

Broadband Telecommunications

Benchmarking Study

January 2004



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Executive Summary

I. Introduction

This paper assesses Ireland's competitiveness relative to 21 countries¹ with a particular focus on the broadband² telecommunications requirements of the enterprise sector.

In recent months, there have been a number of positive developments in the telecommunications sector in Ireland, including:

- The introduction of FRIACO³. Since June 2003, there has been strong growth in the number of flat rate narrowband subscribers and the number of households connected to the Internet.
- There has been strong growth in DSL take-up⁴ as operators have temporarily reduced entry level prices and become more focused on marketing.
- Construction of the Metropolitan Area Networks (MAN) is on schedule and expected to be operational by 2004. Selection of a Managed Services Entity (MSE) to operate these networks is at an advanced stage.

Since the preparation of the statistics for this report, there have been a number of encouraging announcements by:

1. **The Department for Communications, Marine and Natural Resources (DCMNR)** of a Broadband Action Plan, which will connect a further 88 towns of 1,500+ population to broadband with Community Broadband Exchanges and strategic fibre;
2. **eircom** that it also plans to roll-out broadband to every town in Ireland with a population greater than 1,500 by March 2005. eircom also announced recently that it proposes to reduce its prices for basic broadband services. This should serve to improve price competitiveness for broadband services.
3. **Esat BT and ESB** that they propose to cut their wholesale telecoms tariffs which should substantially reduce the price differential that exists between Dublin and the regional towns that they serve.
4. **Smart Telecom** who plan to invest up to €35 million over the next five years creating a fibre optic telecoms network across the State.

The positive implications of these announcements will be captured in future benchmarking reports. However, despite recent progress, Ireland remains significantly behind leading countries with respect to the rollout of broadband, particularly to residential customers and SME's. This paper sets out a range of actions focused on:

1. **ensuring the success of the Government Broadband Strategy (e.g., the metropolitan areas networks);**
2. **enhancing competition and innovation in the delivery of broadband services in Ireland; and,**
3. **promoting demand side initiatives.**

1 The 21 countries are the EU-15, Canada, Japan, Korea, Hungary, the Czech Republic and the US.

2 The two key broadband technologies benchmarked are leased lines and Digital Subscriber Line (xDSL) technology which allows the provision of high speed services over the copper lines into businesses and homes. See Appendix 1 for a detailed glossary of technical terms used.

