50% discount on phone calls dialed for online access, the rebate is not sufficient to foster growth in internet access. While one may assume that this fact would be a significant driver of broadband access where available, it still hasn't made broadband attractive to many.

## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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At the end of 2001, the two leading telcom operators in Argentina – Telefonica and Argentina Telecom had reported approximately 50,000 DSL subscribers between them. Cable operator, FiberTel reported 55,000 cable internet subscribers at the end of 2001.

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### **Leading Broadband Access Providers in Argentina, End of 2001 (in thousands of subscribers)**

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	<b>Technology</b>	<b>Subscribers</b>
Telefonica	ADSL	25
Argentina Telecom	ADSL	35
FiberTel	Cable	55

*Source: company data, May 2002*

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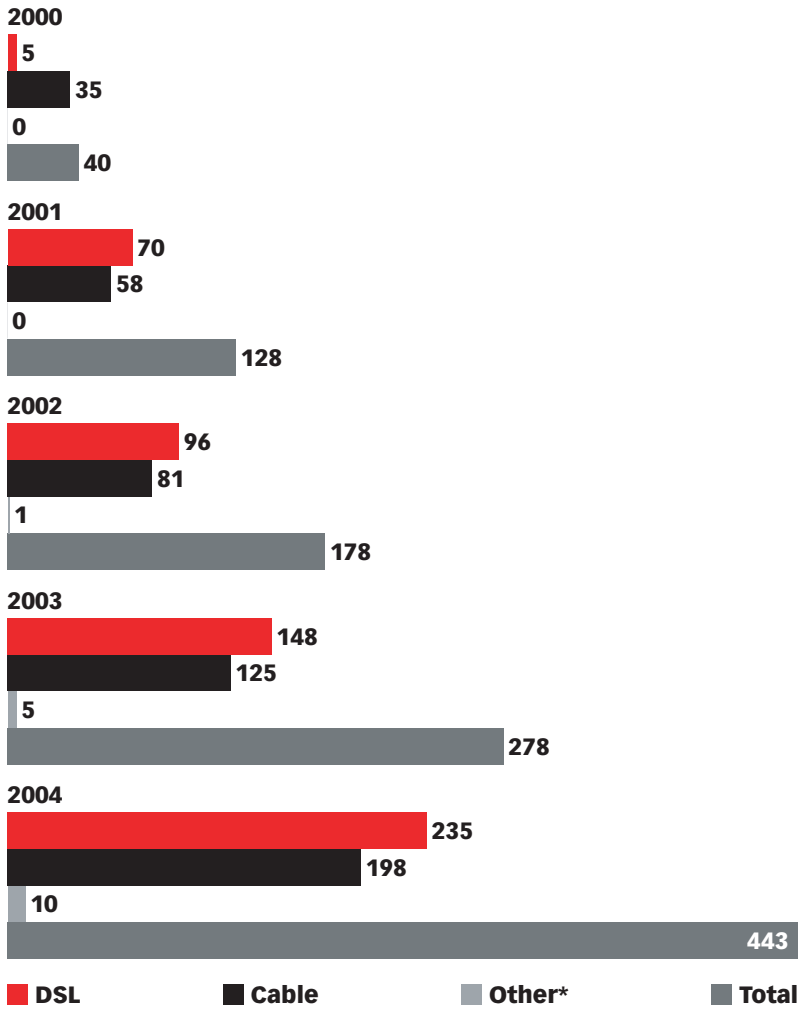
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eMarketer estimates only 440,000 broadband households in Argentina by 2004, from 128,000 at the end of 2001. DSL and cable internet households will each number approximately 200,000 by 2004.

**Broadband Households in Argentina, by Access Technology, 2000-2004 (in thousands)**



Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology

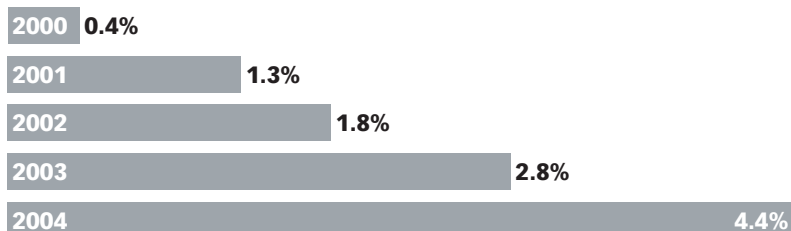
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There was some optimism 12 months ago that Argentina had some of the right ingredients that would kick-start the broadband sector. Unfortunately, this has not been the case to date, and it is likely that less than 5% of households will have broadband by 2004 if current growth rates continue.

