Oftel

Office of Telecommunications

International benchmarking of DSL and cable modem services

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Contents

Executive summary

Scope

S.1 This International Benchmarking report covers Digital Subscriber Line (DSL) services, providing high speed telecoms connections to consumers in the UK, France, Germany and the USA over the local copper loop. These services are relatively new (particularly in Europe) but are expected to become increasingly important in giving consumers access to a range of services such as fast Internet access and video on demand.

S.2 The analysis and drafting of this report have been carried out by Oftel. The models developed by Oftel used to generate the results contained in the report have been audited by an independent consultant, Analysys Ltd, who confirm the following:

- The models are logically sound (ie they correctly implement the methodology described in this report); and
- The tariff data has been checked and has been correctly entered and interpreted.

S.3 This study is a follow up to the study for DSL services carried out by Analysys Ltd for Oftel, published in April 2000 (the 'April 2000 study').

S.4 Data has been collected for a range of tariff packages available to residential and small/medium sized businesses for major operators and service providers in each country as at October 2000. Data collection has been carried out for Oftel by consultants Tarifica Ltd, with some additional data provided by Analysys Ltd (from their DSL pricing service, www.dslpricing.analysys.com).

S.5 Services on offer in different countries have been compared on the basis of price and bandwidth (ie speed of connection) both downstream to the consumer and upstream from the consumer. This study only considers DSL services providing Internet access which is the main application for DSL at the current time. Other applications, such as video on demand', have not been considered.

S.6 In order to compare prices across countries, a price index has been constructed based on the average of the lowest priced packages offered by two different operators/service providers in each country. This forms the basis for drawing conclusions regarding price levels.

S.7 The bandwidth provided with a particular service is a key feature of the service 'quality', and all price comparisons are presented in the context of some measure of bandwidth. However, bandwidth is not the only indicator of 'quality' and care needs to be taken in interpreting the results.

S.8 Other key aspects which have been considered are:

- A comparison of the spread of prices available (a wide spread may imply that consumers need to be careful in their choice of operator, or that there are important non-price factors which are not picked up in the analysis); and
- A comparison of the range of services (in terms of the bandwidth offered) which are available.

Points to bear in mind

S.9 There are a large range of operators and service providers offering services to consumers (particularly in the US). It is not possible to cover, in this study, all packages on offer. While it is believed that the sample chosen is fully representative and covers the range of offers available by country, the possibility that consumers have access to additional offers outside the range calculated for the sample used in this report cannot be excluded.

S.10 The objective of this report is to provide a comparison between countries for a range of consumer types. **Prices are based on a snapshot as at 12 October 2000**. Although providing a sound overall picture, the comparison of companies *within* a country should not be taken as representative for an individual consumer. It is particularly difficult to establish value for money when services differ in important respects such as bandwidth, and details of the service bundle.

S.11 The extent of service availability is also relevant in considering the cross-country comparisons: some services are only available currently in certain geographic areas. Within those areas, customers with very long lines may not be able to receive the service.

S.12 There are separate industry funded initiatives and reports which seek to help UK consumers be better informed purchasers of telecommunications services (such as individual enquiry based price comparisons – www.phonebills.org.uk; fixed and mobile quality of service indicators – www.cpi.org.uk for fixed and www.oftel.gov.uk for mobile figures; and information for small businesses about using telecoms and the Internet – www.telecomsadvice.org.uk).

S.13 This report is **not** part of that body of work as it seeks to compare position between, not within, countries and it is not, therefore, intended in any way to be a buyer's guide.

Results for retail residential DSL and cable modem services

S.14 Table 1 shows the results for the price level, price index (relative to the UK) and (downstream) bandwidth provided for residential services. All these measures are constructed using the average of the two lowest priced residential offers (from different operators/service providers) in each country. Results are presented both with, and without, cable modem offers included.

Table 1: Results for price level, price index and (downstream) bandwidth for residential broadband services

	Include cable modems			Exclude cable modems		
	Price level £ per month	Price index	Bandwidth kbit/s	Price level £ per month	Price index	Bandwidth kbit/s
France	37	92	512	48	109	512
Germany	31	78	576	32	72	448
UK	40	100	506	44	100	500
US	32	79	2,000	36	80	695

S.15 From Table 1 it is seen that:

- If cable modem services are *excluded*, then prices in Germany and the US are around 28% and 20% cheaper respectively than in the UK, while prices in France are around 9% more expensive;
- If cable modem services are *included*, then prices in France are around 8% cheaper than in the UK, while prices in Germany and the US are over 20% cheaper;
- Excluding cable modem offers increases the costs in all countries, ie generally one or both of the two lowest priced services are cable modem rather than DSL services. In the UK, cable modem and DSL prices are closer than in some other countries. Accordingly, the exclusion of cable modem services improves the relative UK position;
- The bandwidth provided in the US is much higher than in Europe.

Results for retail business DSL and cable modem services

S.16 Table 2 below shows the results for the price level, price index and bandwidth provided for business services. Note all these measures are constructed using the average of the two lowest priced business offers (from different operators/service providers) in each country. Results are presented with cable modem offers included.

Table 2: Results for price level, price index and bandwidth for business broadband services (cable modem services included)

	No minimum bandwidth			Minimum GM bandwidth of 500 kbit/s			Minimum GM bandwidth of 1000 kbit/s		
	Price level £/month	Price index	Bandwidth – DS kbit/s	Price level £/month	Price index	Bandwidth – GM kbit/s	Price level £/month	Price index	Bandwidth – GM kbit/s
France	126	302	1,000	126	103	506			
Germany	28	66	448	264	217	615	533		1,262
UK	42	100	506	122	100	500			
US	33	80	608	60	49	857	71		1,127

Note: DS = downstream, GM = geometric mean, ie squareroot(downstream bandwidth x upstream bandwidth)

S.17 From Table 2 it is seen that:

- For the most basic services available to business (ie where the business has no minimum bandwidth requirement):
  - prices in Germany and the US are around 34% and 20% cheaper respectively than in the UK; and
  - prices in France are considerably more expensive than in the other countries – but provide significantly higher bandwidth.
- For business services where a minimum *geometric mean* bandwidth of 500kbit/s is required:
  - Prices are widely spread between countries;
  - UK prices are close to prices in France, are about twice as much as those in the US, but less than half of those in Germany; and

  - The bandwidth in the UK is about the same as in France, but less than in Germany and the US.
- For business services where a minimum *geometric mean* bandwidth of 1000kbit/s is required:
  - Services are only available in Germany and the US;[1] and
  - Prices in these two countries are very different, with Germany much more expensive than the US.

Results for wholesale DSL services

S.18 Comparisons of wholesale prices can only be made on a limited set of data. Based on the information available for one company from three countries (BT, QSC and Covad), UK wholesale prices are similar to those elsewhere for services with similar bandwidth, though the range of bandwidths offered is wider in Germany and the US.[2]

Rollout

S.19 Collecting detailed information on current and future availability of services is difficult. The data that has been collected suggests that, for DSL services:

- by the end of 2000, the availability of DSL services in the UK will be behind that in Germany, but ahead of that in France;
- availability and takeup in the US is greater than in the European countries covered in this study; and
- information regarding future rollout plans is too uncertain to enable conclusions to be drawn.

[1] While both France and the UK offer services with a *downstream* bandwidth of at least 1000kbit/s, these services are asymmetric and the geometric mean bandwidth is less than 1000kbit/s.

[2] Comparisons are based on BT's IPStream products as these appear to be the most closely comparable to the Covad (USA) and QSC (Germany) services.

Chapter 1

Introduction

1.1 Oftel's aim is to provide the best possible deal for telecommunications customers in terms of quality, choice and value for money through effective competition. International comparisons of telecoms services are one way of assessing the achievement of this aim.

1.2 This International Benchmarking report covers Digital Subscriber Line (DSL) services, providing high speed telecoms connections to consumers in the UK, France, Germany and the USA over the local loop. These services are relatively new (particularly in Europe) but are expected to become increasingly important in providing consumers with access to a range of services, such as fast Internet access and video on demand.

1.3 Oftel intends to carry out a market review for access to broadband services (and hence the DSL market) in 2005. It is, therefore, appropriate to establish a basis for assessment well in advance of that date.

1.4 This study focuses on comparing the cost for different types of users of DSL services providing Internet access. Cable modems represent an alternative broadband service to DSL. Cable modems provide the user with similar functionality to DSL and, hence, cable modem service prices are also included in the analysis.

1.5 Services differ in the amount of bandwidth (both downstream to the consumer and upstream from the consumer) that is available. The price comparisons presented are, therefore, viewed in the context of the bandwidth provided.

1.6 Results are presented for three market segments: residential, business and wholesale. For business and wholesale markets, results are further split into low, medium and high bandwidth services. However, it is noted that there is not necessarily a clear dividing line between residential and business services. A significant number of home workers and small businesses may well find an entry level service, aimed primarily at residential consumers, is adequate for their needs.

1.7 As well as cost, it is also important to consider issues such as current availability, takeup and future rollout plans. Detailed information for these areas is, however, difficult to obtain.

1.8 There are three subsequent chapters:

- Comparison of price (Chapter 2);
- Availability/rollout (Chapter 3); and
- Conclusions (Chapter 4).

1.9 A detailed list of all packages considered are set out in Annex B to this report.

1.10 The following countries, and number of service providers/operators, are included in the analysis:

- France (four DSL and three cable modem operators/service providers);
- Germany (six DSL and one cable modem operators/service providers);
- UK (seven DSL and two cable modem operators/service providers); and
- US (nine DSL, of which three are incumbent local operators, and three cable modem operators/service providers).

1.11 The study covers the services offered by a range of different operators and service providers in each country. For each operator/service provider, the range of packages on offer (including residential, business and wholesale products) have been identified, and data on pricing and service details has been collected.

1.12 The objective of this study is to provide a cross country comparison, rather than to compare individual telecommunications providers. However, in order to compare prices between countries, it is necessary to analyse the prices of individual services from a range of providers within each country. While the results may relate to specific services or providers, these should be seen as representative of the country, rather than being viewed as a consumers' guide.

1.13 This study is a follow up to the study *International Benchmarking of DSL Services* carried out for Oftel by Analysys and published in April 2000. This study has been expanded to include a comparison of cable modem prices.

1.14 The April 2000 report included a section providing an overview of those aspects of the regulatory framework relevant to the provision of DSL services, and how those regulatory factors affected the market for service provision. This information has not been fully updated for this report. However, in order to set the context for the remainder of the report, the following section provides some brief comments on the status of local loop unbundling in each country and how this relates to the DSL services currently on offer.

Local loop unbundling

1.15 DSL services are provided over the local loop. The owner of the local loop can provide DSL services by installing additional equipment both at the consumer site, and within the local exchange to which the consumer is connected. Competitors to the incumbent can provide DSL services, by one of the following means:

- Building a new local loop plus DSL investment;
- Purchasing wholesale DSL services from the incumbent or wholesale service provider; or
- Leasing the local loop from the incumbent, through local loop unbundling, plus DSL investment.