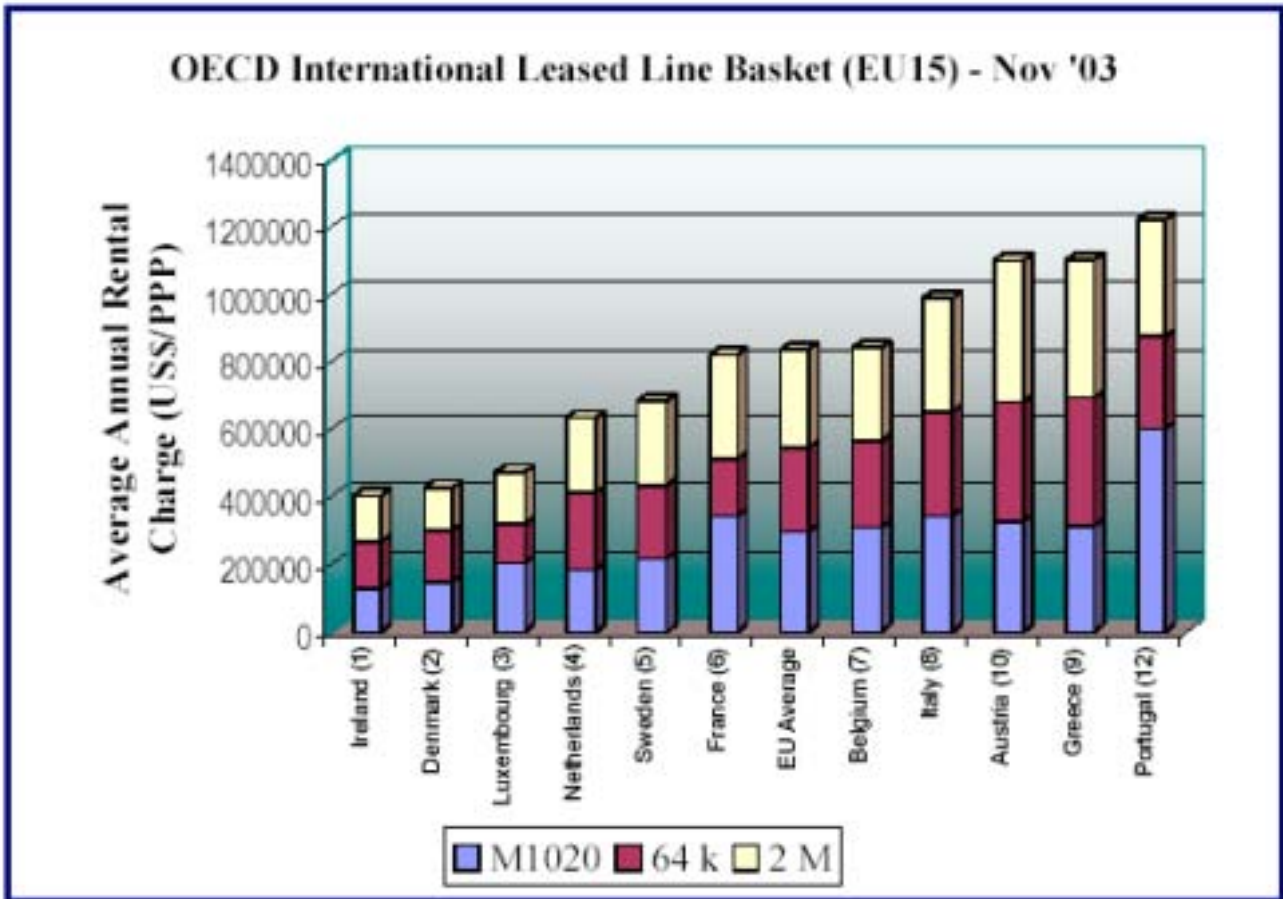
3 Flat Rate Internet Access

4 From a small base

II. Key Metrics

1. International Connectivity

Figure A: International Leased Line Costs

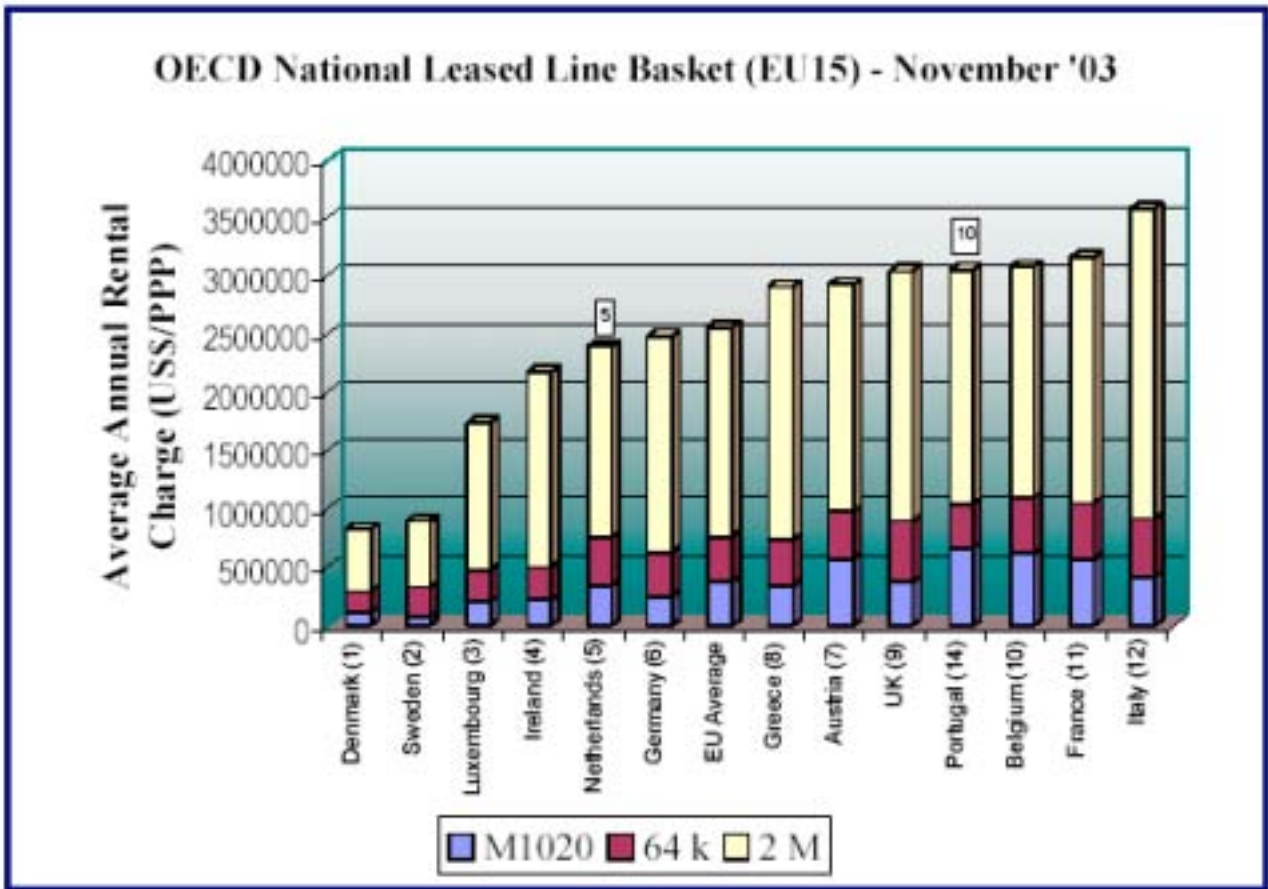


Source: ComReg

Ireland has significant international capacity available to support current and future enterprise activity, and is served by a variety of routes and carriers (e.g., Eircom, EsatBT, NTL, Global Crossing, Cable & Wireless, Hibernia Atlantic etc.). High levels of capacity, and carriers and diversity in terms of landing areas, has resulted in strong competition and very competitive prices. As can be seen in figure A above, Ireland offers the lowest international leased line costs in the OECD.

2. National Connectivity

Figure B: National Leased Lines Cost



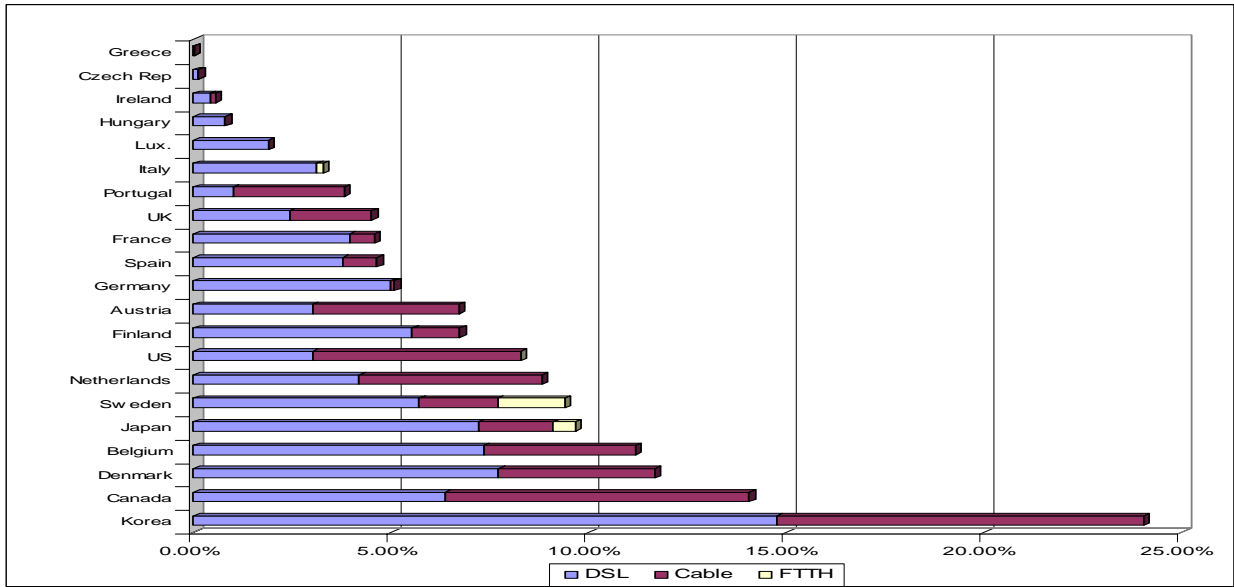
Source: ComReg

Ireland has an extensive national fibre network infrastructure with a range of national (e.g., eircom, EsatBT, ESB, Aurora) and regional players (e.g., Cable and Wireless, Worldcom, etc). As can be seen in Figure B above, national leased line costs compare well with the rest of the OECD. Ireland currently lies in 4th position, three places ahead of the EU average.

3. Overall take-up of Broadband

However, as can be seen from Figure C, Ireland’s *overall* broadband take-up by businesses and residential users relative to other countries is relatively weak. An assessment of Irish broadband coverage/availability, take-up by business and costs, indicates that Ireland is currently about 3 years behind the average country in the benchmark group in terms of overall broadband take-up and 5 years behind the best countries in the group.

Figure C: Overall Broadband Take-Up



Note: FTTH – Fibre To The Home

III. Key Benchmark Results and Recommendations

1. Prices and Service Availability

The relatively high costs of broadband services for businesses is the key issue. Ireland ranks 18th of the 21 comparator countries for entry-level⁵ DSL for small businesses and residential users, 19th for basic 0.5Mbit/s DSL for small businesses, 19th for advanced 2Mbit/s DSL (used by medium-sized businesses) and 9th for fibre to large corporates.

DSL coverage/availability is increasing but remains relatively low at approximately 60%. This figure is expected to reach 74% by the end of 2004, and 82% by 2008. Northern Ireland is expected to have 100% coverage by 2006/07. Ireland currently ranks 17th among the comparator group of 21 countries for DSL coverage.

It is recommended that:

- Government and ComReg should maintain pressure on telecommunications operators to provide DSL services at more competitive prices for mass market take-up to develop. International data indicates that a price of approximately €30-€40 per month is required if customers are to adopt DSL as a mass-market technology. eircom's current retail price stands at €54/month⁶.
- Government should work with the telecoms operators to assess how broadband (DSL, wireless, etc) can be rolled out to the parts of the market where commercial services are not currently planned.

2. Lack of Competition and Innovation within the DSL Market

In Ireland, it is increasingly likely that DSL will be the only significant platform for the delivery of broadband services to residential and SMEs in the medium term; unlike many other countries where there is strong competition between cable and DSL, and within the DSL market.

Both local loop unbundling (LLU) and DSL resale provides telecommunications service providers the opportunity to offer broadband to the enterprise sector by using the incumbent's network and thus boost competition in the DSL market. In Ireland, both options have had limited success to date. Issues remain over the cost of LLU, the availability of collocation space, and the need for more responsive service level agreements on line repairs for SDSL⁷. For resale, both the size of the margin (between eircom's wholesale and retail price) and the high absolute cost of the service provides little incentive for new entrants to offer services. The market in Ireland is characterised by low levels of competition, resulting in high prices and the provision of basic services with little innovation.

It is recommended that:

- The Department of Communications, Marine and Natural Resources has indicated that it may use public buildings to provide collocation space. Further (technical, economic and legal) work is required to analyse all aspects of this proposal to ensure that the provision of collocation centres on an open access basis would be sufficient to develop a truly competitive DSL and broadband market.
- ComReg should initiate work on a remote collocation product so that the necessary regulatory framework will be in place to support government action.
- The Department of Communications, Marine and Natural Resources should assess how DSL resale prices can be lowered in order to stimulate competition and market development.