**Broadband Penetration in Argentina, 2000-2004 (as a % of total households)**



Note: Based on 10 million households at the end of 2001  
 Source: eMarketer, June 2002

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**DSL**

Until infrastructure investments can catch up with pent-up demand for fixed-line telephones, teledensity rates will remain low. Increasing teledensity and lower monthly telephone charges are the keys to growth in Latin America’s internet market. Gross penetration rates, however, may be misleading. First of all, they mask urban-rural disparities. Second, newly installed lines in homes that already have telephones may not indicate more people having access to the internet. Those Argentinians living in the right areas are able to receive DSL from the country’s two major national telecom providers Telecom Argentina and Telefónica Argentina, but availability is limited.

Telefónica Argentina and Telecom Argentina both launched DSL service in late 2000. The comparative estimates from a number of research firms show a level of uniformity for DSL in 2001. All recent estimates hover around 60,000-70,000 subscribers.

**Comparative Estimates: DSL Households in Argentina, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
InfoAmericas, October 2000	20	40	90	203	304
Yankee Group, February 2002	8	70	–	–	–
Point-Topic, April 2002	–	74	–	–	–
DSL Prime, April 2002	–	60	85	–	–
<b>eMarketer, June 2002</b>	<b>5</b>	<b>70</b>	<b>96</b>	<b>148</b>	<b>235</b>

Source: eMarketer, June 2002; various, as noted, 2000 & 2002

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Point-Topic reported that Argentina had 74,000 residential subscribers at the end of 2001 in addition to 49,000 business DSL subscriptions.

**DSL Subscribers in Argentina, Business and Residential, End of 2001 (in thousands)**

<b>Business</b>	<b>49.0</b>
<b>Residential</b>	<b>73.5</b>
<b>Total</b>	<b>122.6</b>

Source: Point-Topic, April 2002

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**Cable**

Unlike other South American countries, Argentina has a well-developed cable network infrastructure and has the highest rate of cable TV subscriptions in Latin America. According to Morgan Stanley Dean Witter, approximately 48% of Argentinean households have cable subscriptions, and Argentina's 5.16 million cable TV subscribers represent nearly 38% of all cable subscribers in Latin America. With this level of penetration, which rivals that of the US, Argentina is the only country in Latin America truly poised to offer broadband internet access over cable lines.

**Number of Cable TV Subscribers in Selected Latin American Countries, 2001-2005 (in millions)**

<b>Country</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
Argentina	6.3	6.6	6.9	7.2	7.5
Brazil	4.2	5.4	6.7	7.7	8.0
Chile	1.0	1.1	1.2	1.3	1.4
Colombia	2.0	2.5	2.6	2.7	2.9
Mexico	2.6	2.9	3.2	3.5	3.9
Venezuela	1.2	1.4	1.6	1.7	1.8
Rest of region	1.0	1.3	2.0	2.6	2.7
<b>Total Latin America</b>	<b>18.3</b>	<b>21.2</b>	<b>24.2</b>	<b>26.7</b>	<b>28.2</b>

Source: World Bank, 1999

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Leading Argentinean cable companies CableVision and MultiCanal, which have cable networks in greater Buenos Aires, have found it difficult to attract people to their cable internet offerings. While the price for access has fallen over the last 12 from approximately \$80 per month to closer to \$40 per month, according to DSL Prime, growth has not significantly picked up.

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There is a reasonable amount of consensus among the variety of comparative estimates for cable internet access in Argentina. The consensus opinion is that there is was approximately 60,000 – 70,000 subscribers in 2001 and this will grow to approximately 200,000 in 2004.

**Comparative Estimates: Cable Internet Households in Argentina, 2000-2004 (in thousands)**

	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
InfoAmericas, October 2000	21	37	74	110	165
Strategis Group, March 2001	37	71	119	185	273
Yankee Group, 2002	30	57	75	143	–
<b>eMarketer, June 2002</b>	<b>35</b>	<b>58</b>	<b>81</b>	<b>125</b>	<b>198</b>

*Source: eMarketer, June 2002; various, as noted, 2000-2002*

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**Alternative Broadband Technologies**

Fixed-wireless access may offer a viable broadband alternative where there is no existing cable or fixed-line infrastructure. In 1999 the Argentinean government allocated fixed-wireless spectrums in a number of frequencies to both local and international operators. Diginet Americas led the process by formally launching a fixed-wireless telephony and data service in Buenos Aires. Its plan is to provide alternative service in all of South America’s major urban centers matching or exceeding the quality of the incumbent carriers. Fixed wireless is currently being used by a number of cyber cafes in the country.