1.16 In general, the first of these options is unattractive due to the high cost and the advantage enjoyed by the incumbent in terms of economies of scale. Service providers may wish to use a combination of the second and third options to provide widespread coverage. However, the third option will provide greater scope to provide a wide range of services and the flexibility to respond to customer needs. It is expected that, in the future, competition will develop on the basis of the third option (ie it is dependent on the process of local loop unbundling).

1.17 Table 1.1 (below) provides a summary of the current position in the countries considered in this report in relation to local loop unbundling and the competitive provision of DSL services.

Table 1.1: Local loop unbundling and competitive provision of DSL services

	France	**Germany**	**UK**	**USA**
Availability of unbundled local loops	Available from January 2001 at regulated prices	Available from February 1999. Regulated prices	Scheduled for introduction during the first half of 2001 at regulated prices	Available from 1996
Retail provision of DSL services by incumbent	Yes	Yes	Yes	Yes
Current competitive provision of DSL services:				
Via resale of incumbent product*	Yes	Yes	No	No**
Via wholesale provision of incumbent product*	No	No	Yes	No**
Via leasing of local loop	No	Yes	No	Yes
Via wholesale provision from a third party (who in turn is leasing the local loop)	No	Yes	No	Yes

**A 'resale' product can be sold directly to an end user, while a wholesale product can only be sold to a service provider.*
*** Based on the data collected for the incumbent operators covered in this study.*
Source: data collected by Tarifica and Analysys (www.dslpricing.analysys.com).

1.18 The detailed results presented in the remainder of the report need to be viewed in the context of Table 1.1. From this table it is to be expected that the range of services available might currently be greater in Germany and the US (where LLU is underway) than in the UK and France (where LLU is being introduced).

1.19 Future benchmarking reports on DSL services will reflect the effect of local loop unbundling in the UK and France on price and range of services.

Chapter 2

Price comparisons

Introduction

2.1 This chapter focuses on price and bandwidth comparisons for DSL and cable modem services.

2.2 Services have been defined in terms of their target market. Services have been split into three categories:

- Services aimed primarily at residential consumers;
- Services aimed primarily at business consumers; and
- Wholesale services which are provided, and sold, to residential and business retail customers by a third party service provider.

2.3 A difficulty in comparing DSL and cable modem prices is that services differ in respect of key parameters which define 'service quality'. The most obvious factors which differentiate services are the downstream and upstream bandwidth which define the rate at which information can, in principle, be passed to and from the consumer site respectively. The price comparisons, therefore, need to be presented in the context of the available bandwidth (or 'speed').

2.4 There are, however, a number of other parameters which, in practice, define the speed actually experienced by the consumer and, hence, which may be of equal importance as bandwidth. A key parameter is the contention ratio, a measure of the extent to which bandwidth is potentially shared by consumers. This will be important in determining the bandwidth that a consumer in practice has access to, especially at popular times. The results, therefore, need to be viewed and interpreted with caution.

2.5 DSL services are typically provided in conjunction with Internet access and may include a range of bundled products such as e-mail and web space, a number of static and/or dynamic IP addresses, the ability to connect more than one user etc. These other features included in the service bundle will also affect the price. This is seen explicitly for some operators/service providers who offer a selection of services, all with the same downstream and upstream bandwidth but with different prices reflecting optional 'add-on' features. The approach taken in this report has been to focus on the lowest priced packages which meet given bandwidth requirements. However, packages from different operators/service providers will vary in the details of what is provided. It has not been possible to explicitly adjust for this, but it is not expected that the impact on the overall country comparisons is significant.

2.6 The remainder of this Chapter considers:

- The methodology used to compare prices;
- The results obtained for residential, business and wholesale services.

Methodology

2.7 The discussion of methodology covers:

- Construction of a consistent measure of price;
- Consideration of bandwidth;
- Consideration of other factors;
- Inclusion of cable modems; and
- A summary of the basis on which prices are compared.

A consistent measure of price

2.8 The price of a DSL service is composed of a number of features which may include:

- Monthly rental;
- One off installation charge;
- Cost of modem – this may be a separate monthly rental or a one off cost; and
- For a small number of services there may be usage charges based on either:
  - a cost per minute usage
  - a cost per GigaByte (GB).

2.9 In order to construct a single price measure, it is necessary to convert any one off charges into an effective monthly charge. This is done by assuming a 'write off period', which is taken to be three years, as was used in the April 2000 study (ie the one off charges are divided by 36 to obtain an effective monthly rate). The results are relatively insensitive to this assumption. Where modem costs can be covered by either a one off charge or a monthly rental, the monthly rental figure has been taken. Prices between countries are presented on a consistent basis:

- By using Purchasing Power Parity (PPP) exchange rates to convert all prices to UK£; and
- VAT is included for residential prices but excluded from business and wholesale offers.

See Annex A for details of the rates used.

2.10 Most services on offer are 'flat rate' (ie do not include any charges which vary with usage). However, in Germany it is relatively common for services to include charges on a per GB basis.

2.11 For residential consumers all operators/service providers in Germany covered in this report provide at least one flat rate service. To ensure comparability, only flat rate services are compared for residential consumers.

2.12 For business consumers, however, usage charges are more common and some operators/service providers in Germany offer only variable rate services. In order to include these in the price comparisons, it is necessary to make assumptions about consumer usage. In the April 2000 report the annual traffic volume is taken to be 200 GB for an SME business. However, this level of usage appears relatively high for small business use. Some operators/service providers in Germany offer businesses the choice of variable or flat rate service. For these operators/service providers, it is possible to calculate the 'break even point' (ie the level of usage at which the price of the variable rate service is equal to that of the flat rate service). Levels of usage for different consumer types have been estimated using this

approach. The figure derived in this way for higher end business use is very close to the assumption used in the April 2000 report. See Table 2.1 (below at paragraph 2.25) for the usage levels used. The sensitivity of the results to variations in these figures has been tested and is commented on (see paragraph 2.46).

Consideration of bandwidth

2.13 In comparing price it is also relevant to consider the bandwidth provided for a particular service. In principle, price would be expected to increase with increasing bandwidth. This is both because there are some additional costs in providing higher bandwidth and because it might be expected that consumers would be prepared to pay more for a higher bandwidth service. This price/quality relationship (higher price for higher bandwidth) is not, in practice, clearly seen either between, or within, countries. This is probably due both to the immaturity of the market, and the fact that bandwidth is only one of several measures of quality. It is not, therefore, possible to 'normalise' prices for differences in bandwidth.

2.14 In order to present information in a meaningful way, price information is presented in the context of a measure of bandwidth. This enables unambiguously 'good value' offers to be identified (ie low price and high bandwidth). Other results will be more ambiguous in terms of the value for money they present (eg a service with a high price, but high bandwidth, may or may not be better value than a service with low price and low bandwidth, depending on the requirements of the consumer).

2.15 For residential retail services, the results focus on the cheapest deals available from operators/service providers, irrespective of the bandwidth offered.

2.16 For business and wholesale offers, information has been presented for different user types, based on the 'minimum bandwidth required'. For these market segments, services are provided over a wide range of bandwidth. Users will need to determine which service best meets their requirements (eg an asymmetric service, offering 500kbit/s downstream bandwidth, may not be an effective substitute for a symmetric service offering in excess of 2Mbit/s in both directions).

2.17 Both up and down stream bandwidth are relevant in defining the service. In order to compare services on the basis of bandwidth, it is convenient to construct a single measure of bandwidth. This report follows the approach used in the April 2000 study:

- For residential, low bandwidth business and low bandwidth wholesale services, the measure used is the downstream bandwidth. This reflects the expectation that these consumers will primarily be interested in downstream bandwidth.
- For higher bandwidth business and wholesale services, the geometric mean of down and up-stream bandwidth is used. It is assumed that these consumers will be equally interested in bandwidth in both directions.[3]

2.18 This study covers both asymmetric (ADSL) services, in which the downstream bandwidth is greater than the upstream bandwidth, and symmetric (SDSL) services, in which the bandwidth is the same in both directions. For two services with the same arithmetic mean bandwidth, the more symmetric service will 'score more highly' on the basis of the

[3] The Geometric Mean is defined as squareroot(downstream bandwidth x upstream bandwidth)

'geometric mean' bandwidth. The choice of geometric mean as the measure of bandwidth reflects the assumption that higher end business consumers will place more value on symmetric DSL services.

Other factors

2.19 While the most obvious measure of service quality is bandwidth, there are a number of other quality aspects which may, in practice, be important:

- In particular, the extent to which the required bandwidth can actually be obtained in busy periods (bandwidth reservation) could be the main contributor to the final service standard. The key parameter is the contention ratio (ie the ratio of the potential maximum demand to the actual bandwidth). The higher the contention ratio, the greater the number of users that may be trying to use the actual bandwidth at any one time and, therefore, the lower the effective speed offered, especially at peak times.
- The extent of service availability:
  - some services may be available only in certain geographic areas (eg in the USA, service from an individual supplier may only be in the coverage area of one of the 'baby Bells');
  - even within areas where the service has been rolled out (ie the local exchange has been upgraded), customers with very long lines may not be able to receive the service;
  - there are likely to be areas where services are not offered as rollout of DSL services is not economically viable.
- The delay in transmission between successive packets of data, or latency, which affects how continuous or disjointed a communication appears to the user.

2.20 Limited data on aspects such as contention ratio is available. This information is not, therefore, presented in this report.

2.21 Services also differ in respect of what is included in the service bundle (eg the number of e-mail addresses, the amount of web space, the number of dynamic and static IP addresses).

2.22 It should be noted that these other factors can be significant in terms of the price offered by operators/service providers. As an example of this, the 'BT Business 500' product is priced at £40 per month – this has the same bandwidth (512/256) as the 'BT Business 500 plus' product which is priced at £100/month. Key differences between the services are contention ratio of 50:1 for the former and 20:1 for the latter and the ability to connect only one user for the former but up to four users for the latter. The price/bandwidth information can, therefore, be misleading when considered in isolation. The comparisons should, therefore, be treated with a degree of caution. It is expected that the general conclusions regarding cross country comparisons will be valid. The report is **not** a guide to the relative value for money offered by individual operators/service providers.

Cable modems

2.23 In addition to collecting data for DSL services, data has also been collected for cable modem services. Cable modem services are expected to provide a close substitute for DSL services, particularly for residential consumers. In presenting the results, cable modem service prices are displayed alongside the DSL prices. Country price comparisons are presented both for DSL and cable modem services taken together, and for DSL services only.

2.24 Factors such as contention ratio also play an important role in determining the level of service received by cable modem subscribers. Care is, therefore, needed in interpreting any price/quality relationship when comparing cable modem and DSL services.