⁵ Operates at speeds of between 0.25 and 0.5Mbit/s.

⁶ Eircom has announced that it intends to lower the cost of basic DSL services in Q1, 2004 to €39.99 per month (including VAT).

⁷ Symmetric Digital Subscriber Line

3. Governments Metropolitan Area Networks (MAN) Strategy

Construction of fibre Metropolitan Area Networks (MANs) by Local Authorities in 19 centres with funding from the Department of Communications, Marine and Natural Resources is expected to be completed in 2004 and should increase competition and diversity of supply, resulting in lower costs for business. The Broadband Action Plan announced by the Department of Communications, Marine and Natural Resources in December 2003 to connect a further 88 towns with community exchanges and strategic fibre is strongly supported by the development agencies.

To leverage these MANs, it is recommended that:

- The Local Authority MAN programme should be extended beyond its current programme to pass more businesses by lengthened existing networks. The network should also be further developed by government and local authority by mandating opportunistic deployment of duct during the laying of other infrastructure (e.g. water mains, roads, bridges etc.)
- The Department of Communications, Marine and Natural Resources should make the best use of the state-owned backbone networks (e.g. CIE, Bord Gáis) to enhance competition in the backbone network (particularly to the MAN centres).
- The implementation of partial private circuits has helped stimulate competition in other EU countries by providing a mechanism to allow operators to efficiently gain access to their incumbent's local access network. It will take a few months to determine if the price levels and provision of circuits are equally positive in Ireland. The Department of Communications, Marine and Natural Resources and ComReg should continue to monitor their up-take, and take appropriate action if necessary.
- The role of the Management Services Entity (MSE) should be restricted to the provision of dark fibre, and should not provide transmission or services.

4. Lack of Inter-Platform Competition

Incumbent telecommunications operators in all countries were originally reluctant to rollout DSL as it undercut the price of their current business services (e.g. ISDN, leased lines, and other premium services). The impetus which forced many of them to invest was serious competition from cable TV companies.

It is recommended that:

- The Department of Communications, Marine and Natural Resources should continue to monitor and promote developments in the cable TV market, with specific emphasis on its role as a platform for the delivery of broadband services.
- Following on from the introduction of a fixed-rate product for basic narrowband services in June 2003, ComReg should mandate the introduction of a similar fixed-rate interconnect product for ISDN services, which would allow competing operators to offer nationwide higher speed always-on services nationally at cost-orientated prices.

5. Demand Side Initiatives

Policies that promote infrastructure availability in isolation from the demand-driven applications that utilise this capacity run the risk of encouraging inefficient investment decisions by Government and the private sector in telecommunications. Much of the focus to date has been on the supply of broadband given Ireland's current position in this context. Going forward, it will be necessary to ensure that support is also given to promoting awareness and demand for broadband content and applications. The *OpenUp* e-business initiative recently launched by Enterprise Ireland should act as a driver for future demand and take up of broadband technologies through creating awareness and support for companies regarding the benefits and possibilities associated with e-business functions⁸.

⁸ Information on this initiative is available at www.enterprise-ireland.com/ebusiness/

It is recommended that:

- A Broadband Awareness Programme should be introduced to inform both enterprise and the general public of service offerings in Ireland and their associated advantages. (Telecoms Strategy Group, Department of Communications, Marine and Natural Resources, Department of Enterprise, Trade and Employment, development agencies).
- As Government procurement contracts for telecommunications arise in 2004/5, greater consideration should be given to the need to promote broadband demand, to encourage the rollout of infrastructure and to promote competition in the telecoms market, while ensuring long-term value for money. (Government)

1.0. Background and Introduction

This paper assesses Ireland's competitiveness relative to 21 countries with a particular focus on the broadband telecommunications requirements of the enterprise sector.

The principal objectives of the benchmarking paper are to:

- determine best practice in the provision of broadband telecommunications for the enterprise sector in competitor countries; and,
- determine and analyse gaps between the provision of broadband telecommunications and tariffs for enterprises based in Ireland relative to other countries and to form an agenda for action and improve Ireland's competitiveness.

2.0. The Benchmarking Methodology

Forfás commissioned Norcontel, a specialist telecommunications consultancy, to benchmark Ireland's broadband telecommunications infrastructure and levels of investment, service availability, tariffs, and the telecommunications regulatory environment with competitor and leading countries. This report compares Ireland to the EU-15, Canada, Japan, Korea, Hungary, the Czech Republic and the US.

The benchmarking methodology was presented to and agreed with a Steering Group comprising members from the Department of Enterprise, Trade and Employment, the Department of Communications, Marine and Natural Resources, Forfás, IDA Ireland and Enterprise Ireland.

2.1. What is Broadband?

Broadband is defined as advanced telecommunications services providing high bandwidth communications over a variety of platforms. Currently, there are three main technologies used to deliver broadband services in the benchmark countries: Digital Subscriber Lines (DSL), cable modems and optical fibre. As part of this process, the following technologies are benchmarked:

1. **DSL** for small and medium sized companies;
2. Developments across **cable modems** and a range of other potential broadband technologies, e.g., Broadband Fixed Wireless Access, Mobile, Satellite, etc. are monitored but these are not currently being developed in a meaningful way for businesses in Ireland.(see Appendix 3).
3. **Optical fibre** connections for large companies, the public sector and those requiring very advanced communications capabilities;

ISDN is not normally considered a broadband technology; however it can be used to substitute for DSL where the service is not available in Ireland. However, since the monthly charge for the service varies with usage, it is an expensive alternative to DSL.

3.0. Telecommunications Sector Overview

The telecommunications sector both in Ireland and internationally is still suffering from the economic and technology downturn. In Ireland, the December 2003 *Quarterly Market Commentary* from ComReg⁹, notes that:

- total revenues for fixed, mobile and broadcasting markets now stands at an estimated €3.65 billion per annum, which reflects an increase of approximately 4% since last year and 14% since 2001;
- the telecoms sector is estimated to account for approximately 3.5% of Irish GDP¹⁰;
- Internet penetration continues to grow in 2003 with Ireland's residential penetration rate currently standing at 44%;
- mobile penetration rates now stands at 83%, an increase of 6% in the last 12 months, while average revenue per mobile users remains amongst the highest in Europe (€46 per month compared to EU average of €31);

⁹ Data based on returns from licences for the period July-September 2003

¹⁰ Figure calculated using GDP at market price (2002) by the ESRI

- Approximately 17% of cable/MMDS¹¹ subscribers have upgraded to digital compared to 9% in December 2002. 29% of all households with a TV are now cable/MMDS or satellite digital subscribers;
- ISDN continued to grow during the quarter but at a slower rate reflecting some increase in DSL take-up. The number of 2Mbit/s ISDN lines in service is currently about 6,000 lines.

4.0. Overall Benchmark Results (DSL)

Since DSL is currently the main delivery platform for broadband services in Ireland (see Figure 1), this section sets out Ireland's relative performance among the benchmarked countries in terms of DSL coverage/availability and take-up/number of connections.

- Ireland**
- **DSL take-up** in Ireland is about 0.42% per capita. Korea remains the leading country in the comparator group at almost 15% per capita.
 - Ireland ranks 19th in the comparator group of 21 countries in DSL take-up as illustrated in Table 1 (p.3). As of October 2003, the number of DSL lines installed by all operators is estimated to be 15,700, with approximately 1,000 orders per week being placed.
 - Ireland ranks 17th in the comparator group of 21 countries in terms of **DSL coverage**, ahead of Greece, Portugal, Hungary and the Czech Republic. Since the launch of DSL services in May 2002 by both eircom and Esat BT, DSL coverage has increased to approximately 60%. This figure is expected to increase more slowly to reach over 82% by the end of 2008¹².
 - Esat-BT has installed DSL in 40 exchanges with the support of NDP funding.