New two-way satellite internet systems, such as the service offered by DirecPC in the US, may be offered in a few years. As the satellites operate over the equator, they provide a footprint that covers most of the Americas. A number of companies have announced their intentions of offering such a service in South America.

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## Broadband Costs

The immediate characteristic of some of the broadband plans on offer in Argentina is that subscribers pay as much as US subscribers for broadband, yet they are provided with a service at only half the speed – typically 256kbps downstream. This only just scrapes into the definition of being ‘broadband’. Cost and value for money continue to be significant barriers for broadband growth in Argentina.

### **Selected Broadband Access Plans in Argentina, 2002**

<b>Company</b>	<b>Access technology</b>	<b>Speed downstream (Kbps)</b>	<b>Initial charge</b>	<b>Monthly charge</b>
Telefonica	DSL	256	-	\$50 + ISP charges
Argentina Telcom	DSL	256	-	\$50 + ISP charges
FiberTel	Cable	256	\$40	\$30

*Source: company reports, 2002*

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High Speed Internet is not compelling enough for most consumers. It is the services and applications offered on top of broadband which will inevitably drive demand. See eMarketer’s April 2002, Benefits of Broadband Report for this aspect of the industry.

[http://www.emarketer.com/products/report.php?broadband\\_ben](http://www.emarketer.com/products/report.php?broadband_ben)

**“We purchased your ‘Benefits of Broadband’ report and have enjoyed it a lot. Finally — a report which summarizes the analysts’ forecasts and focuses on the benefit side through the applications”**

*– Jon Bohmer, Chairman, Proto TV AS*

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## B. Brazil

### Summary

While Brazil is ranked 24th globally in terms of broadband penetration, there are signs that broadband is poised for rapid growth. Greater teledensity, DSL and cable network availability are beginning to meet an obvious demand in the country.

### Brazil Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
195	76	25	296	0.66%	2	24

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 3 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

With one-third of the region's population, Brazil is the single largest market for internet services and e-commerce in Latin America and the Caribbean. Brazil is highly urbanized, with 81% of its population living in cities, 10 of which have more than 1 million inhabitants. The two largest cities, São Paulo and Rio de Janeiro, have 17.7 million and 10.6 million residents, respectively. Because 49% of Brazilians are 24 and under, this "baby boom" will form a potentially lucrative internet market in the decade ahead.

The international Telecommunication Union reported Brazil had 8 million internet users in 2001, from only 3.5 million in 1999.

### Internet Users in Brazil, 1999-2001 (in millions)

1999	3.5
2000	5.0
2001	8.0

Source: International Telecommunication Union (ITU), 2000-2002

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## Internet Households

While household access to fixed-line telephony services remains low, eMarketer estimates there were 3.4 million online households in Brazil at the end of 2001. Most are using a dial-up connection but broadband access is growing rapidly.

### Internet Households in Brazil, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	3,100	6.9%
DSL	195	0.4%
Cable	76	0.2%
Other	25	0.05%
<b>Total broadband households</b>	<b>296</b>	<b>0.7%</b>
<b>Total online households</b>	<b>3,396</b>	<b>7.5%</b>

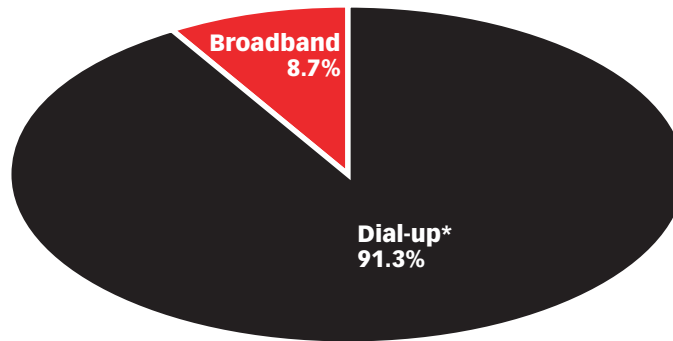
Note: \*based on 45 million households; \*\*includes ISDN  
Source: eMarketer, May 2002

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Nearly 9% of online households in Brazil at the end of 2001 were broadband households according to eMarketer.