Summary

2.25 Table 2.1 provides a summary of the comparisons undertaken.

Table 2.1: Summary of the comparisons undertaken

No	Description	Min bandwidth required (kbit/s – GM)	Usage per month (GigaByte)	VAT incl?	Bandwidth measure
1	Residential	None	[not used]	Yes	Downstream
2	Business – low	None	6	No	Downstream
3	Business – medium	500	9	No	Geometric mean
4	Business – high	1000	16	No	Geometric mean
5	Wholesale – low	None	[not used]	No	Downstream
6	Wholesale – medium/high	500	[not used]	No	Geometric mean

Note: GM = geometric mean

Other issues

2.26 There are a number of additional issues that arise in presenting the results. The approach taken to these is outlined below:

- Some providers provide a range of bandwidth (rather than a single figure) potentially available to a consumer for a particular service. The bandwidth actually received may, for example, reflect the distance of the consumer from the local exchange. These offers are presented using the mid-point of the range quoted. However, the impact of using the upper limit of the bandwidth range is also commented on;
- The vast majority of retail packages include Internet access. Where Internet access is offered on an unbundled basis, the costs of this are added in to ensure comparability;
- VAT rates vary by US State – an average figure is used for California and New York (the impact on the results of this simplification is very small);
- The standard installation costs are used where these are available (ie short term special offers are not taken into account). Prices for technician install (rather than self install) are used;
- Where an operator offers a lower rate for payment upfront (eg paying the annual amount upfront), the monthly rate has been used; and

- Where DSL is provided over ISDN (ie in Germany), the difference between the ISDN and PSTN monthly subscription charge is included in the DSL cost (ie a PSTN line is taken as the standard 'base'). However, it is noted that ISDN use is relatively widespread in Germany, especially for business use, and the impact of removing the ISDN costs is commented on.

2.27 Regarding the last of these points, it is noted that there is no clear answer as to whether additional ISDN costs should or should not be included. For a consumer who does not already have an ISDN connection, the requirement to have an ISDN connection is an additional cost in taking up a DSL service. However, for consumers who already have an ISDN connection there is no additional cost.

Presentation of results

2.28 As in the April 2000 study, results are summarised by presenting charts, ranked by price, with the relevant measure of bandwidth (ie either downstream or geometric mean) superimposed. This provides one way of viewing and commenting on the results.

2.29 A further way of summarising the results is also presented in this report. A price index has been constructed based on the average price for the two lowest priced offers (for each consumer type) from two different operators/service providers in each country. This is based on the approach taken in Oftel's other benchmarking work.[4] As bandwidth is also a relevant consideration, the average bandwidth is shown alongside the price indices. This type of comparison was not undertaken in the April 2000 study. This was partly because prices in the UK at the time were mainly based on trial prices and hence it was appropriate to comment on relative prices in a more qualitative way. It is expected that the analysis of price in this report will form the basis for constructing a price trend in subsequent reports.

2.30 These price indices do not take account of availability (which is discussed in Chapter 3). However, where it is known that availability is, and will continue to be, on a very limited basis, the operator has been excluded from the index.

2.31 Results are also presented in terms of:

- Charts which show the spread of prices available in each country based on the cheapest service by operator (which meet the minimum bandwidth requirements listed in Table 2.1); and
- Charts which show the spread of bandwidth available in each country based on the minimum and maximum bandwidth offered by each operator.

Results for residential
Price index

2.32 Table 2.2 below shows the results for the price level, price index and (downstream) bandwidth provided for residential services. All these measures are constructed using the average of the two lowest priced residential offers (from different operators/service providers) in each country. Results are presented both with, and without, cable modem offers included.

[4] See for example, *International benchmarking study of mobile services and dial-up PSTN Internet access*, Dec 2000, available at http://www.oftel.gov.uk/feedback/benc1200.htm).

Table 2.2: Results for price level, price index and (downstream) bandwidth for residential broadband services

	Include cable modems			Exclude cable modems		
	Price level £/month	Price index	Bandwidth kbit/s	Price level £/month	Price index	Bandwidth kbit/s
France	37	92	512	48	109	512
Germany	31	78	576	32	72	448
UK	40	100	506	44	100	500
US	32	79	2,000	36	80	695

2.33 From Table 2.2 it is seen that:

- If cable modem services are *excluded*, then prices in Germany and the US are around 28% and 20% cheaper respectively than in the UK, while prices in France are around 9% more expensive;
- If cable modem services are *included*, then prices in France are around 8% cheaper than in the UK, while prices in Germany and the US are over 20% cheaper;
- Excluding cable modem offers increases the costs in all countries, ie generally one or both of the two lowest priced services are cable modem rather than DSL services. In the UK, cable modem and DSL prices are closer than in some other countries. Excluding cable modem services, therefore, improves the relative UK position;
- Compared to the results for business (see section below), the price levels for residential consumers are relatively close together; and
- The bandwidth provided in the US is much higher than in Europe.

2.34 It is also noted that virtually all residential services are asymmetric services. Only a small number of services in the US are symmetric.

2.35 The results have also been run with some of the assumptions varied:

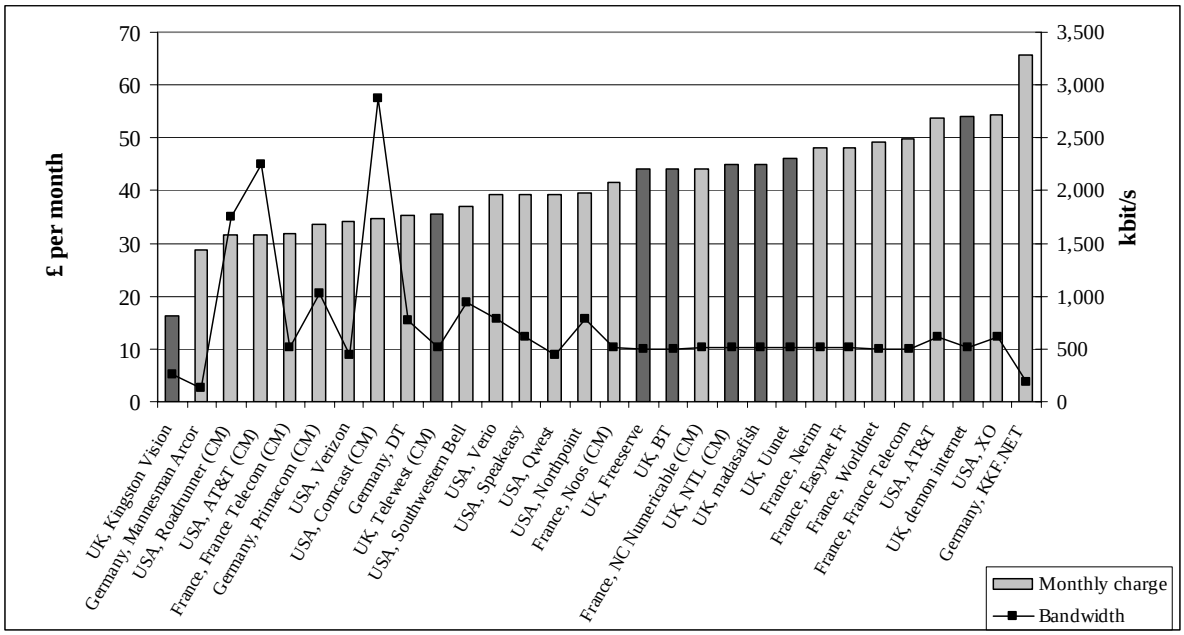
- Excluding the cost of ISDN improves the German position and makes German prices almost half of those in the UK – this comparison may be more relevant for those consumers who already have an ISDN connection; and
- Including the upper limit of bandwidth ranges offered by US operators/service providers, increases the average bandwidth of the two lowest priced offers to 2,500.

2.36 It is also noted that Primacom offer a variable rate cable modem service in Germany, which has not been included in the comparisons. At low levels of usage, the variable rate service is cheaper than the flat rate service, although it also offers much lower bandwidth. Including this service at a usage rate of 0.5GB/month would reduce German prices to around 40% cheaper than UK prices, but would also reduce the bandwidth to around 40% of that offered in the UK.

2.37 The figures in Table 2.2 (above) exclude the Kingston service on the basis of its limited availability[5]. The inclusion of this service would make the UK the cheapest of the countries considered. The Kingston offer is based on an 'Internet over TV' package and, hence, is different to the other DSL services presented which offer Internet over a PC.

2.38 The results can also be presented by considering a chart which lists the cheapest offers of the operators/service providers considered in this study (arranged in price order), with downstream bandwidth superimposed. See Figure 2.1 below (note UK operators/service providers are highlighted using darker coloured bars).

Figure 2.1: Residential DSL and cable modem services in ascending order of price, with 'speed' of service (downstream bandwidth) shown separately.[6]



Note: cable modem services have (CM) after the operator's name. UK services are shown in bold.

2.39 From Figure 2.1 it is seen that:

- The UK Kingston offer (for Internet over TV) is the cheapest service of the operators/service providers considered, though it provides a relatively low bandwidth;
- Cable modem services in the US such as Roadrunner and AT&T appear to provide good value for money in terms of offering a low priced service plus high bandwidth;
- The overall spread of prices is not that great (when compared with business offers) – the bandwidth offered does vary considerably;
- All countries appear to have some offers available spread throughout the price range.

2.40 The results can be compared with those in the April 2000 report. Generally it appears that there has been relatively little movement in terms of prices with a number of packages being offered in the range of £30-£40 both in March 2000 and October 2000.

[5] Prices quoted are for services within Kingston's local access network area; prices of services which may be offered in future outside of this area are not available.

[6] As previously stated in this report, these charts should not be seen as a buyer's guide.

Price and bandwidth spread

2.41 Charts showing the spread of prices and bandwidths are shown in Figures 2.2 and 2.3 respectively. The price spread chart (Figure 2.2) shows the price for the cheapest package offered by each operator as a percentage increase over the cheapest price across all countries. The bandwidth spread chart (Figure 2.3) shows the range of bandwidths on offer (based on the lowest and highest bandwidth offered by each operator).

Figure 2.2: Price spread chart

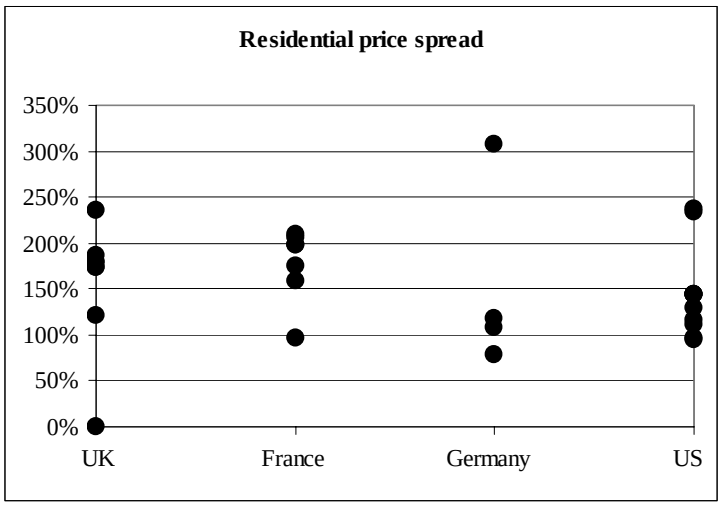
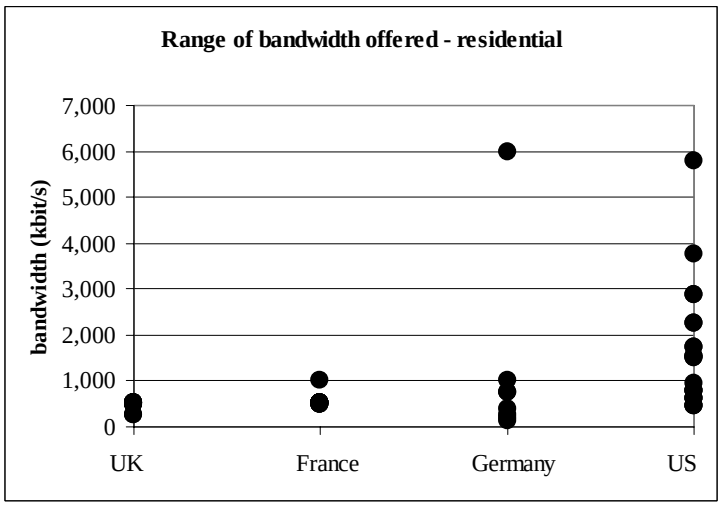


Figure 2.3: Bandwidth spread chart



2.42 Figures 2.2 and 2.3 show:

- The range of prices in all countries is similar both in terms of level and spread;
- The range of bandwidth on offer in the UK and France is very limited. This is in part due to the fact that DSL products are all based on the provision of service by the incumbent operator who offers only one residential service; and
- Both Germany and the US offer a similar range of bandwidth which is much broader than in the UK and France.