Table 1. DSL Take-up and Growth in Take-up, by Population and Businesses, 3rd Quarter 2003

¹¹ Multipoint Microwave Distribution System

¹² Eircom plan to install DSL capability in 170 exchanges by the end of 2004 reaching about 74% of customers. The company's target is to equip 250 exchanges with the technology by 2008.

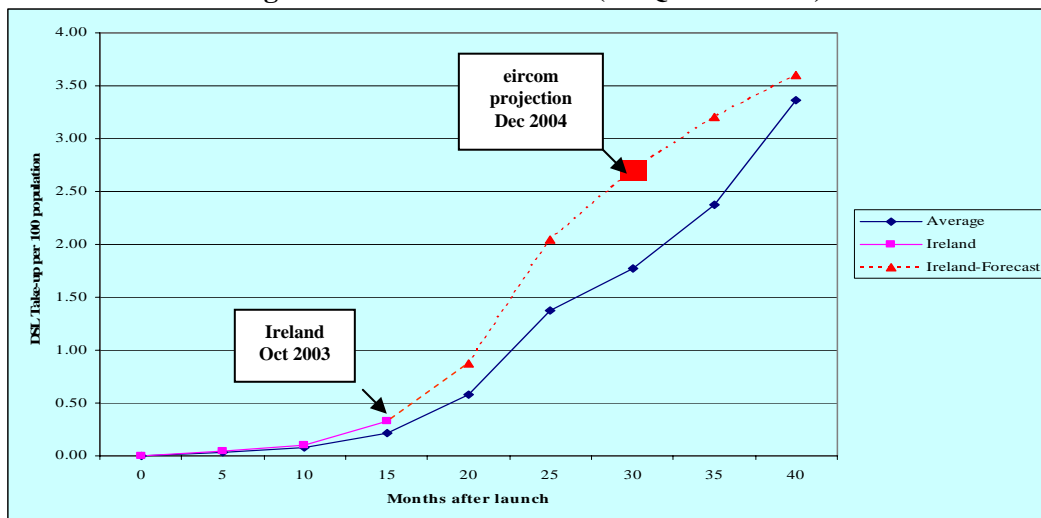
Ranked by DSL Take-up	Country	DSL Coverage	DSL Take-up by population	DSL Take-up by businesses ¹³	DSL Take-up – ‘000 Connections		Growth in DSL Take-up
					Q2 2003	Q3 2003	
		%	%	%			Q3 2003 %
1	Korea	90%	14.76%	61%	6,811	6,918	2%
2	Denmark	95%	7.72%	100%	378	410	8%
3	Belgium	98%	7.33%	100%	644	750	16%
4	Japan	66%	7.21%	61%	8,257	9,139	11%
5	Canada	85%	6.37%	54%	1,868	1,941	4%
6	Sweden	83%	5.71%	23%	484	506	5%
7	Finland	60%	5.54%	100%	259	286	10%
8	Germany	95%	5.00%	37%	3,864	4,102	6%
9	Netherlands	85%	4.19%	48%	543	662	22%
10	France	81%	3.96%	11%	2,039	2,337	15%
11	Spain	90%	3.76%	63%	1,302	1,483	14%
12	Italy	90%	3.12%	34%	1,435	1,781	24%
13	Austria	95%	3.03%	34%	224	244	9%
14	US	87%	3.01%	24%	7,576	8,210	8%
15	UK	75%	2.42%	25%	1,072	1,437	34%
16	Lux.	90%	1.90%	20%	7	8	14%
17	Portugal	50%	1.02%	21%	88	102	16%
18	Hungary	49%	0.80%	10%	64	80	25%
19	Ireland	60%	0.42%	11%	7	15	114%
20	Czech Rep.	57%	0.13%	2%	6.5	13	100%
21	Greece	30%	0.00%	0%	359	485	35%

Sources: Norcontel, Point-Topic, Federal Communications Commission (FCC), Oftel.

Overseas

Figure 2 is based on the average growth curves of the five top countries rebased to a common starting point, and plots the growth of DSL in Ireland relative to that curve. The graph indicates that Ireland currently has above average DSL growth levels and the square box forecasts the required growth rate to meet eircom’s target of 100,000 DSL subscribers by the end of 2004. However, Norcontel estimate that 380,000 DSL broadband subscribers are required by the end of 2004 if Ireland is to match the estimated average rate of the top five countries at that time (8.4%).

Figure 2: DSL Growth Path (3rd Quarter 2003)



¹³ As a percentage of all businesses.

Conclusions

- Korea remains the leading country and has seen further growth in DSL take-up of over 100,000 connections since April of this year. Close to 15% of the Korean population and 61% of Korean businesses now use DSL with telecommunications operators there servicing 6.9 million DSL connections.
- Denmark continue to rank second and have seen further steady growth of 8% in DSL take-up since the last quarter.
- The UK is witnessing significant growth in DSL with over 1.4 million DSL subscribers.
- Coverage, already high in comparator countries, is still growing as DSL equipped sites reach further into less densely populated areas and as the range of DSL improves. The cost of installing DSL lines is continuing to fall rapidly from €700 per line only three years ago to under €200 today, thus making the services increasingly economical in more regional areas.
- A substantial percentage of businesses in comparator countries are already using broadband.
- Business use of broadband is booming worldwide, mainly driven by take-up of DSL. As can be seen in Table 1, Ireland has experienced strong growth rates. However, Ireland continues to lag leading and competitor countries for take up of broadband services, and remains near the bottom of the table for overall broadband take-up.
- While DSL coverage is estimated to reach up to 81% by the 2008 from 60% in October 2003, this compares unfavourably with other EU countries. By comparison BT in the UK currently covers about 64% of the population and will cover 80% of households by 2005. Even those with low population density such as Sweden (83%) have substantially greater coverage than Ireland.

5.0. Sector-Specific Broadband Results

This section benchmarks Ireland's broadband competitiveness for three user categories: small, medium-sized, and large companies. Table 2 sets out the current price of broadband services for each of these user categories. In each case, the most appropriate technology to provide the required applications are benchmarked, that is DSL for small and medium sized businesses, and fibre optic based high-speed leased lines for large corporates and Government. (see Appendix 2 for typical business uses of broadband).

Table 2: Monthly Tariffs for DSL and Leased Lines, 3rd Quarter 2003¹⁴

	Small Firms DSL				Medium Sized Firms DSL		Large Corporates and Government Leased Lines	
	'Entry level' Services		Basic Broadband Services		Advanced Broadband Services		Advanced Broadband Services	
	0.25-0.5Mbit/s		0.5Mbit/s		2Mbit/s		34Mbit/s (2km lines)	
	Price €	Rank	Price €	Rank	Price €	Rank	Price €	Rank
Korea	32	1	32	1	36	1	-	
US	36	2	33	2	92	3	5,195	12
Portugal	39	3	62	7	294	16	6,805	15
Netherlands	40	4	85	14	105	6	1,548	2
Canada	41	5	75	11	106	7	-	
Japan	41	6	57	4	74	2	8,004	16
Hungary	46	7	99	16	292	15	-	
Belgium	47	8	76	12	299	17	2,177	5
Spain	48	9	83	13	163	9	5,210	13
UK	49	10	105	17	204	12	4,468	10
France	54	11	59	5	195	10	3,800	8
Sweden	56	12	61	6	195	11	2,073	4
Italy	58	13	71	10	254	14	6,037	14
Austria	59	14	213	20	686	19	1,900	3
Finland	59	15	63	8	95	4	-	
Germany	68	16	70	9	106	8	1,295	1
Denmark	75	17	50	3	102	5	3,374	7
Ireland (eircom)¹⁵	75	18	175	19	352	18	4,311	9
Ireland (Esat BT)	69		100		399			
Lux.	77	19	87	15	248	13	3,325	6
Czech Rep	98	20	213	21	764	20	-	
Greece	122	21	141	18	-		4,477	11

Sources: Norcontel, point-topic, Irish Operators, Tarifica.

