

A. Australia

Introduction

After starting slowly, broadband take-up and average advertised speeds are now above the OECD average though well behind the leaders. Prices are comparatively high; caps on usage are universal and plans for fiber access networks have stalled since 2005. 3G wireless penetration far outstrips fixed-line access in Australia. Under a plan announced in April 2009, the federal government is establishing a public-private partnership to build and operate a national, wholesale-only, fiber-to-the-premises (FTTP) network. Many have welcomed this as a visionary response to slow, expensive broadband and the continuing power of the once state-owned incumbent, Telstra. But the plan has also been strongly criticized by those unconvinced of the universal demand for these fixed access speeds, and skeptical about the likely commercial return on the huge investment, especially given the rapid growth of mobile broadband.

Market highlights

Overall, 52.0% of households in Australia have broadband access.³³⁷

	Fiber / LAN	Cable	DSL	Other	Overall ³³⁸
Subscriptions per 100 people ³³⁹	0.0	4.3	19.9	1.2	25.4

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	16	Maximum advertised speed, OECD	14	Price low speeds, combined	28
Household penetration, OECD	13	Average advertised speed, OECD	7	Price med speeds, combined	27
3G penetration, Telegeography	3	Average speed, Akamai	24	Price high speeds, combined	19
Wi-Fi hotspots per 100000, Jiwire	17	Median download, speedtest.net	22	Price very high speeds, combined	N/A
		Median upload, speedtest.net	24		
		Median latency, speedtest.net	17		
		90% Download, speedtest.net	18		
		90% Upload, speedtest.net	24		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis

■ 1st quintile
■ 2nd quintile
■ 3rd quintile
■ 4th quintile
■ 5th quintile

337 Australian Bureau of Statistics, Household Use of Information Technology, 2007/08, 8146.0, as of 2007/08.

338 Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

339 OECD Broadband Portal, Table 1d, data supplied by the Australian Government, as of 2008.

Broadband development to date

Broadband in Australia started slowly. Cable TV penetration was low; cable modem services launched by Telstra and Optus in the late-1990s were expensive by North American standards, and untimed local calls made dial-up internet cheap. Telstra launched the first DSL services in 2000. Two years later, there were 1.3 broadband subscribers per 100 inhabitants, about a third of the OECD average and well behind market leaders Korea (20.3) and Canada (10.3). In 2004, the figure had increased to 5.2, closer to the OECD average (8.5) but still leaving Australia 20th in the OECD.

Take-up was boosted by Telstra's sharp price reductions early in 2004, just as Optus was planning to launch a resale DSL product. Australia moved ahead of the OECD average (13.6 to 13.0) in December 2005. At 25.4 subscribers per 100 inhabitants in December 2008, overall penetration is still above the OECD average (22.4) though well behind the market leaders.

Dial-up subscriptions peaked in 2004, the same year DSL overtook cable modem as the main form of broadband connection. By June 2009, 87% of all internet subscribers had broadband connections (at least 256 kbps).³⁴⁰ Of the 7.3 million broadband subscribers, 57% were DSL and just 13% were cable. The very few fiber access lines are mainly in new housing estates and central business districts. Stalled plans for wider-scale private deployment of fiber access networks have been at the center of the government plans for public investment in FTTx networks.

The fastest-growing broadband access technology is wireless. In the 18 months before June 2009, Australia added 1.7 million new wireless subscribers and 500,000 DSL subscribers. Twenty-seven percent of all broadband subscribers are now wireless.³⁴¹ This figure reflects aggressive competition from 3G operators. Telstra NextG reaches 99% of the population, Optus 96%, and Vodafone, which recently merged its 3G operations with Hutchison, 94%, though these networks reach far smaller percentages of Australia's land-mass.

Fixed broadband became more competitive as providers installed equipment in Telstra's exchanges, taking advantage of local loop unbundling (LLU) and line sharing services. The level of competition varies greatly across the country. By September 2008, 245 of Telstra's roughly 5000 exchanges had five or more facilities-based competitors, but 2315 had no competitor and 2221 had only one. Most Australians live in places served by Telstra and at least two competing, unbundling-based, DSLAM-type DSL providers. Higher speed ADSL2+ services were available in 1403 exchanges by September 2008, including most metropolitan exchanges. According to the competition regulator, nearly half the population at that time lived within 1.5 km of an ADSL2+ enabled exchange, making download speeds of 12-24 Mbps possible.

According to the OECD's September-October 2008 data, Australia's broadband speeds were in the second quintile of OECD countries (7th), though well behind Japan, Korea, and France, measured by the average advertised speed of surveyed plans. Actual speed measurements from both Akamai and Speedtest were substantially lower, however. Prices were in the most expensive two quintiles of countries, except for the high-speed tier. Australia is one of just four OECD countries where all advertised plans were capped. Further, the average cap among the surveyed offers was around half that of Canada. Once the cap was reached, the average price per additional Mbps was the highest in the OECD.

340 Australian Bureau of Statistics, Internet Activity in Australia, June 2009, 8153.0.

341 Australian Bureau of Statistics, Internet Activity in Australia, June 2009, 8153.0.

Market share and key players

Telstra has the biggest share of all three main retail market segments. Its competitors have been more successful in winning market share in mobile than in broadband. In 2008/09, for the first time, Telstra earned more revenue from mobile than traditional PSTN (local access and fixed voice) services. Of its mobile revenues, 44% came from data.³⁴² Telstra's main competitor in both fixed and wireless broadband is Optus, which stopped reselling DSL broadband over Telstra's network in 2007. Optus has its own wireline LLU network and may stop investing in this network if Telstra wins the contract for the National Broadband Network.³⁴³

Four companies compete in the Australian wireless broadband market: Telstra, Optus Mobile, Vodafone Australia, and Hutchison 3G Australia. The latter no longer operates a 2G network. Telstra controls approximately 42% of the market; Optus controls approximately 33%; Vodafone has 13%; and Hutchison 11%. In addition, dozens of mobile virtual network operators (MVNOs) resell services over these companies' wireless networks.³⁴⁴

Regulatory framework

A specialist regulator, the Australian Communications and Media Authority (ACMA), was formed in 2005 by merging the broadcasting and telecommunications regulators. It licenses carriers and broadcasters, allocates spectrum, and administers content regulation. Competition regulation is handled by the Australian Competition and Consumer Commission (ACCC). It has responsibility for these issues across the whole economy under the Trade Practices Act, but that legislation contains telecoms-specific provisions governing access to networks and anti-competitive conduct.

The overall communications regulatory framework emphasizes competition to ensure high quality services at affordable prices, but regulatory measures also support this goal. Since 1991, a universal service scheme has required a designated provider or providers to offer basic services (voice telephone, payphones, and low speed digital data capability) to anyone requesting them within certain time frames. The net cost of delivering the uneconomic services is recovered through an industry levy. In practice, the scheme has been controversial. Telstra has remained the universal service carrier and its dominance of total industry revenue means it continues to meet most of the cost. Changes are now proposed, although the scheme has been eclipsed by the proposed broadband network as the primary policy tool and source of funds for delivering universal access to basic and advanced services. A Customer Service Guarantee sets standards for service connections, fault repairs and attending appointments with customers. Compensation must be paid to customers where these standards are not met. The scheme covers standard voice telephone services but not internet access or mobile services.

Political economy

Australia is a parliamentary democracy with a market economy. Legislative power is shared between federal and state parliaments and local councils. Telecommunications, spectrum, broadcasting, and intellectual property laws are made by the federal parliament. A mix of federal, state and local government laws regulates the building of communications infrastructure, classification, and censorship of content and consumer protection. The wide social and economic impact of broadband has given all levels of government an interest in the quality and price of services. The federal government's legislative powers and financial capacity mean it is best placed to act.

³⁴² Telstra Corporation, Full Year 2009 Financial Results Analyst Briefing, 13 August 2009

³⁴³ TeleGeography, GlobalComms Database, Country profile,, Australia, pp. 5-6.

³⁴⁴ Ibid, pp. 9-10.

A state-owned monopoly controlled domestic telecoms for most of the 20th century. International links were provided by private and mixed public-private operators until soon after World War II, when they were merged and nationalized. A state-owned domestic satellite system was established in the 1980s. The Labor Government elected in 1983 reversed many long-standing economic policy positions, liberalized financial markets, cut tariffs, and privatized state-owned enterprises. Telecoms markets were progressively opened to competition from the late 1980s. The state-owned domestic and international telecoms companies were merged to form Telstra. The Liberal/National (Conservative) Coalition Government, elected in 1996, privatized it in three stages between 1997 and 2006. A 2003 poll found that 57% of Australians preferred Telstra to be fully publicly owned and 31% preferred mixed public/private ownership. Less than 10% wanted full privatization.³⁴⁵

Debates over broadband policy in the 2000s were shaped by the major political parties' long-held positions on privatization. The Coalition was unwilling to contemplate major structural changes to a company it was determined to sell; Labor defended public ownership of a vital national asset.

Broadband strategy

The centerpiece of the Government's strategy is the National Broadband Network (NBN) announced in April 2009. Costing up to AUD 43 billion (USD 36.5 billion), around USD 1800 per head of population, the plan will deliver download speeds of 100 Mbps to 90% of homes and workplaces within eight years. It will wholly replicate most of Australia's 11 million copper exchange lines with optical fiber-to-the-premises (FTTP). The 10% of the population not served will get speeds of at least 12 Mbps by other means, such as terrestrial wireless or satellite. In addition to the access network, extra fiber backhaul links will be constructed in non-metropolitan areas.

A company has been established to build and operate the NBN. Substantial private sector participation is intended, but the government will remain the majority shareholder. The Government now says AUD 43 billion figure has "got a pretty sizeable chunk of contingency built into it." Its contribution will be around AUD 11 billion. This assumes 50/50 debt/equity for the whole project with half of the equity held by government. Of the AUD 11 billion, AUD 4.7 billion will be direct public subsidy and AUD 6.3 billion will come from Infrastructure Bonds offered to institutional and retail investors on terms yet to be settled. The network will be privatized five years after construction ends. The company will have no retail customers, but will offer wholesale access to all on fair and non-discriminatory terms. Much of the detail of its structure and operation, including any non-government shareholdings and the terms and conditions of access to its facilities, has not been settled.

The NBN supplants the broadband policy the Labor Opposition took to the 2007 election. It would have provided AUD A4.7 billion to bring speeds of 12 Mbps to 98% of Australians via an upgrade of the fixed line network to fiber-to-the-node, FTTN. This first plan for revived public investment provided a policy bridge away from Labor's historic opposition to privatizing Telstra. It capitalized on the "broadband backwater" implied by the OECD's data, the technical opportunity offered by next generation fixed line access networks, widespread criticism of Telstra's continuing power, and its refusal to invest in a fiber access network without regulatory change and large budget surpluses.

345 Pusey, M. and Turnbull, N. 2005, 'Have Australians embraced economic reform', in Wilson, S. et al (eds), *Australian Social Attitudes: The First Report*, UNSW Press, Sydney, pp. 161-81 at 165-6

The global financial and economic crisis helped spread these policy impulses across the whole economy. By diminishing the private sector's capacity to invest, increasing the demands for governments to spend, and undermining faith in the efficacy of free markets, the crisis provided a rationale for "nation-building" initiatives. Among them, broadband, "the most important economic infrastructure of the 21st century" in the Australian Prime Minister's words, was as persuasive as any. Interpreting FTTN as only an interim solution, FTTP became a leap-frog straight to what the finance minister has called "the end game."

This large public investment in telecommunications infrastructure is a big shift from the trends that dominated Australian policy for more than a decade. Early thinking about broadband in the mid-1990s coincided with the liberalization of telecommunications markets and the long-delayed launch of pay television services. Successive governments agreed that this burgeoning competition was the key to new, higher-bandwidth services, along with telcoms-specific laws about third-party access to essential facilities and anti-competitive conduct and safety net regulation for consumers.

One way the Liberal/National Government secured parliamentary support for privatization was by committing large sums from the proceeds towards improvements in telecommunications infrastructure and services, especially in rural areas. A lack of focus and performance evaluation in the initial Networking the Nation program was criticized, and subsequent schemes addressed more specific needs, funding either particular groups (local government, regional and remote communities) or particular solutions (extended mobile phone coverage, extra rural networks).

Two inquiries into the state of communications in non-metropolitan Australia in 2000 and 2002 made detailed recommendations to improve services. A National Broadband Strategy, coordinated between federal and state governments, was announced in 2004. Funding was provided to build on broadband infrastructure developments in public sector areas such as health and education, and to aggregate broadband demand in local areas to attract additional infrastructure investment. The Strategy also established the first of a series of programs providing per-customer subsidies to ISPs offering broadband services in regional, rural, and remote areas at metro-comparable prices. Around AUD 250 million has been committed to the latest version of this program, the Australian Broadband Guarantee, over four years to 2012. Metro-comparable broadband service means any service offering at least 512 kbps download and 128 kbps upload and 3GB per month data usage.

Policy interventions and outcomes

Government investment in infrastructure

Even before the change of government in 2007, policy had shifted back towards higher public investment in telecoms infrastructure. An AUD 2 billion Communications Fund was established by the Liberal/National Government to generate an annual revenue stream to fund new technologies in rural areas. That government also nearly agreed to a subsidy for Telstra to upgrade its fixed line network to FTTN. In response to the Labor Opposition's 2007 broadband plan, the Government announced its own plan, to provide WiMAX and ADSL2+ local access and fiber backhaul in non-metropolitan areas.