Results for business
Price index

2.43 Table 2.3 below shows the results for the price level, price index and bandwidth provided for business services. All these measures are constructed using the average of the two lowest priced business offers (from different operators/service providers) in each country. Results are presented with cable modem offers included.

Table 2.3: Results for price level, price index and bandwidth for business broadband services (cable modem services included)

	No minimum bandwidth			Minimum GM bandwidth of 500 kbit/s			Minimum GM bandwidth of 1000 kbit/s		
	Price level £/month	Price index	Bandwidth – DS kbit/s	Price level £/month	Price index	Bandwidth – GM kbit/s	Price level £/month	Price index	Bandwidth – GM kbit/s
France	126	302	1,000	126	103	506			
Germany	28	66	448	264	217	615	533		1,262
UK	42	100	506	122	100	500			
US	33	80	608	60	49	857	71		1,127

Note: DS = downstream, GM = geometric mean

2.44 From Table 2.3 it is seen that:

- For the most basic services available to business (ie where the business has no minimum bandwidth requirement):
  - prices in Germany and the US are around 34% and 20% cheaper respectively than in the UK; and
  - prices in France are considerably more expensive than in the other countries – but provide significantly higher bandwidth.
- For business services where a minimum *geometric mean* bandwidth of 500kbit/s is required:
  - Prices are widely spread between countries;
  - UK prices are close to prices in France, are about double those in the US but less than half of those in Germany; and
  - The bandwidth in the UK is about the same as in France, but less than in Germany and the US.
- For business services where a minimum *geometric mean* bandwidth of 1000kbit/s is required:
  - Services are only available in Germany and the US;[7] and
  - Prices in these two countries are very different, with Germany much more expensive than the US.

[7] While both France and the UK offer services with a *downstream* bandwidth of at least 1000kbit/s, these services are asymmetric and the geometric mean bandwidth is less than 1000kbit/s.

2.45 It is also noted that, in both Germany and the US, a range of symmetric services are offered, while in the UK and France, all services are asymmetric.

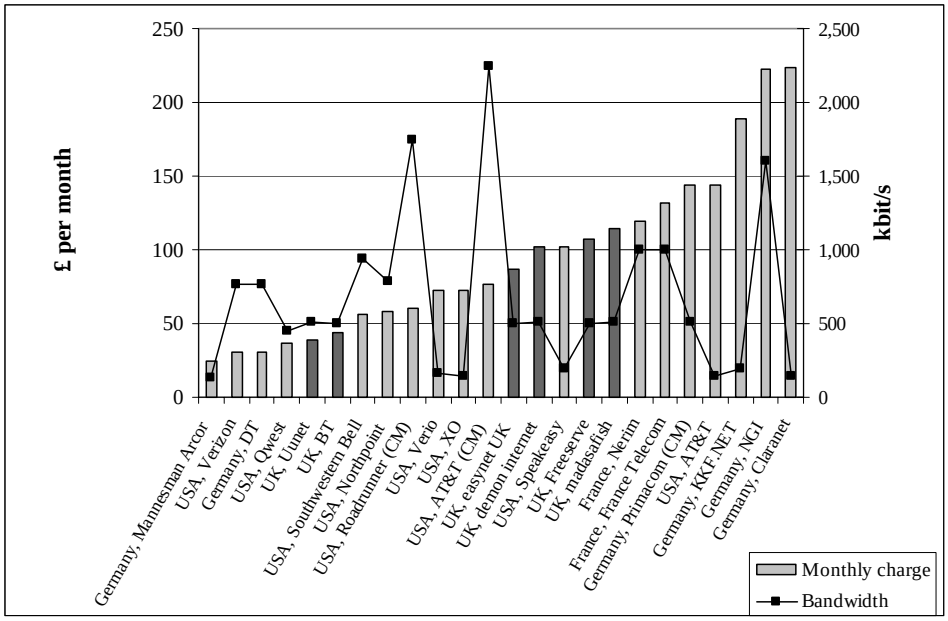
2.46 The results have also been run with some of the assumptions varied as follows:

- Excluding the cost of ISDN improves the German position for the most basic business services making German prices less than half of those in the UK. This comparison may be more relevant for business consumers who already have an ISDN connection. There is no impact for business consumers requiring higher bandwidth services;
- Including the upper limit of bandwidth ranges offered by US operators/service providers results in relatively small increases in the average bandwidth;
- Halving the usage rate (in GB) has no impact for 'low' business use. It improves the German position in respect of price for 'medium' and 'high' business use, but German prices for the former remain 50% higher than those in the UK; and
- Doubling the usage rate again impacts on the price for medium and high business use, resulting in the gap between Germany and other countries being further increased.

2.47 Excluding cable modem services has relatively little impact on the results as these are largely offered to residential, rather than business, consumers as at 12 October 2000.

2.48 The results can also be presented by considering a number of charts which list the cheapest offers of the operators/service providers considered in this study (arranged in price order), with the relevant measure of bandwidth superimposed. See Figures 2.4 to 2.6 below (note UK operators/service providers are highlighted using darker coloured bars).

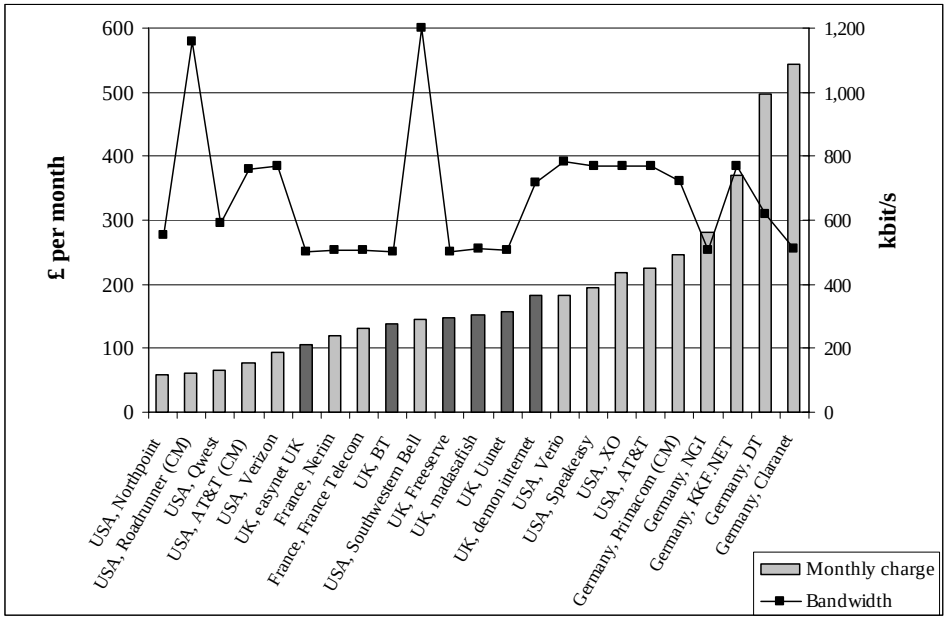
Figure 2.4: Business DSL and cable modem services in ascending order of price, with 'speed' of service (downstream bandwidth) shown separately – no minimum bandwidth required.[8]



Note: cable modem services have (CM) after the operator's name. UK services are shown in bold.

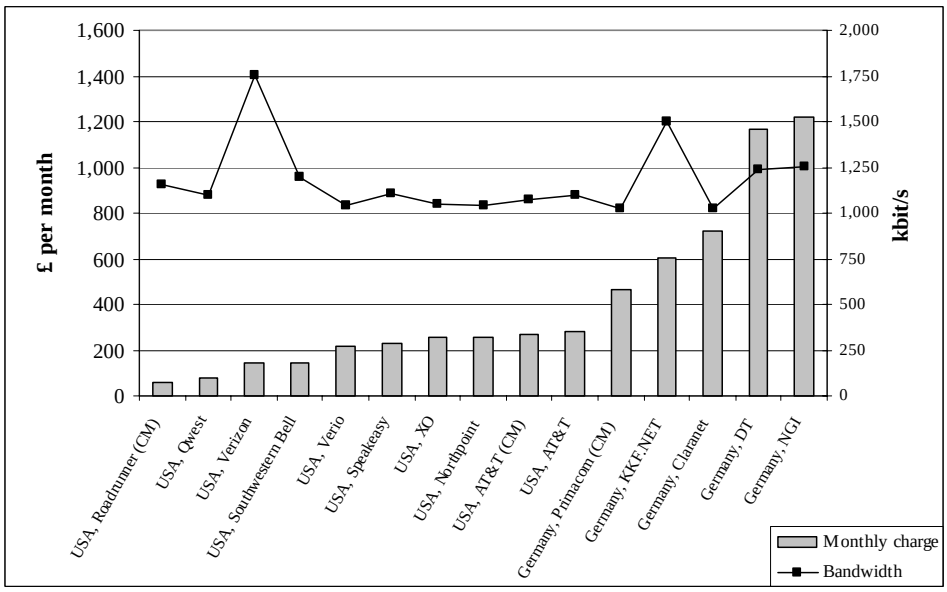
[8] See footnote 6.

Figure 2.5: Business DSL and cable modem services in ascending order of price, with 'speed' of service (geometric mean bandwidth) shown separately – minimum bandwidth 500kbit/s (GM).[9]



Note: cable modem services have (CM) after the operator's name. UK services are shown in bold.

Figure 2.6: Business DSL and cable modem services in ascending order of price, with 'speed' of service (geometric mean bandwidth) shown separately – minimum bandwidth 1000kbit/s (GM).[10]



Note: cable modem services have (CM) after the operator's name. UK services are shown in bold.