5.1 Small Firms: Entry Level/Basic DSL Services

- Introduction**
- Small firms are generally more risk adverse and tend to sample products before making significant investments. With broadband, they can do this by purchasing entry level DSL (0.25-0.5Mbit/s) first. This is only suitable for SMEs with limited internet applications, but will be critical to developing a mass market for broadband in Ireland. The price of entry level DSL provides a sound benchmark of the potential for mass-market growth.
 - Typically, small firms use basic asymmetric DSL (ADSL) which provides downstream bandwidth speed of 0.5Mbit/s.

¹⁴ All prices quoted in table 2 include the amortised installation & equipment costs of DSL by the Telco.

¹⁵ Prices for eircom services are used to benchmark Ireland's position since these services are more widely available than those of Esat BT.

Ireland Entry Level DSL (0.25-0.5Mbit/s):

- Although prices have halved in recent months (€41 to €75), Ireland still ranks 18th among the 21 comparator countries in terms of price competitiveness for entry level DSL. (see Table 2).
- eircom are currently offering a discounted rate with free installation, equipment and one month's free rental for subscribers who contract before the end of February 2004. This brings the cost down to €9.91/mth (€54 including VAT)¹⁶. Esat-BT's service price stands at €69/mth, with the current discount rate at €45.79/mth. The benchmark prices in Table 2 do not include short term discounts in Ireland and the other comparator countries.

Basic DSL (0.5Mbit/s):

- Ireland**
 - The current price charged per month for basic DSL in Ireland is €75. Ireland ranks 19th among the comparator group, ahead of Austria and the Czech Republic.
- Overseas**
 - Korea is ranked first for basic DSL prices, charging €32 per month for the service. Operators in a number of countries have launched low cost 'entry level' products which are developing market demand in those countries.
 - The US have reduced both entry-level and basic broadband prices in recent months and are now ranked 2nd for both services.
- Conclusions**
 - Ireland's entry level DSL prices have dropped considerably. The current discount offer of €9.91, temporarily improves competitiveness with countries in the comparator group.
 - Basic broadband prices in Ireland remain significantly more expensive than the leading countries, thus, small firms in Ireland face a substantial cost disadvantage. This is a serious cause for concern since such high prices can only serve to constrain DSL penetration in Ireland. It is unlikely that Ireland will reach mass-market penetration levels in the near future.
 - Despite facing higher costs, business use of broadband is growing. Norcontel estimate that 11% of Irish businesses now have broadband (The average currently stands at 40% in the comparator group)

5.2 Medium Sized Firms: Advanced DSL Services (2Mbit/s)

- Introduction**
 - Medium sized firms require higher levels of bandwidth so as to keep Internet access per employee above minimum broadband levels and to support more advanced broadband applications. These can be delivered through advanced ADSL at a speed of 2Mbit/s downstream.
- Ireland**
 - Ireland ranks 19th among the comparator group with eircom's charge for advanced DSL at €52 per month¹⁷. Esat BT's price for equivalent 2Mbit/s DSL has dropped considerably from a price of €42/mth, but at €99/mth still remains higher than eircom's offering.
- Overseas**
 - Korea and Japan remain 1st and 2nd respectively for 2Mbit/s DSL services. Companies in the US have considerably reduced their prices since the last report, from €202 to the current price of €92, and are now ranked 3rd.
- Conclusion**
 - Demand for advanced DSL in Ireland is expected to continue to increase over the next few months. However, prices remain significantly higher than in the leading countries.

¹⁶ Eircom has announced that it intends to lower the cost of basic DSL services in Q1, 2004 to €9.99 per month (including VAT).

¹⁷ Since eircom do not offer a 2Mbit/s service, calculations for Ireland are based on two 1Mbit/s lines.

5.3 Large Corporates and Government (34Mbit/s – Fibre Optic)

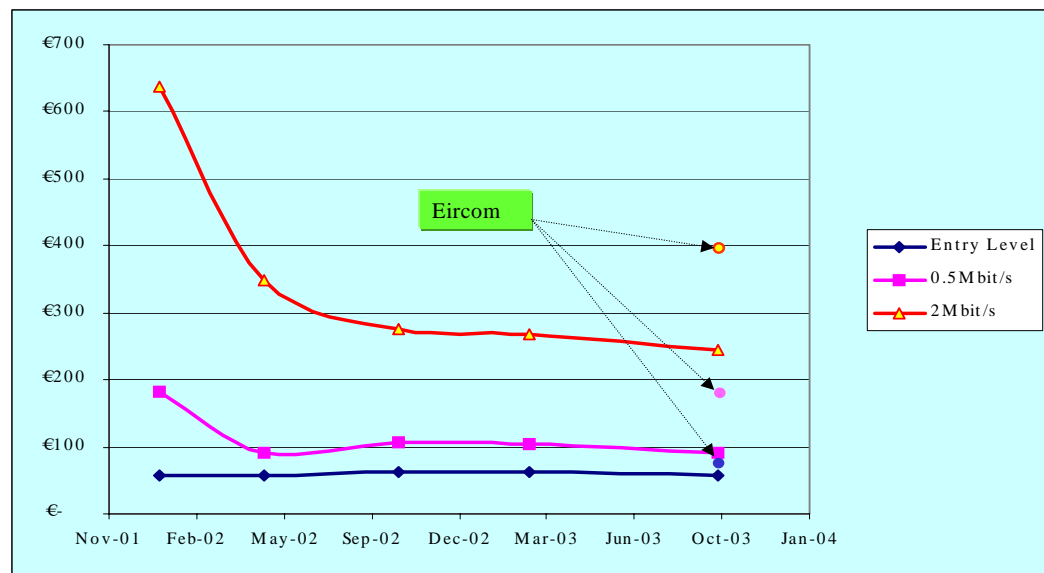
- Introduction**
- A large company or government organisation may require bandwidth in the range of 10 to 100 Mbit/s to ensure leading edge broadband services can be supported (e.g., video-conferencing and permanent video-streaming). In many cases, fibre to the building is required to support these services.
- Ireland**
- Ireland is ranked 9th in the comparator group for high capacity leased lines (see Table 2, p.4).
- Overseas**
- The price of a 34Mbit/s service in Ireland is still significantly more expensive than the leading countries. Operators in Germany cut prices for a 34Mbit/s service from €1,618 to €1,295 earlier this year, moving to 1st in the ranking. The Netherlands and Austria, whose prices have remained static, remain in 2nd and 3rd position respectively.
- Conclusion**
- Ireland compares more favourably with comparator countries in terms of the costs of leased lines than for DSL services. However, Norcontel estimated in October that there were only approximately 690 fibre connections to end users in Ireland. This is equivalent to a fibre take-up rate by business of 0.7%, which is relatively low by international standards (US - 7.3%, UK - 2.4%).

6.0. Drivers of DSL Rollout and Take-Up

There are a number of factors that have driven broadband development in best practice countries. These are summarised below. Developments in Ireland are also examined, and key recommendations are outlined.

- 6.1 PRICE OF DSL**
- International data indicates that a price of approximately €30-€40 per month is required if customers are to adopt DSL as a mass-market technology. Price variations (both up and down) are evident in many countries as broadband markets mature. However, the overall trend is a lowering of broadband costs.
 - Figure 3 looks at price trends for the benchmark group in comparison with eircom's prices. While the price of the entry level DSL service has remained fairly static, the average price of business service and especially high speed business services have fallen considerably over the last 21 months in the benchmarking group.