### Percent of Brazilian Online Households, Dial-Up and Broadband, End of 2001



Note: \*Includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

With timed local telephone calls in Brazil, free ISPs like Banco Bradesco and Universo Online gained great popularity 18 months ago. Unable to share telecommunications charges with ISPs and relying only on ad revenue, many free ISPs went out of business. Nevertheless, the shrinking number of free ISPs will not have a substantial impact on the number of internet users in Brazil. First, remaining players in the free ISP marketplace will likely absorb the subscribers of the failed services. Second, for the middle- to upper-class people who make up the majority of Brazil's internet user population, ISP fees (which are close to monthly telephone fees) represent a minor additional burden. The additional cost may lead some users to ration their online time, but it is unlikely to deter overall internet usage.

## Broadband Access

**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

In 1998 the state owned incumbent Telebras was broken up and the broadband market is now organized regionally. According to a report by DSL Prime, Telefonica, Brazil Telecom and Telemar have all experienced significant growth in their DSL subscribers over the last 12 months. Telefonica leads the pack with 120,000 subscribers at the end of 2001, followed by Brazil Telecom at 50,000.

### **Leading Broadband Access Providers in Brazil, End of 2001 (in thousands of subscribers)**

	<b>Access technology</b>	<b>End of 2001</b>
Telemar	DSL	40
Telefonica	DSL	120
Brasil Telecom	DSL	50
CTBC	DSL	3

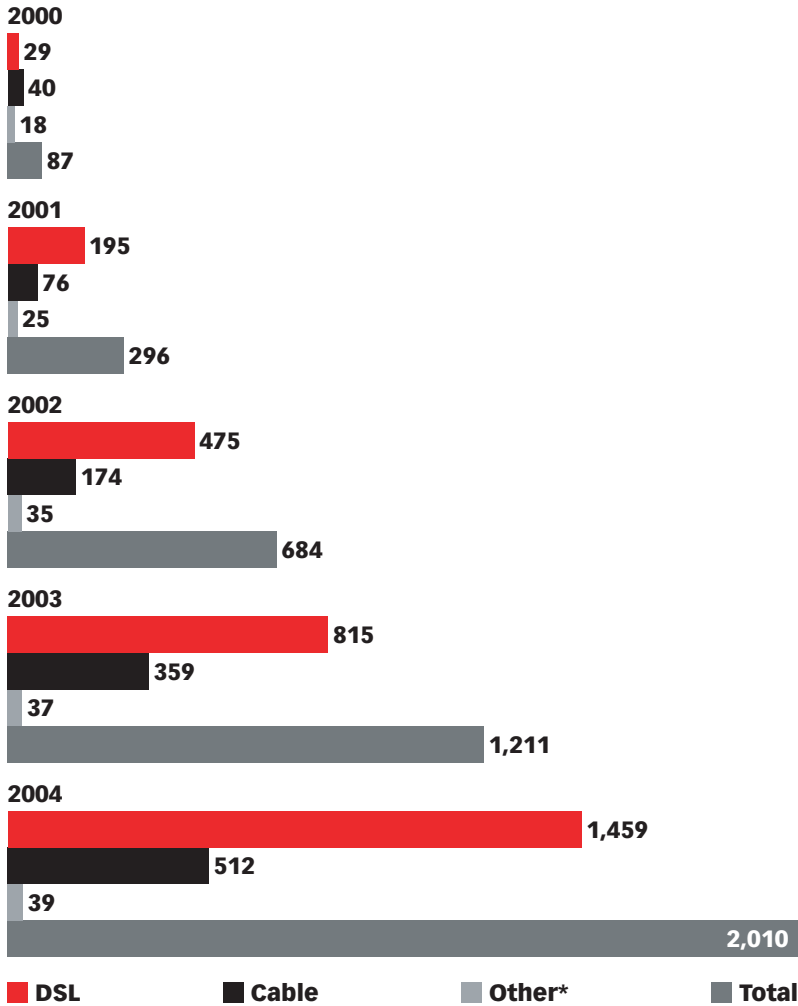
*Source: company data, May 2002*

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eMarketer predicts there will be over 2 million broadband households in Brazil in 2004, from approximately 300,000 at the end of 2001.