2.49 The results can be compared with those in the April 2000 report. Generally, it appears that prices for basic business use are now lower than in April 2000. In the April 2000 report,

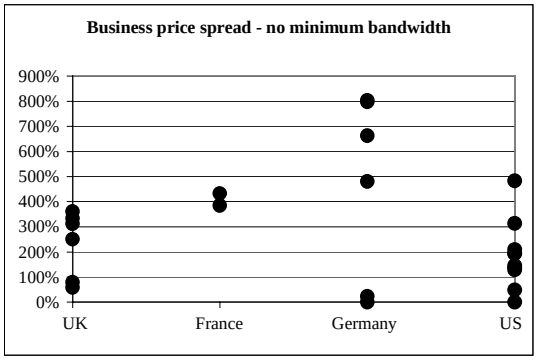
[9] See footnote 6.
[10] See footnote 6.

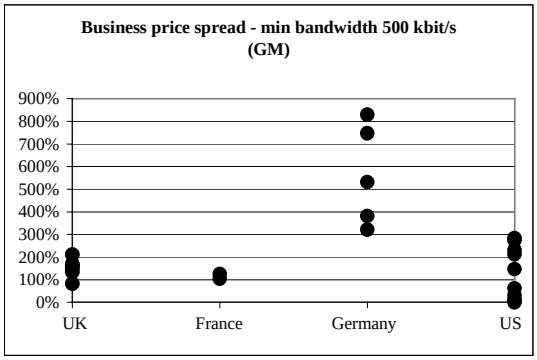
prices for basic business use typically started at close to £100. However, in figure 2.4 above, prices start at around £30-£40.

Price and bandwidth spread

2.50 Charts showing the spread of prices and bandwidths are shown in Figures 2.7 and 2.8 respectively. The price spread chart (Figure 2.7) shows the price for the cheapest package offered by each operator as a percentage increase over the cheapest price across all countries for each business type. The bandwidth spread chart (Figure 2.8) shows the range of bandwidths on offer (based on the lowest and highest downstream bandwidth offered by each operator).

Figure 2.7: Price spread chart





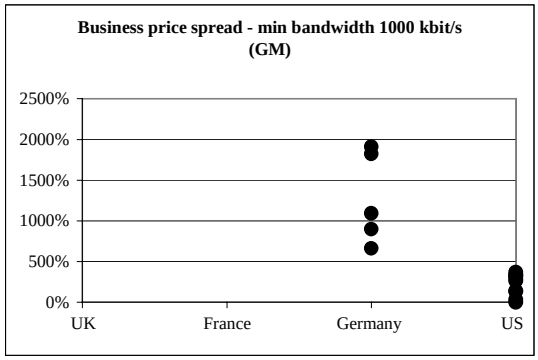
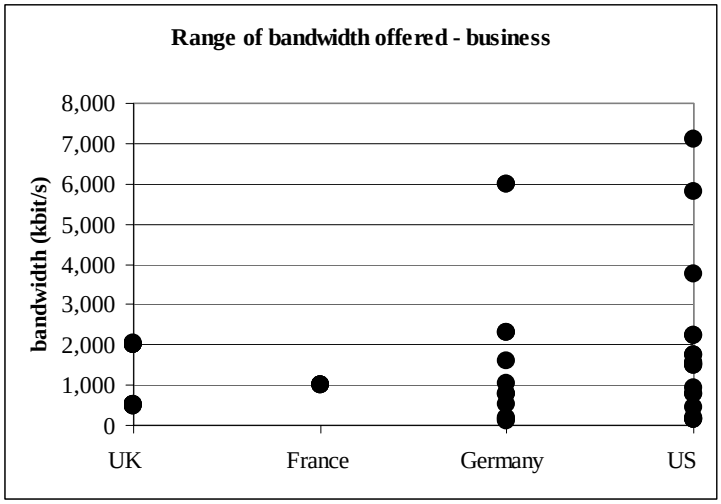


Figure 2.8: Bandwidth spread chart



2.51 Figures 2.7 and 2.8 show that:

- For the most basic services available to business (ie where the business has no minimum bandwidth requirement), the price spread in the UK and US is similar, both in terms of price level and range of prices, while prices are much more narrowly spread in France and much more widely spread in Germany;
- For business services where a minimum bandwidth of 500kbit/s (geometric mean) is required, the spread of prices in the UK is relatively narrow (only France has a narrower range);
- For business services where a minimum bandwidth of 1000kbit/s (geometric mean) is required, only the US and Germany offer services, and prices in Germany are both higher and more widely spread; and
- Taking all services on offer, the range of capacities on offer in Germany and the US is much wider than in the UK while, in France, only one bandwidth level is available (the narrow spread of prices in France is likely to be a reflection of the limited range of services available).

Results for wholesale DSL

2.52 Information has been collected for the following three wholesale providers of DSL services:

- BT in the UK;
- QSC in Germany; and
- Covad in the US.

2.53 BT provides DSL services over its own network. QSC and Covad are examples of wholesale providers in Germany and the US who lease the local loop and then install DSL equipment to allow them to offer a wholesale DSL product.

2.54 A 'wholesale' product is defined in this report as a product which is not sold directly to end users, rather, it is sold to a service provider who then provides the service to the consumer (and maintains the relationship with the consumer). The France Telecom Netissimo product (on which all DSL services in France are based) is considered to be a resale product,

as it can be sold directly to the consumer. This product is not included directly in the retail comparisons (as it does not include Internet access), but is included indirectly as part of the French ISPs DSL services. Similarly Deutsche Telekom offers certain resale products which have not been directly included.

2.55 It has been relatively difficult to establish the price level of wholesale offers outside the UK.[11] Both QSC and Covad appear to offer a range of prices which may depend on the particular ISP they are selling to and the detailed contact terms. The results are presented on the basis of the lower limit of the ranges, but with the upper limit superimposed.

2.56 Given that only three companies are considered, results are presented in chart form only. Two charts are presented:

- The first (Figure 2.9 below) shows all services for a 'basic' service – defined as having a minimum bandwidth (geometric mean) below 500kbit/s. However, where a higher bandwidth service is lower in price than some of these low bandwidth services, these are also included; and
- The second (Figure 2.10 below) shows all services for higher bandwidths ie with a minimum bandwidth (geometric mean) above 500 kbit/s.

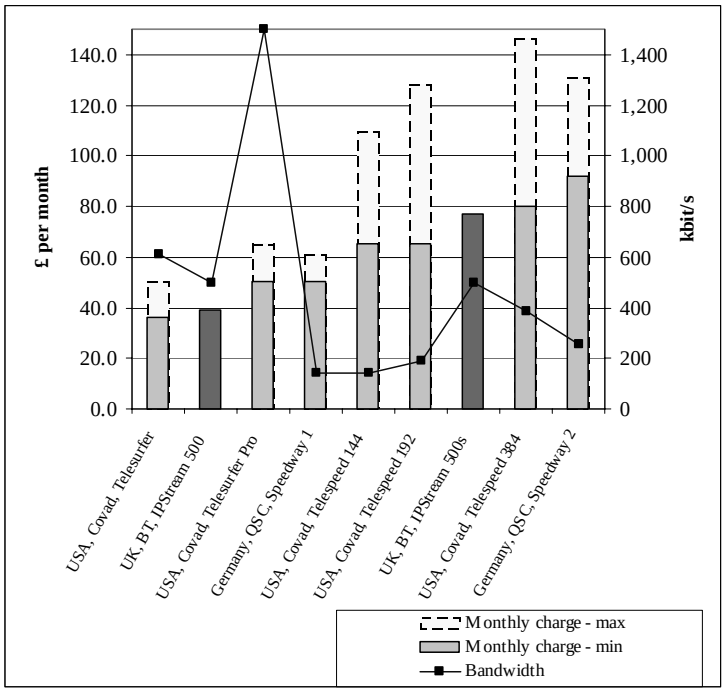
2.57 This way of presenting the results is somewhat different to that for the retail services. This is because with only three operators/service providers, it is useful to include all of their offers.

2.58 It is noted that the comparison of wholesale services is not easy. It is difficult to be sure that the comparison is of like with like. The BT IPStream wholesale services have been chosen for the UK comparison in this study, as these appear to be the most closely comparable to the Covad and QSC services.

2.59 Two BT products with the same bandwidth are included in the comparisons. The BT IPStream 500 product is aimed at residential and basic business use and differs in certain key respects (such as contention ratio) from the more expensive BT IPStream 500s product which is specifically aimed at business use.

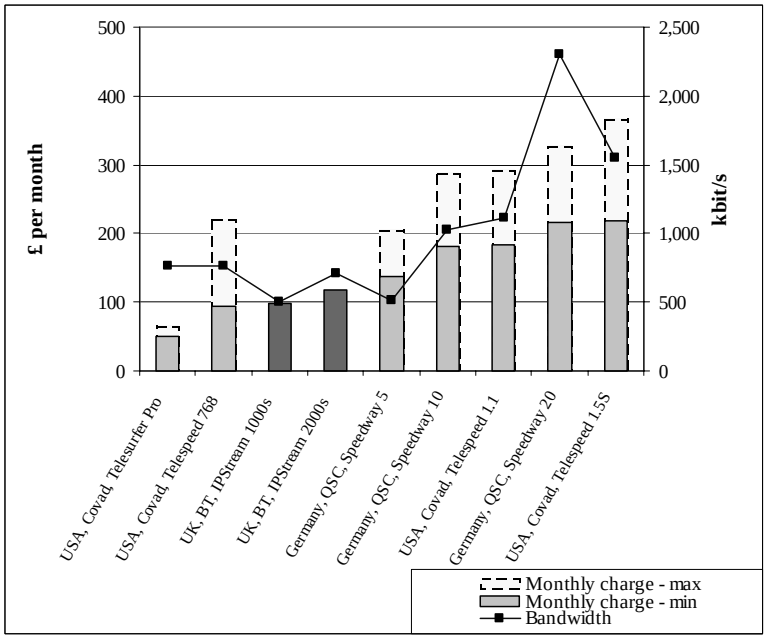
[11] Note data on wholesale tariffs collected by Tarifica has been supplemented by data collected by Analysys. The data provided by Analysys has a tariff valid date of 1st Nov 2000.

Figure 2.9: Wholesale DSL services in ascending order of price, with 'speed' of service (downstream bandwidth) shown separately – lower bandwidth services (bandwidth < 500kbit/s GM).



Source: Tarifica and Analysys (www.dslpricing.analysys.com)

Figure 2.10: Wholesale DSL services in ascending order of price, with 'speed' of service (downstream bandwidth) shown separately – higher bandwidth services (>500 kbit/s GM).



Source: Tarifica and Analysys (www.dslpricing.analysys.com)

2.60 Figures 2.9 and 2.10 show that, based on the information available:

- BT's most basic wholesale service (IPStream 500) is similar in terms of price and bandwidth to Covad's most basic service (although Covad does offer a product with substantially higher bandwidth at relatively little additional cost). It is also similar in terms of price, but better in terms of bandwidth, than QSC's most basic product. The IPStream 500s service is above average in price when compared to the cheapest services available elsewhere, but about middle of the range when compared to mid-point estimates for services elsewhere; and
- For higher bandwidth services, prices for BT's wholesale products are similar to those QSC and Covad products which have similar bandwidth, although higher bandwidth products (at higher prices) are available in both Germany and the US.

2.61 It is also noted that the QSC services, and most of the Covad services, are symmetric services, compared to the asymmetric services offered by BT.