Unlike the current NBN, this plan targeted areas where advanced services were least likely to be commercial and did not involve government directly in the new enterprise. It envisaged more use of wireless and cost considerably less. A tender was run and won, but the incoming government terminated the contract. It proceeded to implement, and later greatly expand, its own national plan, then supplemented it with changes to regulation and Telstra's structure.

Skill building, education, and demand programs

The federal government is spending AUD 2.2 billion over six years on what it calls a “Digital Education Revolution.”³⁴⁶ Most of the funds are being spent to increase computers in schools to one per student in years 9-12 by the end of 2011. In early 2008, almost a third of secondary schools had a computer-to-student ratio of 1 to 8 or worse. Schools will receive FTTP broadband connections under the NBN. Federal and state governments are also supporting IT training for teachers, further work on the professional development required to integrate IT into pedagogical practice, online curriculum tools and resources, and improved online opportunities for parents to participate in their children’s education. A “Digital Regions Initiative” is co-funding partnerships to improve health, education and emergency services in non-metropolitan communities.³⁴⁷

Competition policy

Extensive criticism of the existing regime comes from quite different perspectives. Some argue it has been too weak to prevent the vertically and horizontally integrated incumbent Telstra from dominating local telecommunications markets, particularly for fixed line services.³⁴⁸ Others suggest that the telecommunications industry-specific laws governing third-party access to networks give the regulator too much discretion, which it has exercised capriciously. By regulating too much of Telstra’s network and setting access prices (including for LLU) too low, the ACCC has “severely distorted” price signals and discouraged investment by Telstra and its competitors alike.³⁴⁹

The ACCC first ordered Telstra to open its copper local loop to DSL competition very early, in mid-1999. The following several years saw continuous conflicts over LLU pricing, with the ACCC imposing a set of price controls in April of 2002, which did not allay complaints by entrants, in particular Primus and AAPT, the then-primary users of Telstra unbundled loops. By March 2004 the ACCC issued a notice against Telstra for anti-competitive conduct, but it was another year before Telstra’s prices were lowered and its commitments brought sufficiently into alignment with the ACCC’s requirements that the competition notice was revoked. Throughout 2005 and until August 2006 there was an extended back and forth between the ACCC and Telstra over the proper pricing of LLU services. The OECD 2007 Communications Outlook described Australia as having, by late 2006, no effective regulated rate, and having higher per-month charges in the lowest-cost, Metropolitan areas that were higher than all other OECD countries other than Norway, Poland, and the Slovak republic, while unbundling rates for access to regional networks were almost twice that high.³⁵⁰ By 2008 LLU prices extracted from the dispute resolution process administered by the ACCC were in line with prices elsewhere.³⁵¹ The relationship between the regulator and the incumbent appears to a reader of reports of the history of regulation in this area to be a fairly contentious one.

Telstra is already subject to accounting separation. Further structural change is central to the planned NBN. The open access network itself will deliver a degree of structural separation and in mid-September 2009, legislation was introduced requiring Telstra to voluntarily structurally separate its wholesale and retail fixed line operations or have strong functional separation imposed by law.³⁵² While its fixed line

346 Department of Broadband, Communications and the Digital Economy (DBCDE) 2009, Australia’s Digital Economy: Future Directions - Snapshot, Canberra: DBCDE (July) and see <http://www.deewr.gov.au/Schooling/DigitalEducationRevolution/Pages/default.aspx>

347 http://www.dbcde.gov.au/communications/digital_regions_initiative

348 Fletcher, P. 2009, *Wired Brown Land? Telstra’s Battle for Broadband*, UNSW Press, Sydney.

349 Ergas, H. 2008, *Wrong Number: Resolving Australia’s Telecommunications Impasse*, Allen and Unwin, Sydney.

350 OECD, *Communications Outlook 2007*. Table 2.10.

351 OECD, *Communications Outlook 2009*. Table 2.10.

352 Senator Stephen Conroy 2009, ‘Historic reforms to telecommunications regulation’, 15 September.

activities remain vertically integrated, and it retains an HFC network and 50% stake in pay TV operator Foxtel, it will be unable to acquire additional spectrum for advanced wireless broadband. The government appears determined to ensure the NBN is not thwarted by competition from a still vertically-integrated Telstra.

Network non-discrimination

Network non-discrimination has not been a major issue. The ACCC declined to impose a form of neutrality for backbone networks in 2004. Telstra argues that this results from competitive retail broadband and universal “volumetric pricing” capped plans where usage above the monthly allowance is throttled or charged at a pre-determined rate. This practice is said to reduce any incentive for ISPs to block or throttle content unaffiliated to the ISP or generated by users, while creating an incentive for them to encourage extra use of content from any source and to upgrade facilities.³⁵³ The neutrality issue is playing out in a different way. Rather than negatively discriminating against particular content, some ISPs are positively discriminating by offering unmetered access to some content. The publicly-funded national broadcaster, the ABC, argues that the publicly-funded NBN should carry all its content unmetered.

Spectrum policy

Spectrum can be allocated under flexible spectrum licenses that do not specify uses, or licenses that authorize the operation of particular transmitters. Use of spectrum can also be authorized under rules that allow complying devices to be operated without individual licenses. In 2001, Australia auctioned 3G spectrum licenses, which were won by Telstra, Vodafone, Optus, and Hutchison. In its Spectrum Outlook, ACMA identifies three major projects: the expiry of spectrum licenses for 2G mobile telephony in 2013 and 2015 and 3G in 2017; the “digital dividend” from shutting down analog TV between 2010 and 2013; and a review of government, including defense, spectrum use. Demand is growing for the parts of the spectrum that best suit emerging and evolving services, like mobile broadband. Each of these projects could improve spectrum efficiency and create opportunities for new services, though not without cost to existing users.

Conclusion

Announcing his broadband policy for the 2007 election, the current Prime Minister cited Australia’s poor international ranking and the need to do something about worsening productivity, especially to help deliver prosperity beyond the mining boom. His response had two strands, an “education revolution” and improved infrastructure. Broadband figured in both. In government, amid a global recession, he has massively increased the scope and cost of the planned NBN and announced major changes to regulation and the structure of Telstra, placing a big, public wager on the benefits that will flow from faster fixed line broadband and a publicly-controlled, wholesale-only operator.

353 Kelso, R. 2009, ‘Moving the debate from open access to network neutrality: US lessons for Australia’, *Telecommunications Journal of Australia (TJA)*, 59(2), 20.1-20.20; Endres, J. 2009, ‘Net neutrality: how relevant is it to Australia’, *TJA*, 59(2), 22.1-22.10.

B. Canada

Introduction

Though it was among the first nations in the world to provide widespread, retail broadband service, Canada's recent broadband development has lagged behind other developed nations. Canada's broadband penetration rates are often lauded, but the country is a poor performer on price and speed and a declining performer in penetration. Canada also faces an urban-rural broadband coverage gap. The Canadian broadband industry is relatively consolidated, and both cable and DSL providers have only recently started to deploy wireless and direct-fiber broadband infrastructure. 3G wireless penetration is substantially weaker than fixed line penetration. Recently, Canada's regulatory bodies have pushed for deregulation of the broadband market in the hopes of promoting a more efficient and affordable broadband market.

Market highlights

Overall, 64.0% of households in Canada have broadband access.³⁵⁴

	<i>Fiber / LAN</i>	<i>Cable</i>	<i>DSL</i>	<i>Other</i>	<i>Overall</i> ³⁵⁵
Subscriptions per 100 people ³⁵⁶	0.0	15.6	13.0	0.4	29.0

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Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis



³⁵⁴ OECD Broadband Portal, Table 2a, from "Communications Monitoring Report" published by the Canadian Radio-television and Telecommunications Commission (CRTC).

³⁵⁵ Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

³⁵⁶ OECD Broadband Portal, Table 1d, OECD estimation based on company reporting, as of 2008.

Broadband development to date

Cable and DSL services have been available in at least some parts of Canada since 1996. In that year, SaskTel became one of the world's first telecommunications carriers to offer DSL.³⁵⁷ At around the same time, Rogers Communications Inc. of Toronto premiered the first high-speed cable Internet service in the world.³⁵⁸ By the end of 2008, broadband services were available to virtually all urban households, with 94% of all households having access to fixed broadband and over 91% having access to mobile broadband.³⁵⁹ Only 52% of households actually subscribe to broadband services, however, with a further 22% of households accessing the Internet via dial-up or other connections with speeds under 1.5Mbps.³⁶⁰ Cable's dominance in the broadband market has persisted. By 2008, 55.0% of residential broadband subscribers accessed the Internet via cable, while only 39.5% did so via DSL.³⁶¹

Despite its early broadband leadership, Canada has most recently lagged peer nations in broadband penetration, speed, and price. Though it was in the top OECD quintile in penetration in 2002, it is no longer. Canada has little fiber-to-the-home (FTTH) deployment.³⁶² Measured by percent of total subscribers of all broadband technologies, Canada's fiber customers represent 0.01% of all broadband subscribers. This is in stark contrast to countries like Korea (39%), Japan (44%), and Sweden (20%).³⁶³ Possible explanations for Canada's weakening performance include lack of competition.³⁶⁴ Though broadband providers Rogers, Bell Canada, and cable operator Shaw have announced plans to roll out FTTH services, their plans are primarily geared toward multi-dwelling buildings, condominiums, and hotels.³⁶⁵ In speed, Canada is a weak to mid-pack performer. By advertised speeds and actual measurements of the highest speeds, Canada is in the fourth or fifth quintile. By measured average speeds, according to both Akamai and Speedtest, Canada is in the third quintile of performers. On prices, the OECD shows Canada as a fourth or fifth tier performer, while our own study observed better prices, locating Canada in the third or fourth tier of prices.³⁶⁶

Bandwidth caps are mainstays in the services of the largest Canadian broadband providers, such as Rogers Communications and Bell Canada. While pricing structures differ across companies, bandwidth caps can be as low as 2 GB per month to as high as 60175 GB per month, depending on the service plan. Incumbent carriers such as Bell that provide infrastructure for other broadband services can now also impose bandwidth caps on other companies that provide broadband using its local facilities.³⁶⁷

357 Promoting Broadband: The Case of Canada, p. 17

(<http://www.itu.int/osg/spu/ni/promotebroadband/casestudies/canada.pdf>)

358 Promoting Broadband: The Case of Canada, p. 18

(<http://www.itu.int/osg/spu/ni/promotebroadband/casestudies/canada.pdf>)

359 CRTC Communications Monitoring Report 2009, p. 171

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

360 CRTC Communications Monitoring Report 2009, p. 213

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

361 CRTC Communications Monitoring Report 2009, p. 259

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

362 CRTC Communications Monitoring Report 2009, p. 259

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

363 OECD Communications Outlook 2009, Table 4.8 (<http://dx.doi.org/10.1787/624773722011>)

364 Michael Geist, Testimony to The Standing Senate Committee on Transport and Communications.

(http://www.parl.gc.ca/40/2/parlbus/commbus/senate/Com-e/tran-e/47244-e.htm?Language=E&Parl=40&Ses=2&comm_id=19)

365 TeleGeography, GlobalComms Database, Country profile, Canada, p. 25,28 of 30.

366 Next Generation Connectivity, p. 81, Table 3.6

367 Telecom Order CRTC 2009-484 — Bell Aliant Regional Communications, Limited Partnership and Bell Canada – Applications to introduce usage-based billing and other changes to Gateway Access Services.

(<http://www.crtc.gc.ca/eng/archive/2009/2009-484.htm>)

Canada is even weaker in 3G wireless service than in fixed broadband. This report shows that Canada is a fifth quintile performer in 3G penetration and a fourth quintile performer in Wi-Fi hotspots, and although growth in 3G subscriptions is strong internally, when measured by new subscriptions per capita, growth is still among the five slowest in the OECD.³⁶⁸ Mobile operators have recently been attempting to expand current 3G wireless services. Bell Mobility and Telus Mobility are currently working to attain total coverage of 3G wireless services in Canada's major population centers. Rogers Communications, along with Bell and Telus, have turned their attention to laying the foundation for rolling out 4G LTE technology in the next several years.

Market share and key players

Five companies dominate broadband services, as measured by market share: Bell Canada (22.4%), Shaw Communications (17.8%), Rogers Communications (17.7%), Telus Communications (12.1%), and Vidéotron (11.52%). Together they control roughly 81% of the broadband market. However, their services are focused in particular regional markets. Bell Canada, a DSL provider, concentrates mostly in Ontario and Quebec. Ninety-two percent of its broadband subscriber base resides in those two provinces. In these areas, Bell Canada competes mainly with cable providers Rogers and Vidéotron, each of which is focused mostly on southeastern Ontario and Quebec, respectively. Cable provider Shaw Communications competes with Telus Communications in western Canada, specifically British Columbia, Alberta, Saskatchewan, Manitoba, and northwestern Ontario.³⁶⁹ Despite the presence of a couple of hundred smaller ISPs, over half of whom resell ISP services offered by the incumbents, alongside several local utility companies, municipalities, and some ISPs using wireless technologies, no substantial competitor to the five major incumbents has emerged.