**Broadband Households in Brazil, by Access Technology, 2000-2004 (in thousands)**

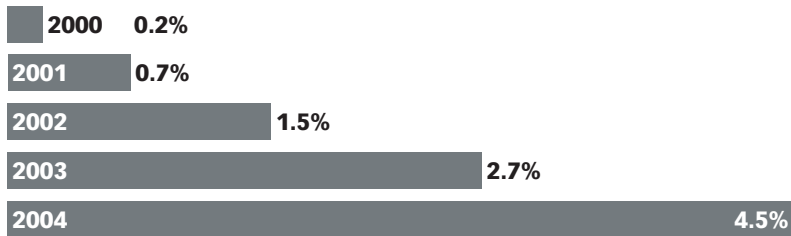


Note: \*Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology  
 Source: eMarketer, June 2002

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While Brazil boasts over four times as many households as Argentina, eMarketer predicts that Brazil will rival Argentina as the leading broadband country in Latin America by 2004. A more stable economy than Argentina over the last 12 months and a more liberalized telecommunications environment has created the right environment for broadband growth.

**Broadband Penetration in Brazil, 2000-2004 (as a % of total households)**



*Note: Based on 45 million households at the end of 2001  
Source: eMarketer, June 2002*

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**DSL**

Telebras, the state-owned telephone monopoly, was privatized in 1998. Competition is emerging in the local loop, and full market liberalization is scheduled to follow in 2002.

The variety of comparative estimates show a consensus opinion that there were approximately 200,000 DSL subscriptions in Brazil in 2001. In 2003, the Yankee Group predicts 1 million DSL subscribers and in 2005 IDC predicts 3.5 million DSL subscribers.

**Comparative Estimates: DSL Households in Brazil, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004	2005
InfoAmericas, October 2000	85	213	425	744	1,116	-
International Data Corporation (IDC), 2001	-	-	-	-	-	3,500
Pyramid Research, July 2001	-	110	257	474	-	-
Yankee Group, 2002	78	260	540	1,000	-	-
DSL Prime, April 2002	-	213	501	-	-	-
Point-Topic, April 2002	-	186	-	-	-	-
<b>eMarketer, June 2002</b>	<b>65</b>	<b>195</b>	<b>475</b>	<b>945</b>	<b>1,896</b>	<b>-</b>

*Source: eMarketer, June 2002; various, as noted, 2000-2002*

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Point-Topic reported there were 47,000 business DSL subscriptions in the Brazil, at the end of 2001.

### DSL Subscribers in Brazil, Business and Residential, End of 2001 (in thousands)

<b>Business</b>	<b>46.5</b>
<b>Residential</b>	<b>186.2</b>
<b>Total</b>	<b>232.7</b>

Source: Point-Topic, April 2002

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### Cable

Cable is forecast to reach only 13% of homes in 2004 from a current figure of 8%. The poor quality of the telecommunications system should encourage the development of cable internet, which could provide telephony as well as internet and TV services. Brazil currently has some of the region's highest metered local phone charges, averaging \$0.028 per minute, according to ebusinessforum.com. Taxes on local calls are also high, typically around 40%. This cost for dial-up internet makes cable internet even more appealing.

### Number of Cable TV Subscribers in Selected Latin American Countries, 2001-2005 (in millions)

Country	2001	2002	2003	2004	2005
Argentina	6.3	6.6	6.9	7.2	7.5
Brazil	4.2	5.4	6.7	7.7	8.0
Chile	1.0	1.1	1.2	1.3	1.4
Colombia	2.0	2.5	2.6	2.7	2.9
Mexico	2.6	2.9	3.2	3.5	3.9
Venezuela	1.2	1.4	1.6	1.7	1.8
Rest of region	1.0	1.3	2.0	2.6	2.7
<b>Total Latin America</b>	<b>18.3</b>	<b>21.2</b>	<b>24.2</b>	<b>26.7</b>	<b>28.2</b>

Source: World Bank, 1999

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eMarketer forecasts 500,000 cable internet households in Brazil in 2004. This estimate coincides with estimates from InfoAmericas and Pyramid Research.

**Comparative Estimates: Cable Internet Households in Brazil, 2000-2004 (in thousands)**

	2000	2001	2002	2003	2004
InforAmericas, October 2000	60	90	180	315	473
Yankee Group, June 2001	41	–	–	–	–
Pyramid Research, July 2001	–	73	205	410	–
<b>eMarketer, June 2002</b>	<b>40</b>	<b>76</b>	<b>174</b>	<b>359</b>	<b>512</b>

Source: eMarketer, June 2002; various, as noted, 2000 & 2001

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**Alternative Broadband Technologies**

Fixed-wireless services are available in selected areas in Brazil, targeting high-end business customers.