2.62 In principle, it is possible to compare the retail prices offered by service providers with the price of the wholesale product on which their service is based and, hence, to calculate the 'retail mark up'.

2.63 However, while in the UK it is possible to be relatively confident of the relationship between a retail product and the wholesale product which underlies it, it is more difficult to be sure of this relationship for Germany and the US where there is a range of wholesale prices (for services of a given bandwidth) and a range of retail products. Accurate estimates of retail mark-ups for these countries could only be established if information was collected from ISPs regarding the price they actually pay for the wholesale product underlying a particular retail offering.

2.64 Given these difficulties, it is not considered that meaningful information on retail mark-ups can be presented.

Chapter 3

Service rollout

3.1 Table 3.1 below summarises the information on service availability and takeup that it has been possible to collect for particular operators. It should be noted that it is difficult to find detailed information on this. Furthermore, the information that is available is not provided in a common form.

Table 3.1: Service availability and takeup for DSL services.

Country/ operator		
UK, BT	Current subscribers	14,000 end users at end Nov 2000. BT expects this figure to rise to 70-80,000 by the end of March 2001, depending on continued demand from service provider customers.
	Current availability	40% of business and homes covered by Oct 2000
	Future rollout plans	50% of business and homes by end March 2001 70% coverage by end 2002
UK, Kingston	Current availability	Available throughout East Yorkshire
France, France Telecom	Current subscribers	12,469 end users at April 2000
	Current availability	A third of exchanges enabled by end 2000
	Future rollout plans	Two thirds of exchanges expected to be enabled by end 2001. Coverage to be extended to 80% of the population by 2003.
Germany, Deutsche Telekom	Current subscribers	No information available
	Current availability	Expected to be available to 60% of households by end 2000
	Future rollout plans	90% coverage expected by end 2001 full coverage of all core regions expected by end of 2002*
USA, Covad	Current subscribers	No information available
	Current availability	Coverage of over 45% of all US homes and businesses expected by end 2000
	Future rollout plans	No information available
USA, Northpoint	Current subscribers	No information available
	Current availability	Expected to reach 63 million potential subscribers by end 2000 (approximately 60% of households)
	Future rollout plans	No information available

Source: Tarifica, Analysys (www.dslpricing.analysys.com).
Note it is unclear what is meant by 'all core regions'.

3.2 The Federal Communications Commission (FCC) in the US collects data on the deployment of high-speed Internet services in the US. Table 3.2 below summarises some key figures based on company data as at 30 June 2000. It should be noted that the information on availability is not directly comparable to that in Table 3.1 above.

Table 3.2: FCC data on takeup and availability in the US

number of residences (including home office and small business customers) with high speed lines (at least 200kbit/s in one direction)	3.1 million
as % of total households	3%
% ADSL/other wireline technologies*	28%
% cable	70%
total number of high speed lines (at least 200kbit/s in one direction)	4.2 million
of which advanced services (200kbit/s in both directions)	2.8 million
% ADSL/other wireline technologies*	39%
% cable	52%
% of zip codes in which the provider has at least one high speed subscriber (these zip codes cover 95% of the population)	70%

**'other wireline technologies' includes traditional telephone company high speed services and symmetric DSL services*

3.3 Based on this limited information, it appears that, by the end of 2000, availability of DSL services in the UK will be behind that in Germany but ahead of that in France. Based on stated rollout plans, DSL services will be available to a substantial number of European consumers by the end of 2001, with further rollout continuing in 2002-03. From the figures, it appears that planned availability in the UK will be less than in France and Germany. However, it is not clear whether the figures relating to planned rollout are directly comparable or realistic. Technical issues will limit the ability to offer DSL services to consumers who live too far from the local exchange. Furthermore, it is unlikely to be economically viable to roll out DSL to sparsely populated areas. In this context Deutsche Telekom's plans for in excess of 90% coverage appear optimistic.

3.4 It has not been possible to obtain information on cable modem rollout plans in France and Germany. In the UK, cable operators expect widespread availability of cable modem services within their franchise areas by the end of 2001.

3.5 It is difficult to compare directly with the US because of the limited company specific information collected and given that availability will differ from State to State. However, it is expected that availability in Europe is generally behind that in the US. Based on the FCC data, the number of households and businesses using high speed access remains relatively low (eg 3% of households/small businesses), although this level of takeup is still higher than in Europe. A high percentage of zip codes (70%) have at least one high speed subscriber. As zip codes with high population density are more likely to have high speed services available, these 70% of zip codes in fact cover 95% of the population. However, these figures do not provide information about the extent to which service is available throughout a zip code region and do not, therefore, provide an indication of overall availability.

Chapter 4

Conclusions

4.1 This report has considered (within the limitations described) comparisons of DSL and cable modem services in the UK with France, Germany and the US in terms of price/bandwidth and availability/rollout.

4.2 The comparisons of price and bandwidth indicate that:

- For residential use:
  - For DSL services only, prices in Germany and the US are around 28% and 20% cheaper respectively than in the UK, while prices in France are around 9% more expensive;
  - However, when cable modem services are included, then prices in France are around 8% cheaper than in the UK, while prices in the US are over 20% cheaper;
  - The bandwidth offered in the US is much higher than in the European countries studied;
- For basic business use, UK prices are higher than in Germany and the US, but cheaper than in France, although the bandwidth offered in France is higher;
- For mid-bandwidth business use, UK prices are close to those in France, more expensive than those in the US and cheaper than those in Germany;
- For high-bandwidth business use only Germany and the US offer a range of services, with German prices very significantly higher than in the US; and
- UK wholesale prices are similar to those elsewhere for services with similar bandwidth, though the range of services offered is more limited.

4.3 It is more difficult to compare availability, rollout and future rollout plans, as only limited information is available. Furthermore, the data that is available is not in a consistent form. Based on the information collected it appears that:

- By the end of 2000, availability of DSL services in the UK will be behind that in Germany but ahead of that in France;
- Availability and takeup in Europe is behind the US; and
- Information regarding future rollout plans is too uncertain to enable conclusions to be drawn. Oftel intends to continue to monitor this.

4.4 This study is the second in what is expected will be an ongoing series of reports which provide international comparisons of DSL and other broadband services. It is expected that this study will be updated in approximately six months time.

Annex A

Exchange rates and VAT rates

A.1 The exchange rates and VAT rates used in the study are shown in Table A1.

Table A1 Exchange rates and VAT rates

Country	Exchange rate as at 12 Oct 2000	PPP factor	PPP exchange rate	VAT rate
France	0.09	1.17	0.11	19.6
Germany	0.31	1.16	0.36	16
UK	1.00	1.00	1.00	17.5
USA	0.69	1.06	0.73	7.6

Source: Exchange rate as at 12 Oct provided by Tarifica from Financial Times; PPP factors are the latest available from OECD (Aug 2000); USA VAT rate is an average across States provided by Analysys (www.dslpricing.analysys.com).

A.2 All results are presented using Purchasing Power Parity (PPP) exchange rates. This means that the exchange rate is offset by the PPP factor given in Table A1.

Annex B

DSL and cable modem prices by country

B.1 This annex presents more detailed information on the information collected for this study on DSL and cable modem prices and service specifications by country. Data collection has been carried out for Oftel by consultants Tarifica Ltd, with some with some additional data provided by Analysys Ltd.

B.2 All prices are quoted in the countries own currency and excluding VAT.

DSL prices in the UK

Country	Operator/SP	Package	One off charges		Fixed monthly charges		Usage charges	Usage allowance	Capacity		Availability		
			Connection charge	One off modem	Modem	Sub scription	per GB	GB	Down	Up	Bus	Res	WS
UK	BT	Home 500	127.7	0.0	0.0	34.0	0.0	0	500	250	no	yes	no
UK	BT	Business 500	150.0	0.0	0.0	40.0	0.0	0	500	250	yes	no	no
UK	BT	Business 500 plus	260.0	0.0	0.0	100.0	0.0	0	500	250	yes	no	no
UK	BT	Business 1000 plus	260.0	0.0	0.0	130.0	0.0	0	1,000	250	yes	no	no
UK	BT	Business 2000 plus	260.0	0.0	0.0	160.0	0.0	0	2,000	250	yes	no	no
UK	BT	IPStream 500	150.0	0.0	0.0	35.0	0.0	0	500	250	no	no	yes
UK	BT	IPStream 500s	260.0	0.0	0.0	70.0	0.0	0	500	250	no	no	yes
UK	BT	IPStream 1000s	260.0	0.0	0.0	90.0	0.0	0	1,000	250	no	no	yes
UK	BT	IPStream 2000s	260.0	0.0	0.0	110.0	0.0	0	2,000	250	no	no	yes
UK	BT	Datastream	100.0	0.0	0.0	50.8	0.0	0	500	250	no	no	no
UK	BT	Datastream	100.0	0.0	0.0	60.0	0.0	0	1,000	250	no	no	no
UK	BT	Datastream	100.0	0.0	0.0	70.0	0.0	0	2,000	250	no	no	no
UK	Demon Internet	Demon express	127.7	0.0	0.0	42.5	0.0	0	512	256	no	yes	no
UK	Demon Internet	Demon express plus	250.0	0.0	0.0	95.0	0.0	0	512	256	yes	no	no
UK	Demon Internet	Demon express pro	250.0	0.0	0.0	175.0	0.0	0	2,000	256	yes	no	no
UK	Demon Internet	Demon express gold	250.0	0.0	0.0	290.0	0.0	0	2,000	256	yes	no	no
UK	Easynet UK	Easy DSL500	275.0	0.0	0.0	79.0	0.0	0	500	250	yes	no	no
UK	Easynet UK	Easy DSL1000	275.0	0.0	0.0	99.0	0.0	0	1,000	250	yes	no	no
UK	Easynet UK	Easy DSL2000	275.0	0.0	0.0	119.0	0.0	0	2,000	250	yes	no	no
UK	Madasafish	Dazzle 500U	153.2	0.0	0.0	34.0	0.0	0	512	256	no	yes	no
UK	Madasafish	Dazzle 500	270.0	0.0	0.0	106.4	0.0	0	512	256	yes	no	no
UK	Madasafish	Dazzle 1000	270.0	0.0	0.0	144.7	0.0	0	1,024	256	yes	no	no
UK	Madasafish	Dazzle 2000	270.0	0.0	0.0	191.5	0.0	0	2,048	256	yes	no	no
UK	Uunet	Pipex ADSL	150.0	0.0	0.0	35.0	0.0	0	512	256	yes	yes	no
UK	Uunet	Pipex Business 500	260.0	0.0	0.0	110.0	0.0	0	512	256	yes	no	no
UK	Uunet	Pipex Business 1000	260.0	0.0	0.0	150.0	0.0	0	1,000	256	yes	no	no
UK	Uunet	Pipex Business 2000	260.0	0.0	0.0	200.0	0.0	0	2,000	256	yes	no	no
UK	Freeserve	Freeserve Plus, 500	260.0	0.0	0.0	100.0	0.0	0	500	250	yes	no	no
UK	Freeserve	Freeserve Plus, 1000	260.0	0.0	0.0	140.0	0.0	0	1,000	250	yes	no	no
UK	Freeserve	Freeserve Plus, 2000	260.0	0.0	0.0	190.0	0.0	0	2,000	250	yes	no	no
UK	Freeserve	Home (USB)	127.7	0.0	0.0	34.0	0.0	0	500	250	no	yes	no
UK	Kingston Vision	KITV	34.0	0.0	0.0	12.8	0.0	0	256	256	no	yes	no