Industry players are expanding in different directions. DSL providers Bell Canada and Telus have started to provide fiber-based broadband in their largest markets. Vidéotron, eager to cut into Bell Canada's business in Quebec, has begun to lay infrastructure for a fiber-based broadband service of its own as of 2009. Rogers has branched out from its predominantly cable-based business to gain a slight toehold in the DSL broadband market as of the end of 2008.³⁷⁰

In recent years, both the residential and business markets for Internet access seem to have undergone consolidation, with incumbent telecommunication service providers (TSPs) and large cable companies picking up market share at the expense of new entrants and incumbent TSPs operating outside of their traditional geographic regions. In August 2009 the CRTC reported that revenue shares for all Internet access captured by all entrants (including residential and business; dial-up and broadband; and non-incumbents and out-of-territory incumbent TSPs) declined from 23% in 2003 to 12% in 2008.³⁷¹ While out-of-territory incumbent TSPs have never had a presence in the residential market for high-speed Internet access and only a small presence in the market for residential dial-up access,³⁷² their revenue share in the business market for Internet access declined from 13% in 2004 to 10% in 2008.³⁷³ During

368 Next Generation Connectivity p. 49, Figure 3.11

369 TeleGeography, *GlobalComms Database*. Canada Country Overview, p. 22-27 of 30.

370 TeleGeography, *GlobalComms Database*. Canada Country Overview, p. 26 of 30.

371 CRTC Communications Monitoring Report 2009, p. 214

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

372 CRTC Telecommunications Monitoring Report 2006, p. 59, Table 4.4.7

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2006/tmr2006.pdf>); CRTC Communications Monitoring Report 2009, p. 218, Fig. 5.3.1

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

373 CRTC Telecommunications Monitoring Report 2006, p. 58, Table 4.4.6

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2006/tmr2006.pdf>); CRTC Communications

this same time period, the revenue share of non-incumbent TSPs in the business market also declined, from 31% to 24%.³⁷⁴ The share of residential Internet access subscribers, both dial-up and high speed, captured by all entrants, both non-incumbents and out-of-territory incumbents TSPs, has also declined, from 16% in 2004 to 8% in 2008.³⁷⁵ The entrants' share of high-speed access (at or above 128kbps) in 2008 was even smaller at 5.5%, though had risen slightly from 4% in 2004.³⁷⁶ These numbers suggest that as dial-up access phases out, incumbent TSPs and cable companies are gaining ever greater market and subscriber shares, especially in the residential market, over new entrants and incumbent TSPs operating out-of-territory. This consolidation in the residential market has its parallel in the business market, as incumbent TSPs who had ventured out of their traditional areas seem to be retrenching in their own historical territories, while other entrants have lost market share, largely to cable companies.³⁷⁷

In wireless, Rogers Communications (36.8%), Bell Mobility (30.0%), and Telus Communications (28.4%) comprise most (95.1%) of the wireless market, with SaskTel Mobility, MTS Allstream, and Bell Aliant controlling the remaining share.³⁷⁸ Rogers, however, has outpaced the rest of the market on deployment. After adopting the 1xEV-DO Rev A standard initially, Bell Mobility and Telus Mobility have now banded together to jointly develop 3.5G HSPA (high-speed packet access) networks to better compete against Rogers, which has already completed a national 3.5G rollout using the UMTS/HSDPA standard and leads the wireless market.³⁷⁹

In order to spur competition in the wireless market, Industry Canada reserved 40Mhz of spectrum for non-incumbents during the most recent Advanced Wireless Services (AWS) auction for spectrum in the 1710-2200MHz range.³⁸⁰ A large portion of this reserved spectrum was awarded to companies such as Vidéotron, Globalive, a long-distance reseller, and DAVE Wireless, a startup, suggesting that the market for mobile broadband will become more competitive in the future. The three incumbents also purchased additional spectrum during the AWS auction in preparation for rolling out 4G services, once they become feasible. The Federal Cabinet decided in December 2009 that Globalive met Canadian ownership and control requirements and would be allowed to compete in the Canadian wireless market, overturning an earlier CRTC decision.

Monitoring Report 2009, p. 218, Fig. 5.3.1

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

374 CRTC Communications Monitoring Report 2009, p. 217, Table 5.3.1

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

375 CRTC Communications Monitoring Report 2009, p. 215

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

376 CRTC Communications Monitoring Report 2009, p. 219, Table 5.3.2

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

377 Compare CRTC Report to the Governor in Council: Status of Competition in Canadian Telecommunications Markets 2005, p. 62, Figure 4.4.1 (<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2005/gic2005.pdf>), with CRTC Communications Monitoring Report 2009, p. 218, Figure 5.3.1

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

378 TeleGeography, *GlobalComms Database*. Canada Country Overview, p.15 of 30.

379 TeleGeography, *GlobalComms Database*. Canada Country Overview, p. 17 of 30. See also CRTC Communications Monitoring Report 2009, p. 261

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

380 Industry Canada, Policy Framework for the Auction for Spectrum Licences for Advanced Wireless Services and other Spectrum in the 2 GHz Range, p. 5. ([http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/awspolicy-e.pdf/\\$FILE/awspolicy-e.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/awspolicy-e.pdf/$FILE/awspolicy-e.pdf))

Regulatory framework

Wireline broadband access is governed by the Telecommunications Act of 1993 (the Act). The Act includes general directives to create a telecommunications system across Canada, and to make telecommunications services affordable, efficient, and responsive to the needs of Canadian citizens.³⁸¹

The Canadian Radio-television Telecommunications Commission (CRTC) exercises the main regulatory control over telecommunications. Under §47 of the Act, the CRTC must implement the Act's policy objectives, some of which are mentioned above.³⁸² The CRTC must also forebear from regulation where telecommunications services face sufficient competition. Thus far, CRTC has forborne from regulation of retail Internet services and satellite services,³⁸³ though it continues to regulate wholesale Internet access.³⁸⁴ Note that in the case of retail internet services, the CRTC explicitly retained the right to regulate under §27(2) of the Act, a section which prohibits unjust discrimination in the provision of telecommunications services.³⁸⁵ However, despite the CRTC's power to regulate in specific areas, it is nevertheless directed to follow the policy direction set forth by Industry Canada, which is responsible for the Telecommunications Act. The CRTC has begun to reduce regulation in some parts of the industry in response to an interpretive order, codifying a recommendation of Industry Canada's Telecommunications Policy Review Panel in 2006, that requires the CRTC to "rely on market forces to the maximum extent feasible" to achieve policy objectives.³⁸⁶ For example, many wholesale Internet providers are scheduled to be deregulated by the end of 2012, with additional review of the remaining wholesale services in 2013.³⁸⁷ This is in line with the order's language, which required the CRTC to "determine the extent to which mandated access to wholesale services that are not essential services should be phased out," suggesting that continued regulation might reduce "incentives for innovation and investment in and construction of competing telecommunications network facilities."³⁸⁸ On the other hand, the CRTC did decide in 2008 to extend the unbundling rules to fiber infrastructure, as non-essential facilities subject to phase-out by 2013.³⁸⁹ This decision, however, was later overturned by the Federal Cabinet.³⁹⁰

In the wireless area, Industry Canada is responsible for managing the use of wireless spectrum in Canada under the Radiocommunications Act of 1985.³⁹¹ This includes the auctioning of spectrum licenses for wireless broadband providers. However, Industry Canada recommended in 2006 that, for the sake of transparency and efficiency, the management of spectrum should be transferred to the CRTC, leaving Industry Canada to focus on broad spectrum policy.³⁹²

381 Telecommunications Act of 1993, Section 7. (<http://laws.justice.gc.ca/en/showdoc/cs/T-3.4//20090901/en?page=1>)

382 Telecommunications Act of 1993, Section 47

383 CRTC Communications Monitoring Report 2009, Appendix 2, p. 1 of 2.

(<http://www.crtc.gc.ca/eng/publications/reports/policymonitoring/2009/2009MonitoringReportFinalEn.pdf>)

384 TeleGeography, GlobalComms Database, Country profile, Canada, p. 19 of 30.

385 CRTC Telecom Decision 99-592

386 Order Issuing a Direction to the CRTC on Implementing the Canadian Telecommunications Policy Objectives

SOR/2006-355, (<http://www.gazette.gc.ca/archives/p2/2006/2006-12-27/html/sor-dors355-eng.html>)

387 TeleGeography, GlobalComms Database, Country profile, Canada, p. 20 of 30.

388 Order Issuing a Direction to the CRTC on Implementing the Canadian Telecommunications Policy Objectives

SOR/2006-355, §1(c)(ii), (<http://www.gazette.gc.ca/archives/p2/2006/2006-12-27/html/sor-dors355-eng.html>)

389 CRTC Telecom Decision 2008-117.

390 CBC News, December 11, 2009. "Open Access Rules Take Hits"

<http://www.cbc.ca/technology/story/2009/12/11/clement-internet-access-bell-telus-mts.html>

391 *Radiocommunications Act*, Section 5(a). (<http://laws.justice.gc.ca/en/showdoc/cs/R-2//20090901/en?page=1>)

392 Telecommunications Policy Review Panel: Final Report 2006., Chapter 5. ([http://www.telecomreview.ca/eic/site/tprrp-gecert.nsf/vwapj/report_e.pdf/\\$FILE/report_e.pdf](http://www.telecomreview.ca/eic/site/tprrp-gecert.nsf/vwapj/report_e.pdf/$FILE/report_e.pdf))

Political economy

The CRTC's regulatory regime over broadband service providers has varied in breadth and intensity over the last two decades. The political economy of the broadband market over this period can be characterized as a struggle between a government seeking to increase competition and dominant broadband providers seeking a reprieve from such policies, which they argue can stifle innovation and investment. With the enactment of the Telecommunications Act of 1993, the CRTC imposed much regulation on providers, including local loop unbundling on incumbent telecommunications carriers. These unbundling rules, however, contained sunset provisions and a price-determination method unusual among OECD countries that resulted in comparatively high rates for local loop access, discussed below. Over the years, and at the urging of Industry Canada, the CRTC has begun to slowly loosen its grip in certain areas of the broadband market. In April 2007, the CRTC declared that it would forebear from regulating telecommunications markets where at least two carriers provide service to 75 percent of residential customers.³⁹³

Given the two-company structure of most regional broadband markets in Canada, this seems to be a victory for the Canadian markets' main broadband providers. Although it is still unclear whether broadband markets in Canada will be fully deregulated, the December 2009 Federal Cabinet decisions lean strongly in that direction. Following CRTC decision 2008-17, which established a general regulatory framework for wholesale internet services, the CRTC issued decision 2008-117, which mandated that ILECs such as Bell Canada offer ADSL wholesale services at the same speeds as its retail services.³⁹⁴ This rule was further extended to ILECs' next generation networks (NGNs) in CRTC decision 2009-111.³⁹⁵ Subsequently, both Bell Canada and Telus appealed this decision to the Federal Cabinet. Bell is arguing, among other things, that mandating wholesale access to NGNs amounts to "forced subsidization" of their competitors, that the CRTC's decision will hinder NGN capital investments by making the business case for such investments less attractive, and that the CRTC's decision disproportional burdens ILECs to the benefit of their cable company competitors because wholesale providers "largely rely on the ILECs for providing their internet service."³⁹⁶ The Federal Cabinet sides with the incumbents and overturned CRTC's earlier decision.

Wholesale customers of ILECs also appealed some related CRTC decisions to the Federal Cabinet. Following CRTC decision 2008-17, MTS Allstream Inc (MTS), a purchaser of wholesale internet services from ILECs (and also an ILEC itself in some regions) appealed the CRTC's designation of high speed Ethernet services as "non-essential and subject to phase out."³⁹⁷ The CRTC's 2008-17 decision means that by 2013, Ethernet services will no longer be subject to mandatory unbundling. In its appeal, MTS claimed that Ethernet services were not "practically or feasibly duplicable on a national scale" and so would meet the test for "essential service." The CRTC, however, disagreed and in decision 2008-118, upheld its relevant findings in 2008-17. In a separate appeal before the CRTC, MTS also requested that the CRTC modify its classification of aggregated ADSL services from "conditional mandated non-essential" to "conditional essential."³⁹⁸ According to MTS, this would decrease the price of wholesale

393 Explaining Broadband Leadership, p. A2 (<http://www.itif.org/files/ExplainingBBLeadership.pdf>)

394 CRTC Telecom Order 2008-117

395 CRTC Telecom Order 2009-111

396 Petition for Bell Aliant and Bell Canada; Petitions to the Governor in Council concerning Telecom Decisions CRTC 2008-117 and CRTC 2008-118, Telecom Regulatory Policy CRTC 2009-34, and Telecom Order CRTC 2009-111; (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09316.html>)

397 CRTC Telecom Order 2008-118

398 CRTC Telecom Order 2009-34

service from “rates that include mark-ups of upwards of 50%” to rates of “cost plus 15%”.³⁹⁹ In order 2009-34, the CRTC again disagreed, and upheld its original (2008-17) decision.

Following the CRTC’s two decisions, MTS also filed an appeal before the Federal Cabinet. MTS is argued, among other things, that government regulation is needed to ensure a competitive marketplace for internet services and that such services are essential for spurring innovation in the economy, that if Ethernet regulation is phased out, companies such as MTS will not have an incentive to invest in additional Ethernet-related capital equipment, and that the CRTC incorrectly applied the duplicability test in its “essential” service determination discussed above.⁴⁰⁰ The Federal Cabinet again sided with the incumbents and denied MTS’s appeal.