Figure 3: Benchmark group DSL price development Jan 2002 to Oct 2003



Conclusions

DSL prices are not conducive to mass take-up of broadband:

As of Quarter 3 2003;

1. entry level DSL prices were 29% more expensive than the average benchmark price. The current discounts close this gap until the offer expires at the end of February 2004.
 2. business services were 52% more expensive relative to the benchmark group average.
 3. The cost of the business 2Mbit/s service in Ireland was 61% higher than the average benchmark price.
- In December 2002, the Minister for Communications, Marine and Natural Resources issued a policy direction to the Communications Regulator to give effect to flat rate tariffing. This service was introduced in June 2003 and there are now approximately 30,000 subscribers¹⁸. This has encouraged the take-up and use of the narrowband internet by the general population, and provided an incentive for eircom to encourage its customers to switch to broadband.

¹⁸ ComReg December Quarterly Report 2003

- Recommendations**
- *Government and ComReg should maintain pressure on telecommunications operators to provide DSL services at more competitive prices for mass market take-up to develop. International data indicates that a price of approximately €30-€40 per month is required if customers are to adopt DSL as a mass-market technology. eircom's current retail price stands at €54/month.*
 - *Government should work with the telecoms operators to assess how broadband (DSL, wireless, etc) can be rolled out to the parts of the market where commercial services are not currently planned.*

6.2 COMPETITION FROM OTHER TECHNOLOGIES

- Incumbent telecommunications operators in many countries were originally reluctant to rollout DSL as it undercut the price of their current business services (ISDN, leased lines, and other premium services). The impetus which forced many of them to invest was serious competition from cable TV companies.
- A study of OECD countries indicates that success in promoting broadband rollout is affected more by competition within technologies (e.g., DSL) and competition across technologies (DSL, Cable, Wireless) than the intensiveness of the regulatory authorities¹⁹.

Ireland

- Currently, there is no serious investment being made by the cable network operators in Ireland to promote cable modems and they are not providing strong competition to the DSL market. Despite the large penetration of cable TV in Ireland, cable TV networks are under considerable commercial pressure from other media.
- There were an estimated 3,700 cable modems in service in June of 2003, up from 3,050 in March and about 2,000 in December 2002. Ireland continues to rank relatively poorly for cable modem usage.
- Since March 2002, the Irish cable market is open to competition due to NTL and Chorus losing their exclusive license. This has cleared the way for one regional operator, Casey Cablevision, to offer a cable modem service to a small number of subscribers in Co. Waterford.

Overseas

- The market for cable modems continues to grow strongly in the US and globally. Total cable modem subscribers is currently estimated at 27 million²⁰. Cable operators have taken a substantial share of the broadband market from incumbent telecommunications operators in many countries.

Recommendation

- *The Department of Communications, Marine and Natural Resources should continue to monitor and promote developments in the cable TV market, with specific emphasis of its role as a platform for the delivery of broadband services.*
- *Following on from the introduction of a fixed-rate product for basic narrowband services in June 2003, ComReg should mandate the introduction of a similar fixed-rate interconnect product for ISDN services, which would allow competing operators to offer nationwide higher speed always-on services nationally at cost-orientated prices.*

¹⁹ Source: OECD, *The Development of Broadband Access in OECD Countries*, October 2001.

²⁰ In-Stat/MDR report *Broadband Bonanza*

6.3 LOCAL LOOP UNBUNDLING (LLU) AND COLLOCATION

The effective implementation of LLU is essential for the development of competition in DSL markets. LLU is the rental by a new entrant of a telephone line from an incumbent network owner. Once leased, the new entrant can convert the telephone line into a broadband link. Collocation is the provision of space in an incumbent's telephone exchange to a new entrant to allow them access to the rented telephone lines to attach a DSL modem.

Ireland

- At the end of the second quarter 2003, unbundled lines represented about 17% of the total DSL lines in Ireland. However, this number is dropping as eircom expand both its coverage and penetration in the market. The current rental and connection cost for these lines is €26.94 which is above all the comparator countries except Finland.
- While some progress has been made on LLU, the lack of collocation space beside eircom exchanges limits the ability of new entrants to enter the DSL market. As part of the Local Authority MAN²¹ initiative, collocation space will be provided close to eircom exchanges in towns outside Dublin.

Overseas

- Japan has achieved remarkable success with unbundling, with new entrants providing over 40% of all DSL lines. This success has been the result of government intervention forcing unbundling prices down to very low levels and overcoming collocation problems. Such intervention in unbundling prices would however be incompatible with Irish, EU and US law.
- Local loop unbundling remains largely unsuccessful amongst most EU member states and the US. One interesting exception is Denmark where the incumbent has taken the opportunity of unbundling to develop a wholesale DSL market.
- Globally, the issue of collocation is a huge barrier to competition as new entrants face a formidable task of gaining access to the facilities they need to compete.

Recommendations

- *The Department of Communications, Marine and Natural Resources has indicated that it may use public buildings to provide collocation space. Further (technical, economic and legal) work is required to analyse all aspects of this proposal to ensure that the provision of collocation centres on an open access basis would be sufficient to develop a truly competitive DSL and broadband market.*
- *ComReg should initiate work on a remote collocation product so that the necessary regulatory framework will be in place to support government action.*

6.4 WHOLESALE DSL

- While the provision of unbundled local loops and the installation of equipment in an incumbent's premises by a new entrant is the ideal source of DSL market competition, a second avenue is possible, that is the resale of DSL services by a new entrant. Both options provide telcos the opportunity to offer broadband to the enterprise sector by using the incumbents network and thus boost competition in the DSL market. A major disadvantage for competitors of using wholesale services rather than using unbundled local loops is the reduced opportunities for offering innovative technologies, hence it is difficult for them to develop the market, and differentiate themselves from the incumbent on anything other than price.

Ireland

- In October 2003, the number of resell DSL lines in Ireland is reported as being about 1,000 (6.3% of total DSL lines).

²¹ Metropolitan Area Network

- Overseas**
- There is a wide variation in the price of wholesale services and the margin available to new entrants. The margin is an indication of the competitive service provider's room for manoeuvre in competing with the incumbent. Most competitors will wish to offer the service at a price well below that of the incumbent in order to provide a competitive edge in an otherwise identical offering.
 - The UK has a strong DSL resale market with a margin of 61%. There are over 80 companies offering DSL by reselling BT's wholesale service in the UK, and they have captured over 50% of the market.
- Recommendation**
- *The Department of Communications, Marine and Natural Resources should assess how DSL resale prices can be lowered in order to stimulate competition and market development through improved margins.*

7.0. Drivers of Fibre Optic Rollout and Take-Up

Fibre has been used as a core technology in backbone networks since the 1980's. The focus of investment is increasingly on metropolitan and access networks, where until now the costs of deploying fibre systems have prevented their widespread adoption. Lower equipment costs coupled with rising demand for broadband services are seeing fibre networks being implemented more extensively. Fibre also provides the most future-proof medium for delivery of high-bandwidth services.

To promote competition in fibre optic deployment, it is necessary that competition exists in the backbone and in the access networks. Currently, the major providers of backbone capacity on fibre infrastructure in Ireland are eircom and Esat BT. Others such as ESB Telecom, Bord Gáis Eireann and Chorus are investing in networks while CIE already has a national fibre optic backbone network in place. ESB Telecom launched their Fibre Optic Broadband Network in January 2003 by switching on the "southern loop" of the network which links Dublin to Limerick, Cork and Waterford. The Northern Ring is also near completion. ESB Telecom will operate as "a carriers carrier" providing a number of access packages for telecommunications operators.

7.1

AVAILABILITY OF DARK FIBRE

Ireland

Availability of dark fibre is critical for alternative providers to offer services on the incumbent's network.

- There is a shortage of competitive capacity in the Irish fibre backbone networks at present.²² The recent completion of the ESB Southern and Northern Ring should make additional capacity available.
- Dublin City Council also arranged a tender process for the management of their 170km of open access fibre, with no restriction on the type of organisation that could apply;
- ComReg have recently introduced a regime for Partial Private Circuits (PPCs). Feedback from industry on their value has been mixed.