DSL prices in France

Country	Operator/SP	Package	One off charges		Fixed monthly charges		Usage charges	Usage allowance	Capacity		Availability		
			Connection charge	One off modem	Modem	Sub scription	per GB	GB	Down	Up	Bus	Res	WS
France	Nerim	Base	642.6	0.0	37.3	320.1	0.0	0	512	128	no	yes	no
France	Nerim	Pro	990.0	0.0	0.0	1,090.0	0.0	0	1,000	256	yes	no	no
France	France Telecom	Wanadoo ADSL	642.6	0.0	37.3	332.6	0.0	0	500	128	no	yes	no
France	France Telecom	Wanadoo Pro ADSL	990.0	0.0	0.0	1,200.0	0.0	0	1,000	256	yes	no	no
France	France Telecom	Netissimo 1*	642.6	0.0	37.3	219.7	0.0	0	500	128	no	no	no
France	France Telecom	Netissimo 2*	990.0	0.0	0.0	700.0	0.0	0	1,000	256	no	no	no
France	Easynet FR	EasyDsl	642.6	0.0	37.3	320.1	0.0	0	512	128	no	yes	no
France	Worldnet	ADSL	642.6	0.0	37.3	328.7	0.0	0	500	128	no	yes	no
France	Worldnet	ADSL pro	990.0	0.0	0.0	890.0	0.0	0	1,024	256	no	no	no

** resale product not included in the analysis*

DSL prices in Germany

Country	Operator/SP	Package	One off charges		Fixed monthly charges		Usage charges	Usage allowance	Capacity		Availability		
			Connection charge	One off modem	Modem	Sub scription	per GB	GB	Down	Up	Bus	Res	WS
Germany	KKF.NET	Speedconnect 6x	1,500.1	0.0	0.0	193.6	78.2	0	384	384	yes	no	no
Germany	KKF.NET	Speedconnect 12x	1,500.1	0.0	0.0	299.2	78.2	0	768	768	yes	no	no
Germany	KKF.NET	Speedconnect 24x	1,500.1	0.0	0.0	399.0	78.2	0	1,500	1,500	yes	no	no
Germany	KKF.NET	Speedconnect 35x	1,500.1	0.0	0.0	498.7	78.2	0	2,300	2,300	yes	no	no
Germany	KKF.NET	Speedconnect 3x flat	1,500.1	0.0	0.0	487.0	0.0	0	192	192	yes	no	no
Germany	KKF.NET	Speedconnect 6x flat	1,500.1	0.0	0.0	663.0	0.0	0	384	384	yes	no	no
Germany	KKF.NET	Speedconnect 12x flat	1,500.1	0.0	0.0	995.5	0.0	0	768	768	yes	no	no
Germany	KKF.NET	Speedconnect 24x flat	1,500.1	0.0	0.0	1,660.5	0.0	0	1,500	1,500	yes	no	no
Germany	KKF.NET	Speedconnect 35x flat	1,500.1	0.0	0.0	2,442.8	0.0	0	2,300	2,300	yes	no	no
Germany	KKF.NET	Tariff A	473.3	0.0	0.0	145.7	0.0	0	192	128	no	yes	no
Germany	KKF.NET	Tariff B	473.3	0.0	0.0	171.6	0.0	0	384	144	no	yes	no
Germany	QSC	Speedway 1*	611.6	0.0	0.0	125.0	*	0	144	144	no	no	yes
Germany	Claranet	Clara.net 144	990.0	0.0	0.0	599.0	0.0	0	144	144	yes	no	no
Germany	QSC	Speedway 2*	611.6	0.0	0.0	240.0	*	0	256	256	no	no	yes
Germany	Claranet	Clara.net 256	990.0	0.0	0.0	899.0	0.0	0	256	256	yes	no	no
Germany	QSC	Speedway 5*	611.6	0.0	0.0	370.0	*	0	512	512	no	no	yes
Germany	Claranet	Clara.net 512	990.0	0.0	0.0	1,499.0	0.0	0	512	512	yes	no	no
Germany	QSC	Speedway 10*	611.6	0.0	0.0	490.0	*	0	1,024	1,024	no	no	yes
Germany	Claranet	Clara.net 1024	990.0	0.0	0.0	1,999.0	0.0	0	1,024	1,024	yes	no	no
Germany	QSC	Speedway 20*	611.6	0.0	0.0	590.0	*	0	2,300	2,300	no	no	yes
Germany	Claranet	Clara.net 2300	990.0	0.0	0.0	2,999.0	0.0	0	2,300	2,300	yes	no	no
Germany	Mannesman Arcor	Schnell	197.4	0.0	0.0	64	0.0	0	128	128	yes	yes	no
Germany	Mannesman Arcor	Superschnell	197.4	0.0	0.0	72	0.0	0	768	128	yes	yes	no
Germany	NGI	XXLine, 1600	1,119.8	0.0	0.0	255.2	56.0**	0	1,600	160	yes	no	no
Germany	NGI	XXLine, 2100	2,068.1	0.0	0.0	686.2	59.5**	0	2,100	192	yes	no	no
Germany	NGI	XXLine, 4100	5,085.3	0.0	0.0	2,324.1	59.5**	0	4,100	384	yes	no	no
Germany	NGI	XXLine, 6000	6,684.5	0.0	0.0	3,444.8	59.5**	0	6,000	576	yes	no	no
Germany	DT	T-ISDN 300 with DSL	100.9	0.0	0.0	92.4	0.0	0	768	128	yes	yes	no
Germany	DT	T-ISDN xxl with DSL	100.9	0.0	0.0	97.4	0.0	0	768	128	yes	yes	no
Germany	DT	T-ISDN standard DSL	100.9	0.0	0.0	87.4	0.0	0	768	128	yes	yes	no
Germany	DT	T-ISDN Komfort DSL	100.9	0.0	0.0	92.4	0.0	0	768	128	yes	yes	no
Germany	DT	T-Net DSL	100.9	0.0	0.0	82.3	0.0	0	768	128	yes	yes	no
Germany	DT	T-Net 100 DSL	100.9	0.0	0.0	87.4	0.0	0	768	128	yes	yes	no

Country	Operator/SP	Package	One off charges		Fixed monthly charges		Usage charges	Usage allowance	Capacity		Availability		
			Connection charge	One off modem	Modem	Sub scription	per GB	GB	Down	Up	Bus	Res	WS
Germany	DT	T-ATM DSL, 1***	498.6	0.0	0.0	381.4	***	0	2,000	192	no	no	no
Germany	DT	T-ATM DSL, 2***	498.6	0.0	0.0	674.8	***	0	4,000	384	no	no	no
Germany	DT	T-ATM DSL, 3***	498.6	0.0	0.0	958.4	***	0	6,000	576	no	no	no
Germany	DT	T-Interconnect DSL, 1500	1,271.3	0.0	0.0	273.8	60.7**	0	1,500	160	yes	yes	no
Germany	DT	T-Interconnect DSL, 2000	2,347.0	0.0	0.0	762.8	62.6**	0	2,000	192	yes	yes	no
Germany	DT	T-Interconnect DSL, 4000	5,867.5	0.0	0.0	2,131.9	60.7**	0	4,000	384	yes	yes	no
Germany	DT	T-Interconnect DSL, 6000	7,627.7	0.0	0.0	3,109.8	60.7**	0	6,000	576	yes	yes	no

** Lower limit for monthly subscription given. Usage rates also apply*

*** Usage rates vary according to monthly data volume*

**** Complex system of usage charges applies – not included in analysis*

DSL prices in the US

Country	Operator/SP	Package	One off charges		Fixed monthly charges		Usage charges	Usage allowance	Capacity		Availability		
			Connection charge	One off modem	Modem	Sub scription	per GB	GB	Down	Up	Bus	Res	WS
USA	Verio	Verio home office DSL	0.0	0.0	0.0	50.0	0.0	0	784	128	no	yes	no
USA	Verio	VerioOne dsl, 160	0.0	0.0	0.0	99.0	0.0	0	160	160	yes	no	no
USA	Verio	VerioOne dsl, 200	0.0	0.0	0.0	149.0	0.0	0	200	200	yes	no	no
USA	Verio	VerioOne dsl, 416	0.0	0.0	0.0	199.0	0.0	0	416	416	yes	no	no
USA	Verio	VerioOne dsl, 784	0.0	0.0	0.0	249.0	0.0	0	784	784	yes	no	no
USA	Verio	VerioOne dsl, 1040	0.0	0.0	0.0	299.0	0.0	0	1,040	1,040	yes	no	no
USA	Verio	VerioOne dsl, 1540	0.0	0.0	0.0	349.0	0.0	0	1,540	1,540	yes	no	no
USA	Verio	Verio PowerPack DSL, 160	0.0	0.0	0.0	135.0	0.0	0	160	160	yes	no	no
USA	Verio	Verio PowerPack DSL, 200	0.0	0.0	0.0	185.0	0.0	0	200	200	yes	no	no
USA	Verio	Verio PowerPack DSL, 416	0.0	0.0	0.0	235.0	0.0	0	416	416	yes	no	no
USA	Verio	Verio PowerPack DSL, 784	0.0	0.0	0.0	285.0	0.0	0	784	784	yes	no	no
USA	Verio	Verio PowerPack DSL, 1040	0.0	0.0	0.0	335.0	0.0	0	1,040	1,040	yes	no	no
USA	Verio	Verio PowerPack DSL, 1540	0.0	0.0	0.0	385.0	0.0	0	1,540	1,540	yes	no	no
USA	AT&T	Single-user, 608	300.0	0.0	10.0	50.0	0.0	0	608	128	no	yes	no
USA	AT&T	Single-user, 1500	300.0	0.0	10.0	80.0	0.0	0	1,500	384	no	yes	no
USA	AT&T	Multi User, 144	600.0	0.0	40.0	140.0	0.0	0	144	144	yes	no	no
USA	AT&T	Multi User, 192	600.0	0.0	40.0	140.0	0.0	0	192	192	yes	no	no
USA	AT&T	Multi User, 384	600.0	0.0	40.0	180.0	0.0	0	384	384	yes	no	no
USA	AT&T	Multi User, 768	600.0	0.0	40.0	250.0	0.0	0	768	768	yes	no	no
USA	AT&T	Multi User, 1100	600.0	0.0	40.0	330.0	0.0	0	1,100	1,100	yes	no	no
USA	AT&T	Multi User, 1500	600.0	0.0	40.0	400.0	0.0	0	1,500	1,500	yes	no	no
USA	XO	Home office DSL, 608	0.0	0.0	0.0	69.0	0.0	0	608	128	no	yes	no
USA	XO	Home Office DSL, 1500	0.0	0.0	0.0	89.0	0.0	0	1,500	384	no	yes	no
USA	XO	Business Basic DSL, 144	0.0	0.0	0.0	99.0	0.0	0	144	144	yes	no	no
USA	XO	Business DSL, 144	0.0	0.0	0.0	124.0	0.0	0	144	144	yes	no	no
USA	XO	Business DSL, 192	0.0	0.0	0.0	149.0	0.0	0	192	192	yes	no	no
USA	XO	Business DSL, 384	0.0	0.0	0.0	199.0	0.0	0	384	384	yes	no	no
USA	XO	Business DSL, 768	0.0	0.0	0.0	299.0	0.0	0	768	768	yes	no	no
USA	XO	Business DSL, 1048	0.0	0.0	0.0	349.0	0.0	0	1,048	1,048	yes	no	no
USA	XO	Business DSL, 1500	0.0	0.0	0.0	399.0	0.0	0	1,500	1,500	yes	no	no
USA	Southwestern Bell	Basic Stand alone DSL**	150.0	99.0	0.0	40.0	0.0	0	942	128	no	yes	no