Two-way satellite internet systems such as the service being offered by DirecPC in the US may become available in South America in a few years. iSky has pledged to launch its service this year.

**Broadband Costs**

Characteristic of many of the broadband plans on offer in Latin America is that subscribers pay as much as US subscribers for broadband, yet they are provided with a service at only half the speed – typically 256kbps downstream. This only just scrapes into the definition of being ‘broadband’. Cost and value for money continue to be significant barriers for broadband growth in Brazil.

**Selected Broadband Access Plans in Brazil, 2002**

Company	Access technology	Speed downstream (Kbps)	Monthly charge
Telemar	ADSL	256	\$49
Telefonica	ADSL	256	\$49
Brasil Telecom	ADSL	256	\$49
CTBC	ADSL	256	\$49

Source: DSL Prime, April 2002

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## C. Mexico

### Summary

At the end of 2001 Mexico was ranked 3rd within Latin America and 25th globally in terms of broadband penetration of households. Low cable penetration and a poor telecommunications infrastructure will prevent Mexico from building a sizeable broadband user base for three to five years.

### Mexico Broadband Snapshot, End of 2001 (in thousands and household penetration)

DSL	Cable	Other (1)	Total	Household penetration	Regional rank (2)	Global rank (3)
3	135	0	138	0.60%	3	25

*Note: (1) Other includes: fixed wireless, satellite, fiber, Ethernet and powerline technology; (2) Regional rank of 3 countries examined; (3) Global rank of 27 countries examined*  
 Source: eMarketer, June 2002

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### Internet Users

The International Telecommunication Union reported that Mexico had 3.6 million internet users at the end of 2001 from only 1.8 million in 1999.

### Internet Users in Mexico, 1999-2001 (in millions)



Source: International Telecommunication Union (ITU), 2000-2002

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## Internet Households

eMarketer estimates that only 8.4% of Mexican households were online at the end of 2001. Of these online households, 1.7 million had a dial-up connection and approximately 138,000 had broadband.

### Internet Households in Mexico, by Access Technology, End of 2001 (in thousands and as a % of total households\*)

	Internet households	% of total households
Dial-up**	1,786	7.8%
DSL	3	0.01%
Cable	135	0.6%
Other	0	0.0%
<b>Total broadband households</b>	<b>138</b>	<b>0.6%</b>
<b>Total online households</b>	<b>1,924</b>	<b>8.4%</b>

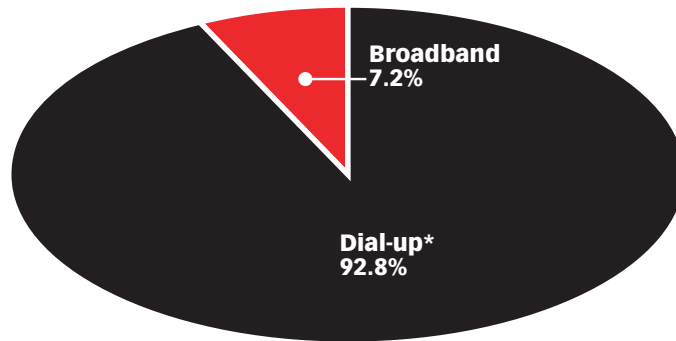
Note: \*based on 23 million households; \*\*includes ISDN  
Source: eMarketer, June 2002

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Only 7.2% of online households had broadband at the end of 2001, according to eMarketer.

### Percent of Mexican Online Households, Dial-Up and Broadband, End of 2001



Note: \*Includes ISDN  
Source: eMarketer, June 2002

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## Dial-Up

Telemex, with a near monopoly in the telecommunications market, is the major provider of dial-up internet access services in Mexico.

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## Broadband Access

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**eMarketer defines a broadband household as one with an internet connection with a speed of greater than 200 kilobits per second downstream.**

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Mexico has its own “Broadband Mexico” project to advance the country’s entry into the information society, but actual rollout of broadband to date has been limited, according to Point-Topic. Telemex, the incumbent, faces little broadband competition and has a stake in both the local loop as well as one of the leading cable networks, Cablevision. Some cable networks have cable modem offerings including Cablevision in Mexico City, Intercable in Monterrey and Megacable in Guadalajara, but their coverage is limited.