Broadband strategy

In 2001, the National Broadband Task Force was created by the Minister of Industry to establish a policy on Canadian broadband services. Its mandate was “to map out a strategy for achieving the Government of Canada’s goal of ensuring that broadband services are available to businesses and residents in every Canadian community by 2004.”⁴⁰¹ The task force recommended a strategy that had four main components: (1) linking all communities in Canada to scalable high-speed networks; (2) emphasizing affordable broadband links to remote and rural communities; (3) ensuring that local broadband infrastructure linked together local education, health, and library facilities; (4) extending local broadband within a community to encompass business and residential users.⁴⁰²

As first steps to fulfilling these priorities, the Canadian government established the Broadband for Rural and Northern Development Pilot program (BRAND) and the National Satellite Initiative (NSI) in 2002 and 2003 respectively. The CAD 155 million NSI program sought to expand satellite capacity in the Far North and Mid North, where communities did not have access to fixed line broadband infrastructure.⁴⁰³ In a similar vein, BRAND had as its goal the provision of broadband to 900 rural communities across Canada. The program disbursed CAD 105 million for the creation of these broadband services.⁴⁰⁴ The overall emphasis of BRAND was to encourage the private sector ownership of broadband services. However, it was limited in its ability to achieve universal broadband access given that communities had to apply to the government, as well as organize a plan of action for broadband provision. Therefore, by 2004, Canada still had not achieved universal access.

In 2006, the Telecommunications Policy Review Panel—a group established by Industry Canada—recommended that the government take a step further to create the Ubiquitous Canadian Access Network (U-CAN) program. Whereas the other programs were limited and targeted specific areas that lacked broadband access, the U-CAN program was designed to cover communities that BRAND did not. Such communities included areas that did not attain broadband connectivity through BRAND or NSI, and

399 Petition for MTS Allstream; Petitions to the Governor in Council concerning Telecom Decisions CRTC 2008-117 and CRTC 2008-118, Telecom Regulatory Policy CRTC 2009-34, and Telecom Order CRTC 2009-111; (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf09316.html>)

400 Petition for MTS Allstream

401 Telecommunications Service in Canada: An Industry Overview, Section 6. ([http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/rt-0303sect6e.pdf/\\$FILE/rt-0303sect6e.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/rt-0303sect6e.pdf/$FILE/rt-0303sect6e.pdf))

402 The new national dream: Networking the nation for broadband access. (Report of the National Broadband Task Force), p. 77 of 109 (ftp://ftp.cordis.europa.eu/pub/ist/docs/ka4/mb_broadbandcanada.pdf)

403 Government of Canada Launches National Satellite Initiative to Provide Broadband Access to Northern and Remote Communities (Press Release) (<http://www.ic.gc.ca/eic/site/ic1.nsf/eng/02469.html>)

404 Allan Rock and Andy Mitchell Announce \$44 Million to Bring Broadband Internet Service to First Nations, Rural and Remote Communities (Press Release) (<http://www.ic.gc.ca/eic/site/ic1.nsf/eng/02463.html>)

where it was not economical for private actors to provide service. Under the U-CAN program, the Canadian government would provide subsidies to private and public actors to extend existing broadband infrastructure to unserved areas. The goal of this program is to deliver broadband to every community in Canada by 2010.⁴⁰⁵

Policy interventions and outcomes

Government investment in infrastructure

Government investment in infrastructure has occurred on the local, provincial, and federal levels. On the municipal level, many local groups have organized to establish broadband connectivity in their own community. For example, in 2000, Upper Canada Networks (UCNet) was formed as a non-profit corporation to provide broadband to communities across the counties of Leeds and Grenville in eastern Ontario. It was funded by a partial grant from the Ontario government, as well as contributions from local equipment vendors, school boards, and local businesses.⁴⁰⁶

On the provincial level, most provinces tend to pair with either local communities or private operators to provide broadband connectivity. For example, the CAD 193 million Alberta SuperNet has private and public components. The base network is funded by Bell West, while the extended network infrastructure is funded by the province itself.⁴⁰⁷

The federal government has continued to focus most of its efforts on improving rural connectivity. As part of Canada's stimulus plan to stave off recession, the federal government has pledged significant funds to providing broadband services to rural and remote areas. As part of the Conservative government's "Economic Action Plan," CAD 255 million is being pledged over the next three years to provinces and private operators to improve access to underserved communities. As of September 2009, specific plans to disburse the funds have not been announced.⁴⁰⁸

Skill building, education, and demand programs

The Government of Canada has stressed that improvements in educational outcomes are partly a result of broadband availability. A particularly successful example of this was SchoolNet, a partnership formed between Industry Canada designed to link all Canadian public schools and libraries to the Internet. While the site was eventually taken down as broadband became more mainstream, the educational dimension of broadband has been underscored as a driving force for increasing broadband provision. As recently as March 2009, the Government of Canada has justified provision of broadband connectivity to more remote areas as enhancing, among other things, the availability of distance learning through broadband access.⁴⁰⁹ As the need for more complex and bandwidth-intense educational media grows, broadband providers will necessarily face demands for faster Internet beyond current generation technologies.

405 Telecommunications Policy Review Panel: Final Report 2006., Chapter 8-14. ([http://www.telecomreview.ca/eic/site/tprp-gecert.nsf/vwapj/report_e.pdf/\\$FILE/report_e.pdf](http://www.telecomreview.ca/eic/site/tprp-gecert.nsf/vwapj/report_e.pdf/$FILE/report_e.pdf))

406 Promoting Broadband: The Case of Canada, p. 28.

407 Promoting Broadband: The Case of Canada, p. 29.

408 Canada's Economic Action Plan: A First Report to Canadians, p. 94
(http://www.plandaction.gc.ca/grfx/docs/ecoplan_e.pdf)

409 Government of Canada to Provide Broadband for 21 B.C. First Nations Communities (news release)
(http://www.fntc.info/files/documents/03-%20FNESS%20news%20release%20v8%20_March%202009_%20_4_.pdf)

Competition policy

Since 1993, Canada has barred corporations that are not Canadian-owned and controlled from functioning as telecommunications carriers. There are signs that this restriction may be substantially relaxed soon. The National Broadband Task Force and the Commissioner of Competition in Canada have both openly recommended that “foreign ownership restrictions in the telecommunications market should be eliminated.”⁴¹⁰ In May of 2009, CRTC initiated a notice for comments related to the review of this ownership restriction.⁴¹¹ The recent decision by the CRTC in the Globalive case has also thrust the issue of ownership restrictions into the spotlight. In brief, Globalive, a wireless company, planned to enter the Canadian marketplace and purchased wireless spectrum for this purpose during the 2008 AWS auction. Following the auction, the incumbent wireless operators took the matter to the CRTC, and alleged Globalive did not comply with the Canadian ownership and control requirements under §16 of the Act. The CRTC agreed because, among other things, Globalive was 66% owned by Orascom, an Egyptian firm, who also provided most of Globalive’s debt and technical expertise.⁴¹² The Federal Cabinet decided in favor of Globalive, providing a boost for competition in the wireless sector.

The CRTC has enforced local loop unbundling (LLU) since 1997 on facilities classified as “essential.”⁴¹³ Initially, the rules were to sunset by 2002, the idea being that the limited regulatory window would incentivize competitors to invest in their own facilities without deterring them from entering the market in the first place. As unbundling failed to flourish, however, the CRTC extended the application of the rules indefinitely, while simultaneously minimizing their scope. More than a third of local loop infrastructure that was deemed as “essential” (infrastructure under monopoly control, functioning as a required input for telecommunication services, and that cannot be duplicated in an economic fashion) is scheduled to be deregulated by 2013.⁴¹⁴ Moreover, the CRTC has allowed incumbent providers to set prices for access where competitors using incumbent local loops provide fixed telephony services through their own infrastructure.⁴¹⁵

The methodology that CRTC uses to determine pricing for access to local loop infrastructure differs from the approach used by regulators in other countries. Instead of relying on long run incremental cost, the CRTC initially adopted a pricing model based on incremental cost plus a 25% markup to allow the incumbents to make a profit on their unbundled loops and thus avoid disincentives to infrastructure investment. In 2002, the markup on pricing was reduced to 15%. Perhaps as a result of this non-standard pricing scheme, Canada has the highest monthly rates for unbundled local loop access among OECD countries.⁴¹⁶ As of September 2008, for example, the monthly price of an unbundled local loop in Canada, excluding prices for remote areas or the most dense downtown areas, in terms of purchasing power parity, was roughly 70% higher than in South Korea and Denmark, almost 50% higher than in Italy, 30% higher than in Japan, France, or Norway, and 25% higher than in Finland or the UK. Combined with the presence of strong incumbents and sunset provisions on unbundling, it is possible that the investment environment is too expensive and uncertain to promote market entry by non-incumbents.

410 Submission To The Competition Policy Review Panel, p. 3 of 26

(http://www.itu.int/ituweblogs/treg/content/binary/commissioner_competition_bureau.pdf)

411 CRTC Reconsiders Process for Reviewing Foreign Investment in Telecommunications Carriers (article).

(http://www.mccarthy.ca/article_detail.aspx?id=4525)

412 CRTC Telecom Decision 2009-678

413 CRTC Telecom Decision 97-8.

414 CRTC Telecom Decision 2008-17.

415 Explaining Broadband Leadership, p. A2 (<http://www.itif.org/files/ExplainingBBLeadership.pdf>)

416 OECD (2009) *Communications Outlook 2009*.

With respect to next generation networks (NGNs) such as fiber-based broadband services, many of the major telecommunications providers such as Bell Canada faced the possibility of continued regulation by the CRTC. Telecommunications providers succeeded in convincing the Canadian Federal Cabinet to reverse earlier CRTC decisions and to lift regulation on these next generation networks on the grounds that they will stifle the provision of these services.

Network non-discrimination

Network neutrality has been, and remains, a controversial issue in Canada. Notably, in 2005, Telus blocked access to Voices for Change, a website that supported the Telecommunications Workers' Union. The union, at the time, was in a labor dispute with Telus. In addition, in 2008, the Canadian Association of Internet Providers (CAIP) filed a complaint with the CRTC over Bell Canada's traffic management practices. Bell had instituted data throttling measures from 4:30 PM to 2:00 AM that targeted traffic from peer-to-peer (P2P) applications. Bell's measures were applied identically to both its retail clients and to the wholesale services sold to companies represented by CAIP. CAIP asserted that Bell's measures violated, among other things, the Act's §27(2) provision against unjust discrimination. The CRTC disagreed, citing Bell's need to control network congestion and the absence of other reasonable methods to accomplish this end, as well as the fact that Bell's retail and wholesale customers were equally impacted by the P2P throttling measures.⁴¹⁷

In October 2009, the CRTC released its net neutrality framework. The framework outlines the process by which users can lodge complaints with the CRTC about an internet provider's traffic management practices (ITMPs). In brief, once a complaint is made against an internet provider, the burden of proof shifts to the provider to demonstrate that the IMTP does not discriminate, or if it does, that it accomplishes a particular need and nothing else, that it results "in discrimination or preference as little as reasonably possible", that any harm caused by IMTP is, "as little as reasonably possible", and that network investment or other economic approaches would not suffice (where a technical IMTP is employed).⁴¹⁸ The policy also provides for disclosure standards to end-users so that they have the information necessary to evaluate a provider's IMTPs. Notably, the framework also provides for standards when IMTPs are applied to a provider's wholesale services. In brief, if a provider implements IMTPs that are "more restrictive" on its wholesale customers than on its own retail customers, prior approval must be sought from the CRTC, who will analyze the request using its IMTP framework.⁴¹⁹ Finally, the framework also mentions that application-specific IMTPs that "degrade or prefer one application, class of application, or protocol over another" may "warrant investigation under subsection 27(2) of the Act".⁴²⁰ It is unclear, however, how this statement will be interpreted in light of the CRTC's prior P2P throttling decision. The possibility of legislation to support network non-discrimination principles has also been discussed. Members of some political parties have voiced support for network neutrality principles. As of 2009, Member of Parliament Charlie Angus tabled a bill mandating network neutrality practices.⁴²¹

Spectrum policy

Industry Canada designates certain parts of the spectrum for specific usages, and then licenses that spectrum to a designated user. Spectrum licenses can be granted on the basis of administrative review

417 CRTC Telecom Decision 2008-108

418 CRTC Regulatory Policy 2009-657

419 CRTC Regulatory Policy 2009-657

420 CRTC Regulatory Policy 2009-657

421 Bill C-398 (http://www2.parl.gc.ca/content/hoc/Bills/402/Private/C-398/C-398_1/C-398_1.PDF)

by Industry Canada. Since 1996, Industry Canada has also auctioned spectrum.⁴²² As of 2009, it has conducted around seven large-scale auctions of various frequency bands.⁴²³ To ensure that the spectrum is not completely dominated by a few bidders, Industry Canada imposes a 100 MHz “aggregation limit” on the amount of spectrum that a single licensee can hold. Some new developments in spectrum management could be on the horizon. Industry Canada stated in a recent policy memorandum that it should rely primarily on “market forces,” in spectrum management, which may result in a reduction in the amount of license-exempt spectrum for public or free use.⁴²⁴ The next spectrum auction will involve the 700 MHz band. Although Industry Minister Jim Prentice suggested in July 2008 that the auction would likely occur within eighteen months,⁴²⁵ a date has not yet been set.