Country	Operator/SP	Package	One off charges		Fixed monthly charges		Usage charges	Usage allowance	Capacity		Availability		
			Connection charge	One off modem	Modem	Sub scription	per GB	GB	Down	Up	Bus	Res	WS
USA	Southwestern Bell	Basic PC Dsl**	0.0	89.0	0.0	60.0	0.0	0	942	128	no	yes	no
USA	Southwestern Bell	Enhanced DSL, 1500**	250.0	0.0	0.0	70.0	0.0	0	942	128	yes	yes	no
USA	Southwestern Bell	Enhanced DSL, 6000**	250.0	0.0	0.0	190.0	0.0	0	3,750	384	yes	yes	no
USA	Southwestern Bell	Business DSL, 1500**	350.0	99.0	0.0	238.0	0.0	0	942	128	yes	yes	no
USA	Southwestern Bell	Business DSL, 6000**	350.0	99.0	0.0	328.0	0.0	0	3,750	384	yes	yes	no
USA	Covad	Telespeed 1.5S*	0.0	0.0	0.0	299.0	0.0	0	1,550	1,550	no	no	yes
USA	Covad	Telespeed 1.1 *	0.0	0.0	0.0	249.0	0.0	0	1,110	1,110	no	no	yes
USA	Covad	Telespeed 768*	0.0	0.0	0.0	129.0	0.0	0	768	768	no	no	yes
USA	Covad	Telespeed 384*	0.0	0.0	0.0	109.0	0.0	0	384	384	no	no	yes
USA	Covad	Telespeed 192*	0.0	0.0	0.0	89.0	0.0	0	192	192	no	no	yes
USA	Covad	Telespeed 144 *	0.0	0.0	0.0	89.0	0.0	0	144	144	no	no	yes
USA	Covad	Telesurfer Pro*	0.0	0.0	0.0	69.0	0.0	0	1,500	384	no	no	yes
USA	Covad	Telesurfer*	0.0	0.0	0.0	49.0	0.0	0	608	128	no	no	yes
USA	Speakeasy	Netadvantage 1.5S	225.0	299.0	0.0	400.0	0.0	0	1,550	1,550	yes	yes	no
USA	Speakeasy	Netadvantage 1.1	225.0	299.0	0.0	300.0	0.0	0	1,110	1,110	yes	yes	no
USA	Speakeasy	Netadvantage 768	225.0	299.0	0.0	250.0	0.0	0	768	768	yes	yes	no
USA	Speakeasy	Netadvantage 384	225.0	299.0	0.0	170.0	0.0	0	384	384	yes	yes	no
USA	Speakeasy	Netadvantage 192	225.0	299.0	0.0	125.0	0.0	0	192	192	yes	yes	no
USA	Speakeasy	Netadvantage 144	225.0	299.0	0.0	125.0	0.0	0	144	144	yes	yes	no
USA	Speakeasy	Telespeed 144	199.0	0.0	0.0	60.0	0.0	0	144	144	no	yes	no
USA	Speakeasy	Telesurfer	0.0	0.0	0.0	50.0	0.0	0	608	128	no	yes	no
USA	Speakeasy	Telesurfer Pro	0.0	0.0	0.0	80.0	0.0	0	1,500	384	no	yes	no
USA	Qwest	Megabit Select**	218.0	145.0	0.0	39.9	0.0	0	448	272	yes	yes	no
USA	Qwest	Megabit Deluxe**	218.0	145.0	0.0	49.9	0.0	0	448	272	yes	yes	no
USA	Qwest	Pro 256**	218.0	145.0	0.0	70.0	0.0	0	448	272	yes	no	no
USA	Qwest	Pro 640	218.0	145.0	0.0	80.0	0.0	0	640	544	yes	no	no
USA	Qwest	Pro 960	218.0	145.0	0.0	90.0	0.0	0	960	816	yes	no	no
USA	Qwest	Pro 1.2	218.0	145.0	0.0	100.0	0.0	0	1,200	1,000	yes	no	no
USA	Qwest	Pro 4.4	218.0	145.0	0.0	170.0	0.0	0	4,400	1,000	yes	no	no
USA	Qwest	Pro 7.1	218.0	145.0	0.0	270.0	0.0	0	7,100	1,000	yes	no	no
USA	Verizon	Online Personal DSL**	120.0	0.0	0.0	40.0	0.0	0	448	90	no	yes	no
USA	Verizon	Online professional DSL**	120.0	0.0	0.0	100.0	0.0	0	1,280	90	yes	yes	no

Country	Operator/SP	Package	One off charges		Fixed monthly charges		Usage charges	Usage allowance	Capacity		Availability		
			Connection charge	One off modem	Modem	Sub scription	per GB	GB	Down	Up	Bus	Res	WS
USA	Verizon	Online DSL power**	120.0	0.0	0.0	190.0	0.0	0	5,790	532	yes	yes	no
USA	Verizon	Bronze Plus	50.0	0.0	0.0	40.0	0.0	0	768	128	yes	no	no
USA	Verizon	Silver	50.0	0.0	0.0	93.0	0.0	0	384	384	yes	no	no
USA	Verizon	Gold	50.0	0.0	0.0	128.0	0.0	0	768	768	yes	no	no
USA	Verizon	Platinum	50.0	0.0	0.0	205.0	0.0	0	1,500	768	yes	no	no
USA	Verizon	Platinum Plus	50.0	0.0	0.0	405.0	0.0	0	1,500	768	yes	no	no
USA	Northpoint	Evolving Edge, 144S	0.0	0.0	0.0	120.0	0.0	0	144	144	yes	yes	no
USA	Northpoint	Evolving Edge, 160S	0.0	0.0	0.0	130.0	0.0	0	160	160	yes	yes	no
USA	Northpoint	Evolving Edge, 200S	0.0	0.0	0.0	150.0	0.0	0	200	200	yes	yes	no
USA	Northpoint	Evolving Edge, 416S	0.0	0.0	0.0	200.0	0.0	0	416	416	yes	yes	no
USA	Northpoint	Evolving Edge, 784S	0.0	0.0	0.0	250.0	0.0	0	784	784	yes	yes	no
USA	Northpoint	Evolving Edge, 1040S	0.0	0.0	0.0	350.0	0.0	0	1,040	1,040	yes	yes	no
USA	Northpoint	Evolving Edge, 1540S	0.0	0.0	0.0	400.0	0.0	0	1,540	1,540	yes	yes	no
USA	Northpoint	Evolving Edge, 784	0.0	0.0	0.0	80.0	0.0	0	784	392	yes	yes	no
USA	Northpoint	Evolving Edge, 784 res	0.0	0.0	0.0	50.0	0.0	0	784	392	no	yes	no
USA	Northpoint	Evolving Edge, 144 res	0.0	0.0	0.0	50.0	0.0	0	144	144	no	yes	no

**Lower limit for monthly subscription given.*
*** Mid point of capacity range given*

Cable modem prices

Country	Operator/SP	Package	One off charges		Fixed monthly charges		Usage charges	Usage allowance	Capacity		Availability		
			Connection charge	One off modem	Modem	Sub scription	per GB	GB	Down	Up	Bus	Res	WS
UK	NTL		21.3	126.8	0.0	34.0	0.0	0	512	128	no	yes	no
UK	Telewest		42.6	38.3	0.0	28.1	0.0	0	512	128	no	yes	no
France	Noos		250.0	0.0	0.0	318.0	0.0	0	512	128	no	yes	no
France	France Telecom (CM)	Cable Wanadoo plien	340.0	0.0	0.0	1,587.8	0.0	0	1,000	256	no	yes	no
France	France Telecom (CM)	Cable Wanadoo multi	340.0	0.0	0.0	781.1	0.0	0	512	128	no	yes	no
France	France Telecom (CM)	Cable Wanadoo base	340.0	0.0	0.0	238.3	0.0	0	512	128	no	yes	no
France	NC Numericable		700.0	0.0	90.0	235.0	0.0	0	512	128	no	yes	no
Germany	Primacom	_easy to go*	128.4	0.0	8.6	0.0	120.0	0	128	64	no	yes	no
Germany	Primacom	_easy*	128.4	0.0	8.6	34.4	90.0	1	256	64	no	yes	no
Germany	Primacom	_pro	128.4	0.0	8.6	68.9	0.0	0	1,024	256	no	yes	no
Germany	Primacom	easy_business	125.0	0.0	0.0	199.0	50.0	2	512	256	yes	no	no
Germany	Primacom	pro_business	125.0	0.0	0.0	489.0	50.0	5	1,024	512	yes	no	no
Germany	Primacom	large_business	250.0	0.0	0.0	990.0	50.0	10	1,024	1,024	yes	no	no
USA	Comcast	Comcast Customer	149.0	0.0	7.0	33.0	0.0	0	2,880	0	no	yes	no
USA	Comcast	Non-Comcast customer	149.0	0.0	7.0	43.0	0.0	0	2,880	0	no	yes	no
USA	AT&T (CM)	Single user – home office	200.0	0.0	0.0	79.0	0.0	0	2,250	256	no	yes	no
USA	AT&T (CM)	Single user – Small office	200.0	0.0	0.0	99.0	0.0	0	2,250	256	yes	no	no
USA	AT&T (CM)	Multi-user	500.0	0.0	0.0	249.0	0.0	0	2,250	256	yes	no	no
USA	AT&T (CM)	Multi-user	500.0	0.0	0.0	349.0	0.0	0	2,250	512	yes	no	no
USA	AT&T (CM)	at home	0.0	0.0	0.0	40.0	0.0	0	2,250	128	no	yes	no
USA	Roadrunner	California	0.0	0.0	0.0	40.0	0.0	0	1,750	768	no	yes	no
USA	Roadrunner	Ohio	70.0	0.0	0.0	40.0	0.0	0	1,750	768	no	yes	no
USA	Roadrunner	New York	99.0	0.0	0.0	40.0	0.0	0	1,750	768	no	yes	no
USA	Roadrunner	New York – PRO	99.0	0.0	0.0	80.0	0.0	0	1,750	768	yes	no	no

** These variable rate services have been excluded from the analysis to ensure comparability.*