Cable internet has been the platform where the majority of broadband subscribers have come from. Megacable reported having 73,000 cable internet subscribers at the end of 2001 and Cablevision has upwards of 61,000 subscribers.

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### **Leading Broadband Access Providers in Mexico, 2001 (in thousands of subscribers)**

---

	<b>Technology</b>	<b>30 June 2001</b>	<b>End of 2001</b>
Megacable	Cable	46	73
Cablevision	Cable	61	–

*Source: Multichannel News International, 2002; company reports, 2002*

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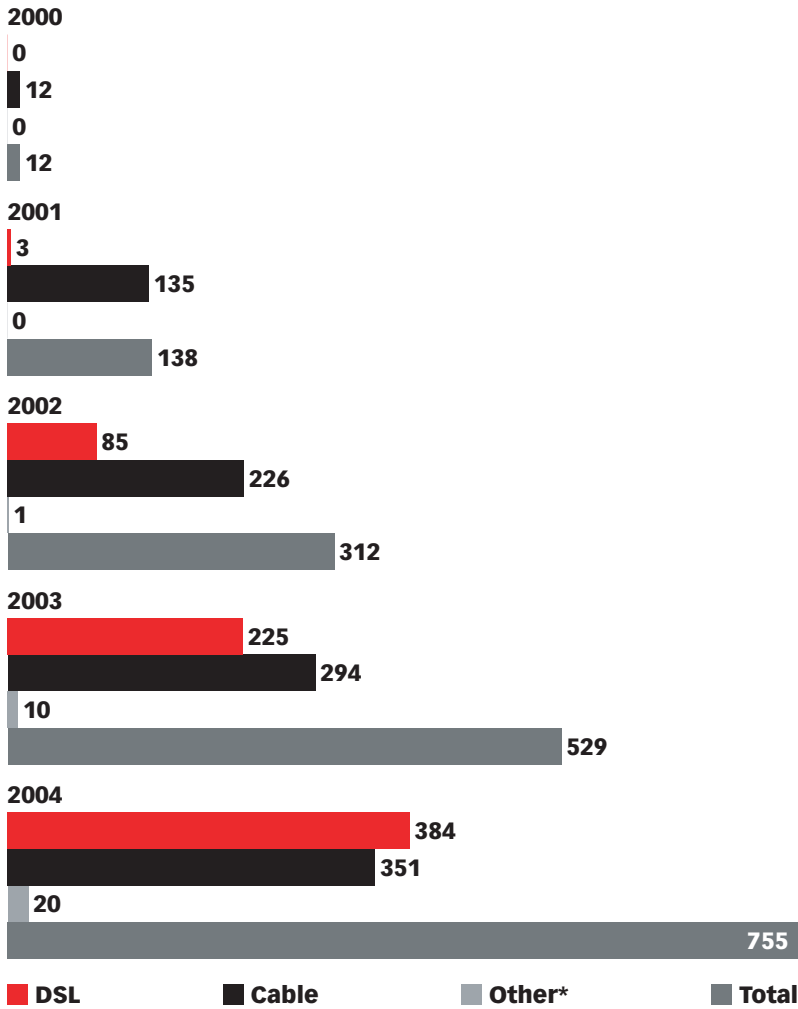
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eMarketer forecasts 755,000 broadband households in Mexico in 2004, from about 138,000 in 2001. DSL and Cable will garner about an equal share of subscribers, despite cable internet's early lead.

**Broadband Households in Mexico, by Access Technology, 2000-2004 (in thousands)**



Note: \*Other includes, fixed wireless, satellite, fiber, Ethernet and powerline technology

Source: eMarketer, June 2002

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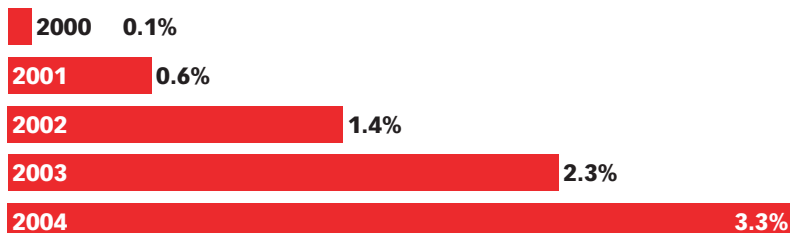
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Household penetration of broadband will only rise to 3.3% by 2004, from less than 1% in 2001.