Deregulatory impulses have been tempered in certain situations to promote competition. Licenses awarded during the latest AWS spectrum auction mandated that incumbents make roaming available at commercial rates outside of licensees’ territory for at least the ten-year term of the AWS licenses, and within new entrants’ licensed service areas for five years, to allow entrants to build out their networks.⁴²⁶ Coinciding with the AWS auction, Industry Canada promulgated a notice in the Canada Gazette in February 2008 outlining conditions for mandatory facilities sharing that apply to all radiocommunication carrier licensees. The new conditions require that licensees facilitate sharing of antenna towers and sites, where technically feasible, with any other licensed radiocommunication carrier by offering to enter a Site-Sharing Agreement, which includes access to ancillary equipment and services, at a reasonable commercial rate.⁴²⁷

Conclusion

Canada opened the decade as an extremely strong performer on broadband. Over the course of the decade, its penetration rates have grown more slowly than those of other countries, its prices have remained high, and its speeds are still low in comparison to other OECD countries. In the area of competition policy, Canada implemented unbundling rules formally in 1997, but its regulated rates were high relative to the rest of the OECD, and it consistently imposed sunsets on all or some category of regulation. As a practical matter, its market has evolved toward a regional market with relatively low investments in other regions by incumbents prominent in one region. Most competition in any given region is between the telephone and cable company that was locally dominant in the past. Government investment has mostly focused on connecting unconnected areas, and not on increasing capacity at the higher end. Canada continues to see itself as a high performer in broadband, as it was early in the decade, but current benchmarks suggest that this is no longer a realistic picture of its comparative performance on several relevant measures.

422 e-Policy Resources: Spectrum Management Policy (http://www.ceprc.ca/spec_e.html)

423 See left hand menu under “Spectrum Auctions” (http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01714.html)

424 Spectrum Policy Framework for Canada, p. 9 ([http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/spf2007e.pdf/\\$FILE/spf2007e.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/spf2007e.pdf/$FILE/spf2007e.pdf))

425 Rolfe Winkler, UPDATE 2 – Canada plans another wireless spectrum auction, Reuters, July 22, 2008. (<http://www.reuters.com/article/technology-media-telco-SP/idUKN2228839320080722?pageNumber=1&virtualBrandChannel=0>)

426 Industry Canada, Policy Framework for the Auction for Spectrum Licences for Advanced Wireless Services and other Spectrum in the 2 GHz Range, p. 8. ([http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/awspolicy-e.pdf/\\$FILE/awspolicy-e.pdf](http://www.ic.gc.ca/eic/site/smt-gst.nsf/vwapj/awspolicy-e.pdf/$FILE/awspolicy-e.pdf))

427 Industry Canada Notice No. DGRB-002-08, pp. 6-7. (<http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08890.html>)

C. Denmark

Introduction

Denmark is among the world's leading nations in broadband penetration, even though some of the country's regions are sparsely populated. Early liberalization of the telecommunications market and LLU did not keep former monopoly telco TDC from taking the lion's share of the broadband market. DSL is still the leading technology but alternative platforms are on the rise. The government has emphasized the public sector's role in demand for broadband while not making any direct investments on the supply side. The regulatory framework poses very low barriers to entry into the broadband market while newly introduced sharing of costs for shared future infrastructure is supposed to attract new investment. 4G licenses are to be auctioned in 2010.

Market highlights

Overall, 69.5% of households in Denmark have broadband access.⁴²⁸

	Fiber / LAN	Cable	DSL	Other	Overall ⁴²⁹
Subscriptions per 100 people ⁴³⁰	3.6	9.9	22.6	1.1	37.2

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	1	Maximum advertised speed, OECD	3	Price low speeds, combined	2
Household penetration, OECD	4	Average advertised speed, OECD	8	Price med speeds, combined	4
3G penetration, Telegeography	18	Average speed, Akamai	8	Price high speeds, combined	5
Wi-Fi hotspots per 100000, Jiwire	10	Median download, speedtest.net	8	Price very high speeds, combined	7
		Median upload, speedtest.net	4		
		Median latency, speedtest.net	8		
		90% Download, speedtest.net	6		
		90% Upload, speedtest.net	3		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis



428 OECD Broadband Portal, Table 2a, from EU Community Survey, from 2007.

429 Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

430 OECD Broadband Portal, Table 1d, as reported by individual governments, as of 2008.

Broadband development to date

The development of broadband in Denmark started with liberalization of telco services and the abolition of the exclusive right of Tele Denmark (now TDC) to establish broadband networks within the boundaries of the municipalities in 1995.⁴³¹ Estimates of early broadband subscriptions differ significantly. According to a report to the National IT and Telecom Agency (IT- og Telestyrelsen), by December 31st, 1999, almost 10% of Danish households and SMEs were connected by broadband through ISDN,⁴³² which was the leading technology at that time, while access via xDSL and cable was still rare.⁴³³ In a recent economic report, IT- og Telestyrelsen estimates that the number of broadband subscriptions was a mere 0.5 per 100 inhabitants for the year 2000.⁴³⁴

ISDN was soon passed by DSL. Denmark adopted local loop unbundling in 1998 and line sharing was required in 2001, resulting in a rise of new entrants in the market for DSL.⁴³⁵ In 2002, when broadband subscriptions had risen to 8.3 per 100 inhabitants,⁴³⁶ DSL subscribers accounted for more than two thirds of Denmark's 445,842 broadband subscribers; a large majority of the other third connected via cable. By 2005, broadband penetration had gone up to 24.7 subscriptions per 100 inhabitants⁴³⁷ and there were 826,181 xDSL subscriptions and 364,803 cable subscriptions with capacities of at least 144kbit/s.⁴³⁸ From January 2001 to January 2005, the cost of household ADSL service decreased by over 45%.⁴³⁹

In 2008, DSL was still the most important technology for broadband access, although alternative platforms have gained momentum. The number of FTTx connections (such as fiber-to-the-home) has grown from 30,000 in 2006 to 108,000 in 2008, making it the fastest growing alternative technology.⁴⁴⁰ At the same time, with only 16,882 subscribers at the end of 2008, WiMAX was not yet a significant alternative option to DSL or cable broadband.⁴⁴¹ There are currently four 3G licenses in use, which together cover a spectrum from 1900 to 1980 Mhz and from 2110 to 2170 Mhz.⁴⁴² 4G licenses in the 2.5 GHz band are expected to be auctioned in March 2010.⁴⁴³

Market share and key players

Even though the fixed-line market was completely liberalized in 1996,⁴⁴⁴ the successor of Denmark's monopoly fixed-line operator was still the dominant player at the end of 2008.⁴⁴⁵ In the broadband

431 OECD, Regulatory Reform in Denmark, Regulatory Reform in the Telecommunications Industry, 2000, p.7.

432 Whether ISDN should be considered broadband is certainly debatable.

433 Eirwen Nichols et al., The Status of Broadband Services For Consumers and SMES, A Report to Telestyrelsen, October 2000, p.5.

434 IT- og Telestyrelsen, Economic Key Figures 2008, June 2009, p.12.

435 Sherille Ismail and Irene Wu, Broadband Internet Access in OECD Countries: A Comparative Analysis, October 2003, p. 14.

436 Ibid, p.4.

437 IT- og Telestyrelsen, Economic Key Figures 2008, June 2009, p.12.

438 IT- og Telestyrelsen, Tele Yearbook - 2005, p.26.

439 The Danish Government, IT and Telecommunications Policy Report 2005, March 2005, p.10.

440 TeleGeography, GlobalComms Database, Country profile Denmark, p.16.

441 TeleGeography, GlobalComms Database, Country profile Denmark, p.16.

442 http://en.itst.dk/copy_of_frequencies/licences/3g-licences/

443 http://en.itst.dk/copy_of_frequencies/licences/Auctions-and-calls-for-tenders/2-5-ghz/expected-time-table

444 i.e. Tele Denmark's exclusive rights to provide telephony services, leased lines, mobile communications, cable television, etc were removed. See: OECD, Regulatory Reform in Denmark, Regulatory Reform in the Telecommunications Industry, p.7 et sq.

445 Fixnet Nordic controls a share of 82.1% of all subscriber lines. See: TeleGeography, GlobalComms Database, Country

market, TDC (now Fixnet Nordic) had accumulated 1.16 million broadband subscribers by the end of March 2009.⁴⁴⁶ This equals a market share of 56.6%, which is split between its DSL and cable (sold under the YouSee brand) divisions. In 2009 TDC also acquired Fullrate, which had a market share of 3.7%. TDC's main competitor in the broadband market is Telenor who offers DSL, VPN and VoIP services and whose share is 14%. Telia Denmark accounts for 9% of the market, which it serves via various subsidiaries using DSL and fiber-optic cable.

The growing market for FTTH is led by independent Dansk Bredband with 18.8% and Energi Midt with 16.5%. Two other providers follow with just above 10% market share.⁴⁴⁷ Three-quarters of WiMAX connections are operated by Danske Telecom (owned by Call Me, which is part of Telia Denmark). ELRO, a utility provider has announced its intention to deploy WiMAX services nationwide by 2010.⁴⁴⁸

The market for 3G connections is led by Hi3G with a share of 36.2%. It was the first provider to operate a 3G network and is expected to roll out HSPA+ later in 2009.⁴⁴⁹ Mobile Nordic (owned by TDC) follows with 30% of the market. Telenor Denmark has 21.6% of the 3G subscriptions and Telia 12.6%.⁴⁵⁰

Regulatory framework

Broadband and the telecommunication industry does not fall under one single law but is regulated by several different acts, including primarily the Act on Competitive Conditions and Consumer Interests in the Telecommunications Market, the Act on Cable Laying Access and Expropriation etc. for Telecommunications Purposes, and the Act on Radio Frequencies.

The regulatory framework poses very low barriers to entry.⁴⁵¹ Neither licenses nor registration are required by the regulatory body, except for operating fixed-wireless connections. The main focus of legislation is on the promotion of competition in the telecommunications market.

The National IT and Telecom Agency (IT- og Telestyrelsen) regulates and supervises the telecommunication industry. As a division of the Ministry of Science, Technology, and Innovation, it also frames and conducts initiatives and implements national IT and telecom policies. Ex-post regulation by the agency follows comprehensive market analyses and has often taken aim at interconnection and LLU prices in the years after liberalization.

As a member of the EU, Denmark is also obliged to implement the EU Framework Directive, which in Article 8.2 requires that "competition in the provision of electronic communications networks, electronic communications services and associated facilities and services" is promoted by "(a) ensuring that users, including disabled users, derive maximum benefit in terms of choice, price, and quality; (b) ensuring that there is no distortion or restriction of competition in the electronic communications sector; (c) encouraging efficient investment in infrastructure, and promoting innovation".

profile Denmark, p.3.

446 TeleGeography, GlobalComms Database, Country profile Denmark, p.16.

447 Ibid.

448 Ibid.

449 TeleGeography, GlobalComms Database, Country profile Denmark, p.9.

450 TeleGeography, GlobalComms Database, Country profile Denmark, p.16.

451 A fact that caused existing telcos to call for a stricter regime, see: TeleGeography, GlobalComms Database, Country profile Denmark, p.15.

Broadband strategy

Denmark's broadband development is based on a plan issued by the Danish Government in 2001.⁴⁵² The plan laid out the ambitious aim "that Denmark should be the world's leading IT nation."⁴⁵³ One of the goals articulated in the plan is to "have fast, cheap and secure internet for support and further development of the Danish welfare society." Even in 2009, Denmark sees great potential and advantages in being a leader in the digital world and "the Government's target is for all Danes to have broadband access by the end of 2010 at the latest."⁴⁵⁴

Believing in the market's ability to provide the infrastructure for digital leadership,⁴⁵⁵ the broadband strategy called for the analysis and monitoring of the market and the behavior of the demand side actors, giving consumers enough information about products and prices while regulation and interventions should "contribute towards a high competition and security level in the IT and telecommunications sector."⁴⁵⁶

The strategy by which Denmark seeks to promote broadband access is based on four principles: a market-driven infrastructure without the use of public funding, technology neutrality in the regulation of the market, transparent regulation, and the public sector as a contributing force behind demand for IT.⁴⁵⁷ The Danish broadband strategy has been described as a "soft-intervention" strategy, which is "characterized by low government involvement in broadband infrastructure deployment" as it relies "on market forces to ensure broadband supply."⁴⁵⁸

To boost demand, Danish Government decided to invest in public sector IT and IT services where the following criteria are met: increased prosperity and productivity; better public service and welfare; increased efficiency in the public sector; skills development within and via IT; and an IT-related boost of the Danish cultural heritage and media production.⁴⁵⁹ As the broadband plan from 2001 puts it: "Increased penetration of fast internet connections will require a wider range of relevant content on the web - there must be something worthwhile."⁴⁶⁰ The strategy also suggests that public-private partnerships should be established for the development of new public IT services for the citizens.⁴⁶¹ A couple of regional and municipal initiatives have reached out to the private sector for a rollout of fiber.⁴⁶²

Denmark's broadband strategy has proven to be successful; Denmark leads the OECD in broadband penetration rates.⁴⁶³ The price for a monthly broadband subscription can be as low as USD 6⁴⁶⁴ and the

452 In its brochure "VISION 2015: 100 megabits for all", the Danish Energy Association argues that there is an urgent need for a new broadband strategy if economic growth and jobs are to be secured.

<http://www.danishenergyassociation.com/Theme/Broadband.aspx>

453 <http://en.vtu.dk/files/publications/2001/from-hardware-to-content-strategy-for-fast-cheap-and-secure/html/inde0002.htm>

454 The Danish Government, IT and Telecommunications Policy Report 2009, March 2009, p.6.

455 if demand is high enough

456 <http://en.vtu.dk/files/publications/2001/from-hardware-to-content-strategy-for-fast-cheap-and-secure/html/inde0009.htm>

457 IT- og Telestyrelsen, Comments on FCC GN Docket No. 09-47, June 2009, p.1.

458 Inmaculada Cava-Ferreruela and Antonio Alabau-Muñoz, Broadband policy assessment: A cross-national empirical analysis, in: Telecommunications Policy 30 (2006) 445–463, p.447.