Overseas

- There are healthy dark fibre markets in many countries resulting in the availability of dark fibre at competitive prices.
- Fibre-To-The-Home (FTTH) and Premises (FTTP) rollouts are continuing in Japan, Korea, Italy, Sweden and the US. China is also rolling out FTTH in significant numbers. Total subscriptions in Japan have risen from nearly zero at the start of 2002 to over 700,000, with over 3,500 new fibre subscribers being connected every working day in July 2003. Bandwidths of 100Mbit/s are available for €42.19 per mth.

²² According to market intelligence from Norcontel, a number of Telecoms, internet service providers and large firms have complained over the lack of dark fibre available for purchase.

- Recommendations** It is recommended that:
- *The Department of Communications, Marine and Natural Resources should make the best use of the state-owned backbone networks (e.g. CIE, Bord Gáis) to enhance competition in the backbone network (particularly to the MAN centres).*
 - *The implementation of partial private circuits has helped stimulate competition in other EU countries by providing a mechanism to allow operators to efficiently gain access to their incumbent's local access network. It will take a few months to determine if the price levels and provision of circuits are equally positive in Ireland. The Department of Communications, Marine and Natural Resources and ComReg should continue to monitor their up-take and take appropriate action if necessary.*

8.0. Government's Broadband Initiative

In early March 2002, the Government agreed a strategy and action plan brought forward by the Minister for Public Enterprise for the rollout of broadband infrastructure over the next 3 to 5 years. This is being implemented in a number of phases with Phase 1 under way, involving the construction of metropolitan area fibre optic networks in 19+ towns in association with local and regional authorities. The rollout is on schedule and slightly below budget. A Managed Services Entity (MSE) is currently being selected to operate the metropolitan area fibre optic networks. Construction of the MANs is expected to be completed in 2004. It is expected that the first networks will be implemented and ready to provide dark fibre, collocation and duct leasing services as soon as the MSE has been chosen.

In December, the Department of Communications, Marine and Natural Resources announced a Broadband Action Plan which will connect a further 88 towns of 1,500+ population to broadband with community exchanges and strategic fibre. This is expected to make high speed connectivity available to 330,000 people throughout Ireland. The rollout of these initiatives by the Department of Communications, Marine and Natural Resources are strongly supported by the development agencies, and are essential to promoting regional economic competitiveness.

However, industry has expressed some concerns regarding the government's MSE policy. The proposed MSE may, in addition to providing dark fibre, be allowed to provide transmission and possibly other services. This approach, taken together with the pressure for the company to generate revenue could result in a situation where the MSE is less motivated to provide dark fibre to other operators.

- Recommendation** It is recommended that:
- *The Local Authority MAN programme should be extended beyond its current programme to pass more businesses by lengthened existing networks. The network should be further developed by government and the local authority by mandating opportunistic deployment of duct during the laying of other infrastructure (e.g. water mains, roads, bridges etc.)*
 - *The role of the Management Services Entity (MSE) should be restricted to the provision of dark fibre, and should not provide transmission or services.*

9.0. Demand for Broadband

- Policies that promote infrastructure availability in isolation from the demand-driven applications that utilise this capacity run the risk of encouraging inefficient investment decisions by Government and the private sector in telecommunications.
- Much of the focus to date has been on the supply of broadband given Ireland's current position in this context. Going forward, it will be necessary to ensure that support is also given to promoting awareness and demand for broadband content and applications.

- The *OpenUp* e-business initiative recently launched by Enterprise Ireland should act as a driver for future demand and take up of broadband technologies through creating awareness and support for companies regarding the benefits and possibilities associated with e-business functions.
- A Telecoms Strategy Group was established in early 2003 with the aim of devising policies for broadband delivery in Ireland. The Group comprises the main Telecoms operators in Ireland represented through the IBEC Telecoms and Internet Federation and ALTO, and representatives of the Departments of Communications, Marine and Natural Resources (DCMNR), Finance and An Taoiseach.

Recommendations

- *A Broadband Awareness Programme should be introduced to inform both enterprise and the general public of service offerings in Ireland and their associated advantages.*
- *As Government procurement contracts for telecommunication arise in 2004/5, greater consideration should be given to the need to promote broadband demand, encourage the rollout of infrastructure and promote competition in the telecoms market.*

APPENDICES

Appendix 1 - Glossary of Terms Used

- **ADSL** Asymmetric digital subscriber line – a communications technology which allows an ordinary telephone to be used for high-speed (broadband) communications. The fact that it is asymmetric makes it particularly useful for Internet access
- **Always-on** Telecoms services (particularly Internet access) which is always available, negating the need to dial up
- **Backbone** On the Internet or other wide area network, a backbone is a set of paths that local or regional networks connect to for long-distance interconnection
- **Bandwidth** The width of a communications channel, typically measured in kbit/s (in digital systems). This measure gives an indication of how fast data flows on a given transmission path
- **Broadband** A high speed connection which allows communications at speeds higher than can be achieved through basic rate ISDN (144kbit/s)
- **Cable modem** A device that connects a computer to the Internet via a local cable network operator
- **Digital** The use of a binary code (ones and zeros) to represent information
- **DSL** Digital subscriber line – a family of similar technologies which allow ordinary telephone lines to be used for high speed broadband communications. The family includes ADSL, HDSL, VDSL etc.
- **Fibre/fibre-optic** Strands of very pure glass that can carry far more information than copper wires over far greater distances
- **Incumbent** The monopoly telecoms operator that existed in most countries prior to telecoms liberalisation. The incumbent is usually policed by a telecoms regulator to ensure that competing operators get fair access to its network
- **Interconnection** The point at which one network hands over traffic to another network. The price and terms and conditions that apply to the handover are also referred to as interconnection
- **Internet** The world's largest computer network, available to anybody with a PC, a modem, a telephone line and an access provider. It supports the reading of text, graphic and video files and email exchange
- **ISDN** Integrated services digital network – the technical standard used in the public switched telephone network (PSTN)
- **Leased lines** A leased line is a telephone line that has been leased for private use. Typically, large companies rent leased lines from the telephone message carriers (such as AT&T) to interconnect different geographic locations in their company
- **Local exchange** The telephone company exchange where subscriber lines are terminated
- **Local loop** The copper wires an incumbent has between its exchanges and its customers
- **Mbit/s** Megabits per second – a measure of how many bits can travel between two points in a second in millions of bits
- **Mobile** An abbreviation commonly used for mobile cellular communications – referring to mobile telephone networks
- **Regulation** The process by which a government agency ensures that a complicated market like telecoms behaves as if it were a competitive market while one player, the incumbent, has an extremely powerful position in that market
- **Symmetric Connection** A connection with the same bandwidth in both directions
- **Wholesale** Sale of goods or services to another party who is not the final consumer of the good or service
- **Wireless access** Access via a system that operates locally without wires

Appendix 2 - Typical Business Use of Broadband

Small Firms: Basic Broadband Services	Medium Sized Firms: Advanced Broadband Services	Large Corporates and Government
<i>Bandwidth required equal to 0.5 Mbits</i>	<i>Bandwidth required equal to 2 Mbits</i>	<i>Bandwidth required from 10 to 100 Mbits</i>
<ul style="list-style-type: none"> • Fast Internet usage • On-line ordering • Fast, high capacity e-mail • Teleworking • Web site management • Occasional tele-conferencing 	<ul style="list-style-type: none"> • Fast Internet usage • On-line ordering • Fast, high capacity e-mail • Web site management • Tele-conferencing: • Occasional on-line training/seminar use • Small scale e-commerce applications 	<ul style="list-style-type: none"> • Fast Internet usage • On-line ordering • Fast, high capacity Email • On-line training/seminar use • Large scale e-commerce applications: • Large company web hosting • Tele-conferencing/ Video conferencing • Web hosting services • Streaming video feeds (e.g., broker service) • Large scale voice services, Fax, ISDN integrated with Internet Security backup services

Appendix 3: Summary of Broadband Access Technologies

Figure 6 provides a summary of the advantages and disadvantages of all the various broadband technologies and how they may contribute to providing broadband in Ireland. What can be discerned is that the deployment of broadband in Ireland is dependent largely on two technologies, DSL and fibre, while others may play a minor role. For large business customers and enterprise in business parks or industrial estates, fibre is the preferred medium. For SMEs and residential customers in metropolitan or urban areas, DSL is the primary choice.