### Broadband Penetration in Mexico, 2000-2004 (as a % of total households)



*Note: Based on 23 million households at the end of 2001*

*Source: eMarketer, June 2002*

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As in Brazil and other countries in Latin America, an underdeveloped cable and fixed-line infrastructure will prevent many Mexicans from acquiring a broadband internet connection.

### DSL

Without telephone lines in the ground you simply cannot get DSL.

With only 15.7 telephone lines per 100 people forecast for 2004, the poor telecommunications infrastructure severely limits the potential for DSL in Mexico.

DSL services were launched by the incumbent Telemex in August of 2001, according to the OECD. Services are available in the major metropolitan areas. As in Brazil, Mexico's DSL services are the low-speed version of the technology at only 256 Kbps downstream. One of the things holding Telemex back from investing too much money on DSL is that it has already invested in ISDN technology which is quite a popular internet access technology in Mexico.

eMarketer does not foresee DSL getting off the ground for at least 12 months but forecasts 384,000 DSL subscribers by 2004. InfoAmericas is more optimistic, forecasting 851,000 DSL subscribers at that date.

### Comparative Estimates: DSL Households in Mexico, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
InfoAmericas, October 2000	42	84	252	567	851
Point-Topic, April 2002	-	2	-	-	-
DSL Prime, April 2002	-	-	100	-	-
<b>eMarketer, June 2002</b>	<b>0</b>	<b>3</b>	<b>85</b>	<b>225</b>	<b>384</b>

*Source: eMarketer, June 2002; various, as noted, 2000 & 2002*

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Point-Topic suggests there were less than 2,000 business DSL lines in Mexico in 2001 out of a total of 4,000 nationally.

**DSL Subscribers in Mexico, Business and Residential, End of 2001 (in thousands)**



Source: Point-Topic, April 2002

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**Cable**

While the cable TV network is limited in Mexico, this is where the majority of broadband subscribers have come from. The leading cable provider in the country is Cablevision with 18% market share, followed closely by Megacable with 14% and Cablemas with 13%. In its prospectus, Cablevision said it would focus on acquiring cable operations in “urban centers with attractive demographics throughout the country as well as smaller cable operators adjacent to its existing network.”

**Number of Cable TV Subscribers in Selected Latin American Countries, 2001-2005 (in millions)**

Country	2001	2002	2003	2004	2005
Argentina	6.3	6.6	6.9	7.2	7.5
Brazil	4.2	5.4	6.7	7.7	8.0
Chile	1.0	1.1	1.2	1.3	1.4
Colombia	2.0	2.5	2.6	2.7	2.9
Mexico	2.6	2.9	3.2	3.5	3.9
Venezuela	1.2	1.4	1.6	1.7	1.8
Rest of region	1.0	1.3	2.0	2.6	2.7
<b>Total Latin America</b>	<b>18.3</b>	<b>21.2</b>	<b>24.2</b>	<b>26.7</b>	<b>28.2</b>

Source: World Bank, 1999

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eMarketer forecasts 351,000 cable internet households in Mexico in 2004 from 135,000 in 2001. InfoAmericas forecasts similar numbers in 2004 at 404,000.

### Comparative Estimates: Cable Internet Households in Mexico, 2000-2004 (in thousands)

	2000	2001	2002	2003	2004
InforAmericas, October 2000	44	88	154	270	404
Yankee Group, 2000	15	–	–	177	–
<b>eMarketer, June 2002</b>	<b>12</b>	<b>135</b>	<b>226</b>	<b>294</b>	<b>351</b>

Source: eMarketer, June 2002; various, as noted, 2000

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### Alternative Broadband Technologies

Fixed-wireless services are available in selected areas in Mexico but they are targeted at high-end business customers.

### Broadband Costs

Characteristic of some of the broadband plans on throughout Latin America is that subscribers pay as much or more as US subscribers for broadband, yet they are provided with a service at only half the speed – typically 256kbps downstream. This only just scrapes into the definition of being ‘broadband’. Telemex’s DSL offering is expensive at \$55 per month plus modem rental.

### Selected Broadband Access Plans in Mexico, 2002

Company	Access technology	Speed downstream	Monthly charge
TeleMex	ADSL	256kbps downstream	\$55 + modem rental

Source: company reports, 2002

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