459 <http://en.vtu.dk/files/publications/2001/from-hardware-to-content-strategy-for-fast-cheap-and-secure/html/inde0009.htm>

460 Ibid.

461 <http://en.vtu.dk/files/publications/2001/from-hardware-to-content-strategy-for-fast-cheap-and-secure/html/inde0010.htm>

462 see section: Government investment in infrastructure

463 OECD, Broadband Growth and Policies in OECD Countries 2008, 2008, p.35.

464 OECD, Broadband Growth and Policies in OECD Countries 2008, 2008, p.42.

fastest download speeds offered by the incumbent provider are lower than those found in many other countries.⁴⁶⁵ Prices for fast connections, however, are still relatively high.⁴⁶⁶

Policy interventions and outcomes

Government investment in infrastructure

In accordance with its broadband strategy, which emphasizes a market-based approach to broadband development, the Danish central government has neither invested substantially in the deployment of backbone infrastructure nor carried out any other major investments in broadband networks for business and residential connectivity. Instead, it has applied a philosophy of establishing fast IT infrastructure in the public sector which in turn boosts public sector demand for broadband connections. Although 21,000 households and businesses still had no access to broadband in 2008,⁴⁶⁷ the government remains committed to its policy of not funding any broadband infrastructure⁴⁶⁸ but rather supports demand through the promotion of IT use in the public sector, education and research programs.

However, there have been public-private partnerships for broadband deployment on a regional and municipal level. The most notable of these are Djurslands.net and Aarhus Network. The former was established in 2001 and covers 8 municipalities by purchasing fiber optic capacity and extending coverage by radio to remote areas. In the latter, the municipality of Aarhus contracted Netdesign to rollout and operate a fiber optic network based on an open network model intended to eventually cover 1,500 localities.⁴⁶⁹

Skill building, education, and demand programs

Denmark has invested considerable energy in improving the technological proficiency of its populace, initiating a number of government programs designed to promote the use of information technology and enhance user skills. In 1993, an educational network was established, linking⁴⁷⁰ primary and secondary schools as well as universities to a conference and learning environment and later to the internet.⁴⁷¹ In 1997, research institutions were able to connect to Forskningsnettet, a research network, which in 1999 allowed downstream speeds of up to 10 Mbit/s.⁴⁷²

The Danish Government has found it crucial for the nation's "ability to utilize the strong growth potential found everywhere in the country" that "knowledge should be put to work in the Danish regions."⁴⁷³ In a regional action plan in combination with the Finance Act for 2005, about DKK 130 million have been allocated to be spent on a number of regional technology centers.⁴⁷⁴

465 OECD, *Broadband Growth and Policies in OECD Countries 2008*, 2008, p.44.

466 OECD, *Broadband Growth and Policies in OECD Countries 2008*, 2008, p.43

467 The Danish Government, *IT and Telecommunications Policy Report 2009*, March 2009, p.8.

468 IT- og Telestyrelsen, *Comments on FCC GN Docket No. 09-47*, June 2009, p.1.

469 IT- og Telestyrelsen, *Mapping of Broadband Access Services in Denmark- Status by mid-2004*, English summary, December 2004, p.10 et sq.

470 Technically, Sektornet is a VPN on Tele Denmark's IP net, see:

<http://cordis.europa.eu/infowin/acts/analysys/products/thematic/flexwork/3-4/3-4.htm>

471 <http://en.vtu.dk/files/publications/2001/from-hardware-to-content-strategy-for-fast-cheap-and-secure/html/inde0007.htm>

472 Ibid.

473 The Danish Government, *IT and Telecommunications Policy Report 2006*, March 2006, p.10.

474 The Danish Government, *IT and Telecommunications Policy Report 2006*, March 2006, p.22.

In 2002, a government proposal was adopted, which " gives the employee the right to a tax allowance of up to DKK 3,500 each year against the cost of having a computer made available at home by his/her employer. The scheme requires the employer to contribute 25 per cent of the costs. In addition, data communications access paid for by the employer will be tax free, provided the employee has access to the employer's network from home."⁴⁷⁵

IT skills are fostered by nine new ICT programs introduced in 2006 at the university level. By 2007, enrollment to ICT university programs had risen by 24% from the previous year.⁴⁷⁶ For the period from 2004 to 2007, DKK 370 million have been granted to municipalities to buy and install PCs for the youngest students, provided that the municipalities pay at least the same amount.⁴⁷⁷

In 2008, a requirement for the use of open standards in the public sector came into force, along with the use of open document formats. Some years before, government and municipalities jointly created "eDay2", which was an initiative to "ensure that private citizens and businesses can communicate safely with public authorities with digital signatures no later than February 1, 2005."⁴⁷⁸ In 2009, 50% of basic public services for citizens were available online in Denmark and 86% for enterprises.⁴⁷⁹

Another notable part in Denmark's IT policy is the action plan for green IT by which the Ministry of Science, Technology and Innovation seeks to reduce energy costs and CO₂ emissions in the public sector.⁴⁸⁰

Competition policy

As an early adopter of local loop unbundling, Denmark has actively pursued open access policies to promote competition in broadband markets. The principal instrument that guides competition policy in the telecommunications sector is the Act on Competitive Conditions and Consumer Interest in the Telecommunications Market, which is applied by Telestyrelsen (in some cases in consultation with the Danish Competition Authority).

Two principles govern policy regarding interconnection: "Firstly, the principle that all providers of public telecommunications networks or telecommunications services are under an obligation to negotiate between them agreements on exchange of traffic, with a view to ensuring mutual access to their telecommunications networks or telecommunications services. Secondly, based on the desire to facilitate the establishment of an effective telecommunications sector driven by competition, the principle that a number of special requirements should be set for providers of telecommunications networks or telecommunications services who have significant market power in a given submarket within the telecommunications sector, or who control a special competitive bottleneck resource."⁴⁸¹ Those requirements for operators with significant market power include - among others - the obligation to meet interconnection requests on non-discriminatory terms and at cost-related prices.

475 The Ministry of Science, Technology and Innovation, IT for All - IT and Telecommunications Policy and Action Plan 2002.

476 The Danish Government, IT and Telecommunications Policy Report 2008, March 2008, p.13.

477 The Danish Government, IT and Telecommunications Policy Report 2008, March 2008, p.9.

478 The Danish Government, IT and Telecommunications Policy Report 2005, March 2005, p.5.

479 European Commission, Europe's Digital Competitiveness Report, Country Profiles 2009, August 2009, p.18.

480 See: The Ministry of Science, Technology and Innovation, Green IT Guidelines for public authorities, December 2008.

481 Act on Competitive Conditions and Consumer Interest in the Telecommunications Market, Chapter IV, p.172.

The Act on Competitive Conditions and Consumer Interest in the Telecommunications Market also contains provisions on Universal Service Obligation. TDC was appointed universal service provider for six years (possibly extended by another two years) from 1 January 2009.⁴⁸²

Prices for local loop unbundling "are set by Telestyrelsen in cooperation with industry players and are based on long run average incremental costs."⁴⁸³ In order to promote competition and lower costs for high downstream speeds, in 2006 and 2007, the regulatory body "decided to reduce TDC's wholesale prices for broadband."⁴⁸⁴ In March 2009 the regulator's plan to require Fixnet Nordic (TDC) to give competitors wholesale access to its cable network was backed by the European Commission.⁴⁸⁵

In December 2008, a bill was passed, which requires companies that share the use of the network to also share the cost of the infrastructure. The Ministry hopes this "will result both in incentives to invest in new technology and also in competition between the services on the existing telecommunications networks."⁴⁸⁶ No accounts of operators requesting competitors to share the cost of future infrastructure are publicly available.

In the field of mobile broadband, the Act on the Establishment and Joint Utilization of Masts for Radiocommunications gives operators the right to use an antenna mast that is owned by a competitor and sets out rules for compensation and sharing of costs.

Network non-discrimination

Network neutrality is not currently at the center of any political debates. Yet it has been the topic of an international conference arranged by the Ministry of Science, Technology and Innovation on 30 September 30th, 2008. According to the Government's IT and Telecommunications Policy Report from March 2009, "Denmark will continue its endeavors to guarantee an open internet for all."⁴⁸⁷

Spectrum policy

The Frequency Act requires the Minister for Science, Technology and Innovation to issue a mandate, which serves as a framework for Telestyrelsen to manage the spectrum of radio frequencies.⁴⁸⁸ Frequencies are allocated by way of auctions. The Frequency Act was revised in 2007 and a new Frequency Act is expected to enter into force on 1 January 2010 allowing the market to trade frequencies and thereby allocating them more efficiently.⁴⁸⁹ The new act will also implement technology neutrality in the use of frequencies and provisions that ban hoarding and anti-competitive behavior.⁴⁹⁰

482 The Danish Government, IT and Telecommunications Policy Report 2009, March 2009, p.9.

483 TeleGeography, GlobalComms Database, Country profile Denmark, p. 16.

484 The Danish Government, IT and Telecommunications Policy Report 2008, March 2008, p.8.

485 <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/394&format=HTML&aged=0&language=EN&guiLanguage=nl>

486 The Danish Government, IT and Telecommunications Policy Report 2009, March 2009, p.10.

487 The Danish Government, IT and Telecommunications Policy Report 2009, March 2009, p.9.

488 http://en.itst.dk/copy_of_frequencies/frequency-legislation/executive-orders-under-the-frequency-act/the-spectrum-policy-framework-mandate

489 The Danish Government, IT and Telecommunications Policy Report 2009, March 2009, p.10.

490 European Commission, Progress Report on the Single European Electronic Communications Market 2008 (14th Report), Country Chapter Denmark, March 2009, p.8.

An auction of additional spectrum is slated for the end of 2009, following a 2008 decision by the Ministry of Science, Technology and Innovation to issue licenses in the 2500-2690 MHz and 2010-2025 MHz bands for fixed and mobile broadband services.⁴⁹¹

491 The Danish Government, IT and Telecommunications Policy Report 2009, March 2009

D. France

Introduction

The development of broadband access in France has been driven primarily by the deployment of DSL. Broadband penetration rates increased markedly after a shift in the regulatory environment and the implementation of local loop bundling. This allowed competitors access to the network of France Telecom and helped to drive down broadband prices in France; consumer broadband prices in France are now among the most affordable in the world. Average broadband speeds in France also place it among the leaders. France is not among the highest performers in terms of broadband penetration rates. However, after strong improvements over the past six years, broadband penetration rates in France are now higher than the OECD average.

The broadband strategy in France has historically relied on private investment and the promotion of market competition. Competition in broadband markets has helped to spur innovation in retail markets, particularly in broadband offering that combine fixed and mobile coverage. This appears likely to change, as the French government has announced its intention to help finance the deployment of fiber networks. The current broadband policy debate in France focuses on the issues of access and sharing of fiber networks. Each of the major players is investing in fiber infrastructure.

Market highlights

Overall, 42.9% of households in France have broadband access.⁴⁹²

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	13	Maximum advertised speed, OECD	3	Price low speeds, combined	11
Household penetration, OECD	18	Average advertised speed, OECD	3	Price med speeds, combined	3
3G penetration, Telegeography	14	Average speed, Akamai	19	Price high speeds, combined	6
Wi-Fi hotspots per 100000, Jiwire	4	Median download, speedtest.net	9	Price very high speeds, combined	5
		Median upload, speedtest.net	6		
		Median latency, speedtest.net	24		
		90% Download, speedtest.net	4		
		90% Upload, speedtest.net	13		

Note: Details in Part 3
 Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis

1st quintile
 2nd quintile
 3rd quintile
 4th quintile
 5th quintile

⁴⁹² OECD Broadband Portal, Table 2a, from EU Community Survey, from 2007.

	Fiber / LAN	Cable	DSL	Other	Overall
Subscriptions per 100 people ⁴⁹³	0.1	1.4	26.6	0.0	28.0 ⁴⁹⁴

Broadband development to date

Compared to its European neighbors, France was slow to adopt widespread broadband Internet. In 2001, penetration rates in France stood at about one-third of the overall average for OECD countries.⁴⁹⁵ However, following an overhaul of the regulatory regime, broadband penetration rates in France have improved substantially over the past six years. Broadband penetration rates in France are higher than the OECD average.

Broadband connectivity in France has been driven primarily through the use of DSL connections via the France Telecom (FT) network. DSL subscriptions make up 95% of all broadband connections in France. The implementation of local loop unbundling (LLU) of FT networks has allowed Iliad/Free and Neuf/SFR to establish themselves as major competitors to FT in broadband markets. The largest cable telephony and broadband cable company, Numericable, controls a vast majority of the broadband cable market. However, this constitutes only about 5% of the overall broadband market. Cable networks have been deployed only in big cities, explaining the low global market share of the technology. Nomadic broadband is offered as a complementary service by DSL operators and has emerged as a result of the convergence between fixed, nomadic, and mobile broadband access, rather than as an autonomous technology. For example, subscribers to Iliad's broadband service (sold under the brand Free) have access to the service box of other Free subscribers to form a subscriber-based system of nomadic access. Similarly, SFR enables its customers to connect wirelessly via FoN subscribers, as well as integrating its nomadic service with its cellular service.