While cable modem technology has the potential to provide for the needs especially of residential customers with CATV service, progress to date by the Irish CATV operators has been slow. Satellite is an option in remote, unserved areas but take up will always be very small because of the cost. WLAN is being 'triallyed' in a number of hot spots around the country and may provide some public broadband access.

Summary and Comparison of Broadband Access Technologies

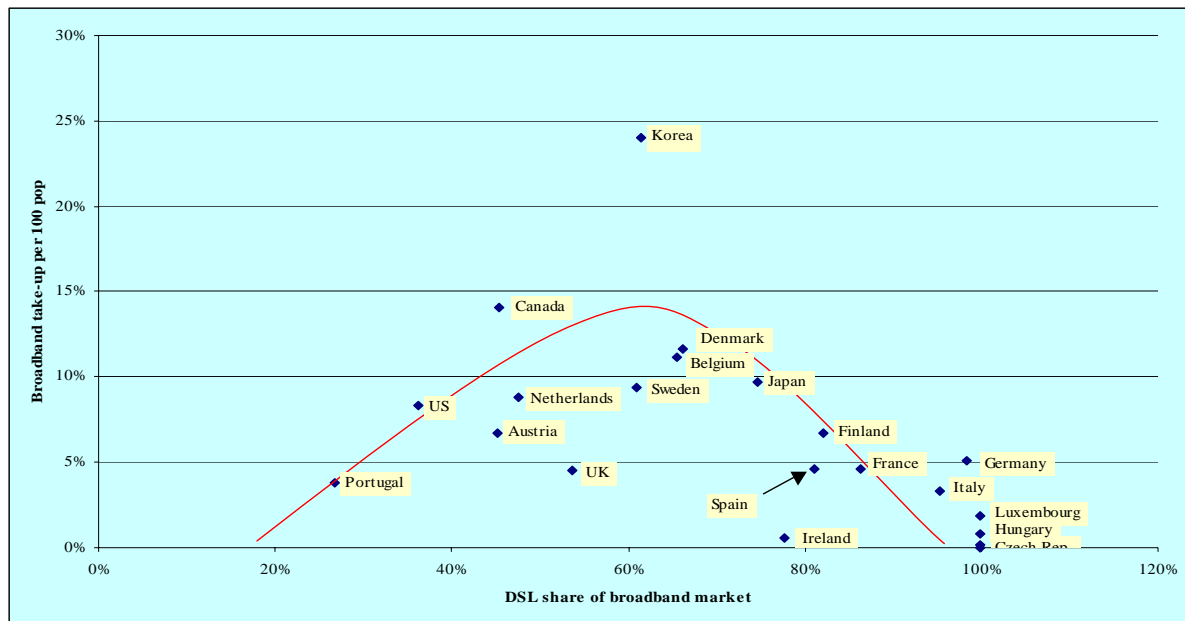
Technology	Bandwidth	Requirements and Characteristics	Advantages	Disadvantages	Major Players	Applicability to Ireland
DSL	0.5Mbit/s - 2 Mbit/s downstream, 0.1-0.64Mbit/s upstream	Delivered over existing telephone lines within 4km radius of switch; switch needs broadband backhaul connection	High speed, low cost, always on Internet access	Bandwidth depends on characteristics of cable. OLOs need unbundled loops or collocation space	Eircom, Esat BT	Suitable for SMEs and residential customers in cities and towns. Can be the number 1 provider of broadband to this market, if encouraged.
Fibre Cable FTTH or FTTB	2m - 155Mbit/s 1G, 10G	Customers premises must be within reach of metro or fibre distribution networks	Unlimited bandwidth, future proof	High cost of deployment, high customer premises equipment cost but falling	Eircom, Esat BT, WorldCom, Colt, MFN, C&W, Local Authorities	Suitable for large business customers, customers in business parks, business areas in cities and large towns.
Cable Modems	0.5Mbit/s - 2 Mbit/s downstream, 0.1-0.64 Mbit/s upstream	Upgraded HFC networks	High speed, low cost, always on Internet access	Upgrade cost of existing Cable TV networks	NTL, Chorus but deployment progress slow	Suitable for residential customers in all areas with CATV networks. Can be a major provider of broadband access particularly for residential. Can provide competition to DSL

Technology	Bandwidth	Requirements and Characteristics	Advantages	Disadvantages	Major Players	Applicability to Ireland
Fixed Wireless Access	2 Mbit/s - 10Mbit/s	Base station and transmitter, broadband backhaul.	Rapid deployment possible	Limited reach from base station and line-of-sight required. CPE expensive	Eircom, Esat BT.	Limited application for business customers in urban areas, business parks. Currently out of favour and unlikely to be a major force in delivering broadband
Broadband Mobile	0.144Mbit/s (GPRS), up to 0.384Mbit/s (3G)	Base stations and network coverage	Provides mobility and mobile access to data and multimedia services	High cost of licence and network, high cost of broadband services	Vodafone, O2, Hutchinson Whamoa	Not an alternative to other fixed technologies but may provide limited access to some services particularly for business customers. Not available before 2004.
Free Space Optics	Up to 10,000Mbit/s	Line of sight required, used for campus networks and to reach metro or fibre rings in last mile	High bandwidth; quick to deploy, no bandwidth licence required.	Limited range, weather affected, not yet widely deployed in the public network.	Terabeam and LightPointe	Enterprise and campus networks for pt-to-pt links, possible last mile applications in limited areas; not likely to have a major impact for some time.
Wireless LAN	11Mbit/s, 52Mbit/s	Provides high speed Internet access within range of node, operates in unlicensed band; needs broadband link to ISP node.	Inexpensive to establish WLAN node, interface to laptops becoming standard feature.	Security, roaming, billing issues to be resolved. Limited range - 100m from node without antenna. Pt-to-pt links also possible.	T-Mobile in US, Telia in Scandinavia, SingTel, BT in UK, O2, Esat BT, Digiweb, Amocom, Irish Broadband	Suitable for 'hotspots' like airports, conference centres. May have an application in bringing Internet to rural communities.

Technology	Bandwidth	Requirements and Characteristics	Advantages	Disadvantages	Major Players	Applicability to Ireland
Satellite	0.128 to 2Mbit/s down, 0.128Mbit/s uplink	Dish required for reception, must be in service footprint	Immediate and complete coverage in footprint once service is launched.	Limited bandwidth, relatively high cost, high latency make it unsuitable for web hosting, VPN, gaming	Hughes Network Systems, SATLYNX, Eutelsat, Astra and others	Suitable for delivering services to areas beyond reach of other technologies, e.g. rural, low density areas, isolated areas, island communities
Digital Terrestrial Television DTT and MMDS	0.25 –0.5Mbit/s downstream, 0.128Mbit/s uplink	National DTT network or digital MMDS	Can reach rural areas unserved by other technologies	Coverage can be problematic; return path technology untried	NTL & Chorus (MMDS) In UK, Freeview (BBC) No national DTT in Ireland	Could provide service to rural areas if service is provided. But DTV future very uncertain and only Chorus has digital MMDS. Will not be a major factor for broadband delivery.

Appendix 4: Inter Platform Competition

Broadband Take-up versus Platform competition



Source: Norcontel

The graph above quantifies the impact of competition by plotting take-up in each of the benchmark countries against the degree of competition with DSL. It shows that there is a very strong link between the degree of platform based competition in a country and broadband take-up, which appears to be maximised when the broadband market is evenly divided between DSL and other platforms. Dominance by any one platform inhibits take-up. Competition between DSL and other platforms, such as a cable and fibre networks, is the main and most powerful promoter of broadband usage and development.