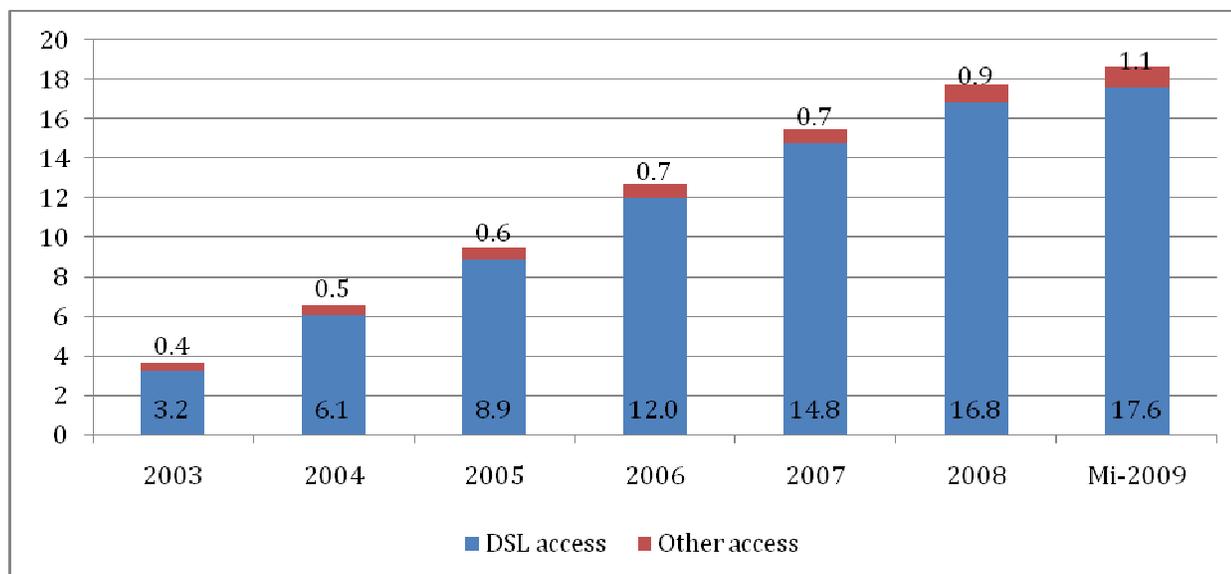
Broadband connectivity is accessible to 99% of the overall population in France, and 97% of residents in rural areas (compared to European averages of 93% and 70%).⁴⁹⁶

493 OECD Broadband Portal, Table 1d, supplied by the French government, as of 2008.

494 This number does not include 3G Wireless. Since subscriptions are shared in a household, it will always be below 100.

495 OECD, G7 historical penetration rates. <http://www.oecd.org/dataoecd/22/14/39574797.xls>.

496 <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/343&format=HTML&aged=0&language=EN&guiLanguage=en>

Figure 1: Broadband subscriptions in France (2003-2009, in millions)

Source: ARCEP

Despite commitments by several of the major broadband companies—including FT, Free, and SFR—to invest in fiber roll-out, fiber-based broadband connections remain marginal in France. Iliad, the parent company of Free, announced EUR 1 billion investment to construct 4 million connections by the end of 2012.⁴⁹⁷ They intended to provide the connections in Paris by the first semester of 2007. France Telecom has also committed to investing in fiber roll-out.

Actual investments in fiber roll-out have been somewhat delayed. In part, this may be due to the public controversy regarding access to the infrastructure of France Telecom. In part, it may be due to demand for high speed services still being fulfilled by the relatively high speeds and low costs of DSL in France. The delayed investment is also consistent with the argument that requiring open access to incumbent facilities delays investment. However these factors interact, fiber-to-the-home has not developed as fast as initially expected in France. By December 2008, only 550,000 households had access to fiber connections in their building,⁴⁹⁸ and the number of subscribers remains very low: among 170,000 of all the very high-speed connections, only 40,000 were through fiber.⁴⁹⁹

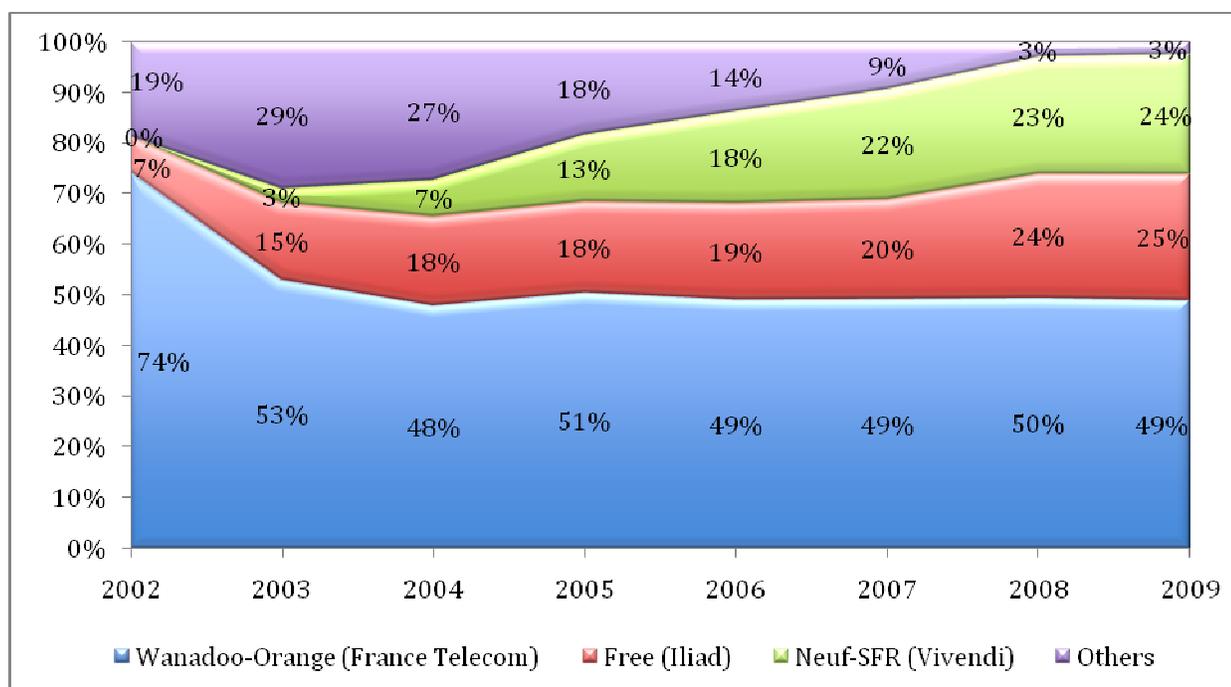
Key players and market share

The historical state-monopolist, France Telecom (FT) remains the leader of the market, although its share of the market dropped substantially following the implementation of local loop unbundling. The FT subsidiary Orange currently holds approximately 50% of the DSL market. (Figure 2).

497 Iliad, Press Release, September 11, 2006.

498 ARCEP, Annual Report, 2008.

499 ARCEP, « Tableau de bord du Très Haut Débit au 31 décembre 2008 ». Published July 4, 2009

Figure 2: Market share of DSL operators in France (2002-2009)

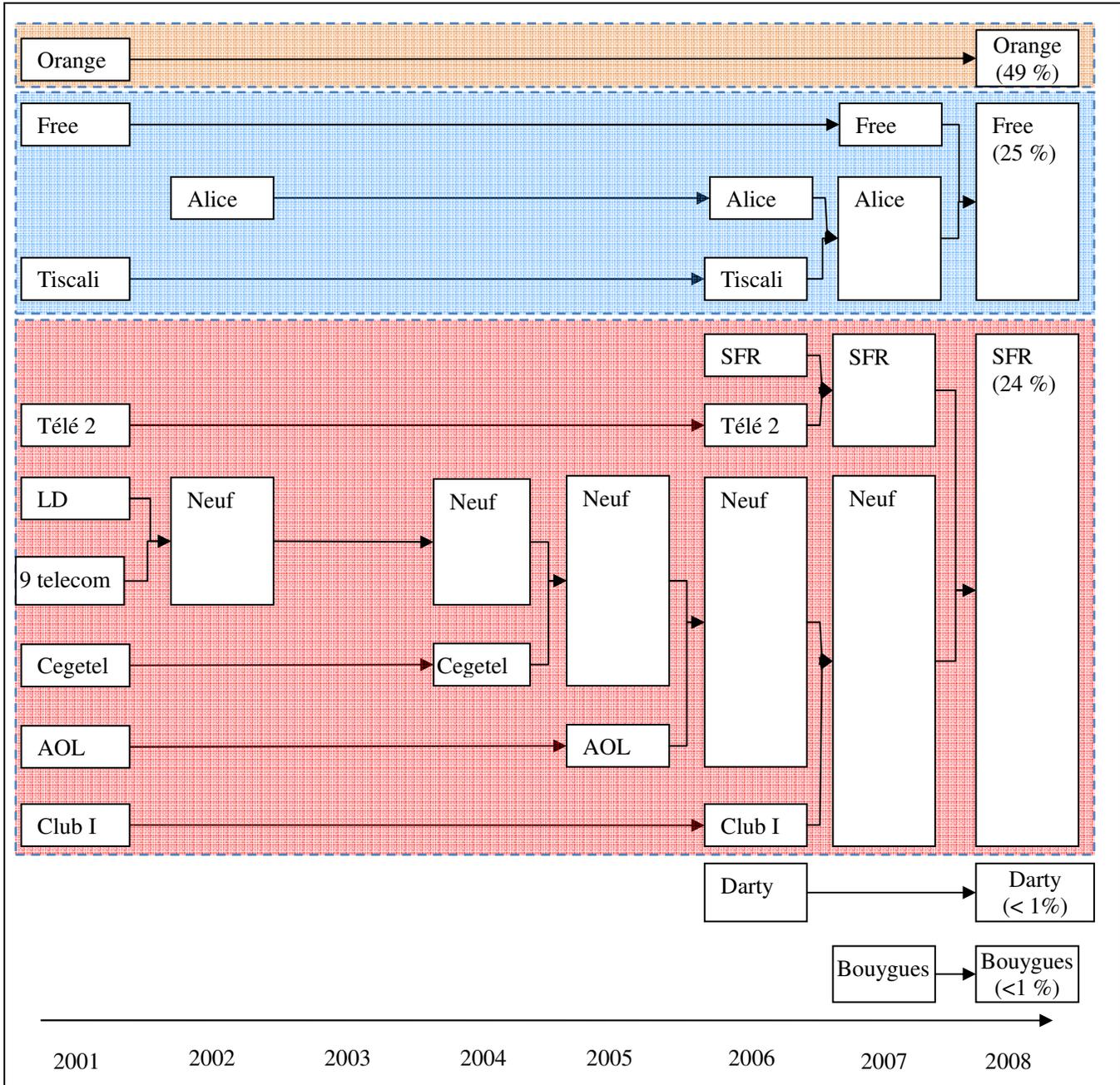
Source: Financial company communication, press releases (collected by Microeconomix)

Between 2001 and 2004, following the regulatory decrease in wholesale prices, several new operators entered the market and gained increasing market share. Building upon unbundled access, Free and SFR have each captured approximately one quarter of the DSL market.

A number of mergers over the past several years have contributed to an increase in market concentration. The last wave of corporate acquisitions in 2008 (Figure 3) consolidated the position of FT-Orange's two principal challengers, Free and SFR-Neuf.

Two recent entrants to the broadband sector, Bouygues and Darty, have adopted distinct market strategies. Bouygues, a telecommunication company, offers convergence of voice and data for their subscribers through broadband access. Darty, a large retailer specializing in household electronics, entered as a virtual operator in 2007. It was not previously active in the telecommunication sector.

Figure 3: Mergers and acquisitions on the French DSL market (2001-2009)



Source: Microeconomix

Only one of the top three operators, Free, was not active in the telecommunication sector before its entry in the broadband market. Iliad is a start-up that introduced an offer for broadband access through ADSL at EUR 30 per month in 2002, and did not change their price even when adding more services, such as unlimited VoIP and TV, to their offer. According to the OECD, this price for broadband access was the best in Europe in 2005.⁵⁰⁰ This price has become the reference point for the French broadband market,

500 OECD (2006), DSTI/ICCP/TISP(2005)12, 20

and has helped to drive down broadband costs in France as other operators have been forced to follow suit.⁵⁰¹

Regulatory framework

The Law of 26 July 1996 opened the telecommunications sector to full competition and mandated the creation of the regulatory authority, ART (*Autorité de Régulation des Télécommunications*), which was subsequently established on January 5th 1997. ART is an independent administrative authority tasked with regulating the liberalization of the telecommunications sector. In 2005, the French Parliament made ART responsible for regulating postal activities; the authority thereby became ARCEP (*Autorité de Régulation des Communications Electroniques et des Postes*).

As in other European markets, the French regulatory framework is driven by implementation of European directives on liberalisation of telecommunications sector, with the Framework Directive 2002/21/EC as a starting point. ARCEP has relied primarily on *ex ante* intervention into wholesale broadband markets. Through access rules and the regulation of tariffs, ARCEP actions have been aimed at ensuring that France Telecom's rivals could compete effectively against the previously state-owned monopolist, which controlled household access via the copper network.

Between 2000 and 2002, the principal regulatory issue centered on the reference offer made by France Telecom to other operators for wholesale access and the co-localisation of operators in DSLAM rooms. These activities were intended to satisfy local loop unbundling requirements, which had been mandated by the European Parliament and the Council in 2000.⁵⁰² As with each member state, France was responsible for the implementation of this law within its own legal system. In 2002, the European Commission started a non-compliance procedure by opening infringement proceeding against France regarding the Regulation on Unbundling of the Local Loop.⁵⁰³ The European Commission indicated that the reference offer from incumbent operators should be sufficiently unbundled to allow competitors to pay only for what they use. In addition, they must provide a breakdown of costs for the sub-loop so that an operator can install equipment closer to customers' premises than the local exchange.

The infringement proceedings opened by the European Commission modified substantially the behavior of ART, which then introduced sub-loop unbundling and significantly reduced the rate charged for local loop access. Although the monthly rental fee became the lowest in Europe after Denmark, the total monthly cost per unbundled loop, including the connection fee, whether full or shared, was still high; in 2003, France was 9th in the EU for full unbundled loops and 6th for shared access.⁵⁰⁴

However, price was not the only consideration. ARCEP also moved to dismantle other obstacles to access unrelated to price. It defined in detail a number of service quality indicators and put forward a protocol for migration to unbundled loops to ensure that the incumbent and new entrants could work together. This included setting precise time limits, forcing FT to disclose the plans of its telephony

501 Iliad has increasingly relied on full unbundling to recover revenue generated by telephony. A significant portion of Iliad's profit is due to fixed-to-mobile calls, because of high interconnection rates. These interconnection rates used to be very high in Europe, but after the intervention of regulators they fell from 40 to 7 cents. FT's prices on these services have been decreasing at the same time, whereas the prices set by the alternative ISP have stayed at a very high level. The regulator expected that the fall in wholesale prices would lead to a similar decrease in retail prices due to competition, but this has not happened. Iliad's business model could not be replicated in countries without such an interconnection regime.

502 Regulation 2887/2000 of 18 December 2000 on unbundled access to the local loop, OJ L 336, 30/12/2000, 4.

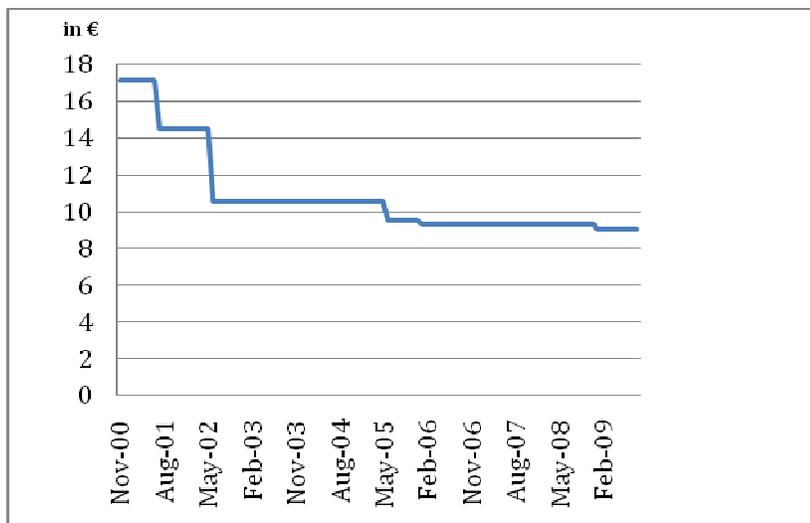
503 European Commission, Press Release nr IP/02/445, March 20, 2002.

504 EU Telecommunications Regulatory Package – 9th Implementation Report – Annex 1, 2003. See figures 63 to 66.

exchanges (“centraux téléphoniques” in French), and setting the exact price of an hour of work on LLU.⁵⁰⁵ This was aimed at preventing the incumbent from continuing the delaying tactics it was alleged to have undertaken in the past in order to gain an advantage in the DSL market.⁵⁰⁶

The regulatory focus on LLU, along with interconnection, has had a clear impact on the provision of broadband in France. LLU represents 60% of broadband access bought on the wholesale market, and represents more than 90% of the growth in the first quarter of 2009.⁵⁰⁷ In 2005, ARCEP launched a consultation process for setting tariffs of the local-loop and published a methodology in December 2005. The current cost accounting method was chosen to evaluate the investment in local loop assets. The total cost of unbundling is defined as the sum of the local loop costs (which includes a capital cost and an operation cost), the costs of services, and a fraction of FT's common costs. FT is required to base its regulated prices on this total cost accounting method. The figure below reports the downward evolution of France Telecom' prices agreed by ARCEP between 2000 and 2009.

Figure 4: LLU price on wholesale access French market (2000-2009)



Most of the recent debates regarding the regulatory framework concern the implementation of fiber networks. ARCEP has stated that France Telecom's civil engineering infrastructure, including the underground infrastructure that hosts the local loop, is the critical element in the deployment of a new fiber local loop. This civil engineering infrastructure has been defined as an essential facility, and France Telecom is thereby required to provide access to it. ARCEP has also stated that it will seek to avoid duplication of installation in buildings, but without eliminating competition at the service level. Operators will need to share the terminating sections of their fibre optic network. Debate over the specific modalities for rolling out and sharing new fiber deployments are on-going.

⁵⁰⁵ OECD Regulatory Reform in France: Regulatory Reform in the Telecommunications Sector (2003).

⁵⁰⁶ On this issue, the misadventures of an early ISP, Mangousta, with FT should be mentioned. Mangousta was launched in 1999 and was one of the first DSL providers in France. Even if FT was obligated to deliver DSL access through resale or unbundling, it prevented the small company from entering some of their telephone exchanges, and even damaged the installations of their new competitor. This eventually led to the bankruptcy of Mangousta. The managers of this ephemeral ISP brought the case before the European Commission and as FT feared the imposition of a considerable fine, they chose to settle the case directly with the managers and paid them compensation that covered slightly more than their initial investment.

⁵⁰⁷ ARCEP, "Tableau de bord des offres de gros du haut débit par DSL", June 2, 2009.

Broadband strategy

In 2008, the Prime Minister F. Fillon created a new ministry dedicated to the digital economy. E. Besson was appointed as a minister of State "in charge of the development of digital economy." He was later replaced by N. Kosciusko-Morizet, who remains the current minister of State.

In 2008, E. Besson presented the new broadband strategy for France "France Numérique 2012." This plan aims, among numerous other goals, to provide universal access to broadband Internet throughout France before the end of 2010. To achieve this goal, the French government will contract at a local level with private operators to provide universal access for the 2 to 3% of citizens who do not have broadband access, with the specification that connectivity should be no less than 512 kbps and at a cost of no more than EUR 35 per month. The plan also provides new financial and administrative tools for local governments' investment in network infrastructure. Since the initial release of the strategy, targets are being redefined towards higher speeds and an applications-based definition of targets in addition to pursuing fixed-mobile convergence.⁵⁰⁸

The initial plan within the "France Numérique 2012" strategy was to organize a call for tender for the supply of the universal broadband access by January 2010. The call for tender was intended to occur in the first quarter of 2009, but has been postponed due to the economic slow-down.

Policy interventions and outcomes

Government investment in infrastructure

The government has never directly invested in infrastructure, whether for DSL or fiber technologies, but limited its role to setting the regulatory framework through the creation of an independent regulatory authority (ART, later ARCEP).

Investments in infrastructure have been made at the local level. Using the loans from the Caisse des Dépôts et Consignations (CDC), the financial arm of the French state, many local governments have developed broadband infrastructure in the areas without adequate broadband coverage in order to reduce the disparity between urban and non-urban broadband penetration rates.

Public investments in services must conform to European guidelines and the scope of authorized public intervention depends on the level of service offered by private operators. In the "white zone", where no private operators provide broadband service, public intervention is a classical response to market failure. Local governments may subsidize the building of networks and may also directly provide broadband access according to Act 2004-575 on Confidence in the Digital Economy.⁵⁰⁹ Local government may be permitted to become minority investors in these projects and contract with private operators, either through a "public service delegation" or public-private partnerships. For example, the governments of Oise, Pyrénées Atlantique, Loiret, and Alsace have established public network projects by leasing unbundled local loops and installing DSLAM.⁵¹⁰ Of the 102 projects launched so far, 85 cover more than 60.000 inhabitants.⁵¹¹

508 <http://www.arcep.fr/fileadmin/reprise/communiqués/communiqués/2009/comnq-nkm-fibre-100709.pdf>.

509 This act improves the prevention and enforcement system on the Internet.

510 OECD, "Working Party on Telecommunication and Information Services Policies: The Development of Broadband Access in Rural and Remote Areas," Directorate for Science, Technology, and Industry, Committee for Information, Computer and Communications Policy (Geneva, Switzerland) May 10, 2004, 23.

511 French Government, « Plan de développement de l'économie numérique, France Numérique 2012 », October 2008.

The relevance of public intervention in the "grey zone" has been widely discussed. The "grey zone" refers to local DSL markets where the incumbent operator remains the only provider of broadband access. Local government can argue that the competition is too low, and build an alternative network to promote an effective competition in the market. However, these public subsidies have to fulfill the European rules regarding public subsidies. In 2007, under the Community State Aid rules, the European Commission approved the funding by Sicoval (an association of municipalities on the south-east side of Toulouse) of a very high-speed telecommunications network exclusively serving businesses and public organizations on its territory.

Investments in the "grey zone" yield litigation risk. For example, the municipality of Paris wanted to offer free wireless network "Paris Wi-Fi", so it organized a call for tender for the supply of the infrastructure and later proceeded with the investment. France Telecom, after it had not been selected in a call for tender, brought an action against the municipality in an administrative French court in March 2007 (on the basis of the L 1425-1 article of "Code General des Collectivités territoriales").⁵¹² Thus far, France Telecom has not been successful in its litigation and "Paris Wi-Fi" continues to operate.

Despite these difficulties, new loans from the CDC will be made available through the plan "France Numérique 2012" and local governments may be permitted to become minority investors.

Public investment in broadband access infrastructure will likely increase in the future through the deployment of fiber networks. Projects estimated to cost EUR 25 to 40 billion are expected to be partially financed with public funding 2010.⁵¹³ This plan for publicly-backed financing, announced by President Sarkozy in 2009, aims to rebuild and redesign French industry with a clear focus on high-tech industry. The amount has not been set, but the bond could be in the range of EUR 80 to 100 billion.

Competition policy

The French competition law follows common European standards concerning the abuse of market power, collusion, and mergers. France's competition policy is in line with the European Commission's approach of decentralized *ex post* enforcement through national institutions. In 2008, national regulatory institutions were restructured with most of the responsibilities concerning the competition law given to *Autorité de la Concurrence*. This new authority has the capacity to proceed with its own investigations and make decisions in all the fields of the competition law. The Ministry of the Economy remains responsible for consolidations that fall below a certain threshold.

The decision by French authorities to address the anticompetitive practices of FT regarding broadband access had a profound impact on broadband markets in France. They penalized the incumbent operator for practices aimed at pre-empting the emerging DSL market between 2001 and 2002 and benefiting its Wanadoo subsidiary. Their practices included predatory prices,⁵¹⁴ discriminatory conditions in access to the local loop,⁵¹⁵ and smear campaigns against the alternative operator.⁵¹⁶ The incumbent was also accused of impeding effective competition in broadband markets in overseas departments through margin squeeze. In bringing its case against FT, the French competition authority argued that the low penetration of broadband access was a direct consequence of the practice.

512 Available online at : <http://www.legifrance.gouv.fr/affichCodeArticle.do?cidTexte=LEGITEXT000006070633&idArticle=LEGIARTI000006389450&dateTexte=20080222>

513 Les Echos, September 11, 2009.

514 Decision by the EU Commission of 16 July 2003, imposing a €10M fine on FT.

515 Decision 05-D-59 (Conseil de la concurrence 7 November 2005), imposing a €80M fine on FT.

516 Decision 07-D-33 (Conseil de la concurrence 15 October 2007), imposing a €45M fine on FT.

The competitive analysis of mergers has been especially relevant in two recent cases: SFR-Télé 2⁵¹⁷ and SFR-Neuf.⁵¹⁸ Interestingly, the planned operations raised concerns about the possible dominant position of the new entity not in DSL markets but in pay-TV markets. The two operations were approved in the light of commitments by SFR and Vivendi to ensure access to Vivendi TV content by other DSL operators.

Spectrum policy

The 1996 Telecommunications Act set up the Agence Nationale des Fréquences (ANFR), a body responsible for planning, monitoring, and coordinating spectrum usage in France. The ARCEP assumes the authority for determining rates for spectrum license fees and administrative taxes. France has used comparative selection procedures (commonly referred to as a “beauty contest”) to allocate spectrum licenses for the telecommunication sector, including 3G licenses. Initially four licenses were offered for tender at the price of EUR 4.95 billion. This was perceived as too high by a number of operators, and only two licenses were awarded in June 2001, to FT and SFR. In December 2001, the government decided to change the license price in order to allocate the remaining 2 licenses, with the modifications also applicable to the two existing license holders. The price was reduced to EUR 619 million with an additional tax of 1% on revenue from 3G activities.⁵¹⁹ Only Bouygues Telecom applied for a license and was awarded a concession in September 2002.⁵²⁰

In July 2006, ARCEP decided to allocate a fourth 3G license, and Iliad indicated that it was interested in acquiring it. After considerable negotiation over the financial details, Iliad declined ARCEP’s offer. In January 2009, the French government decided to split the blocks of frequency on offer into three lots of 5MHz, with one reserved for a new entrant with a price of EUR 206 million. Iliad is officially a candidate since August 2009. The tender is still pending.

The national plan, “France Numérique 2012,” proposes the reallocation the 790-862MHz band, which was used previously for analog TV, to fixed and mobile broadband. This part of the “digital dividend” will be used in coordination with the other European countries.

517 http://ec.europa.eu/competition/mergers/cases/decisions/m4504_20070718_20600_en.pdf

518 http://www.dgccrf.bercy.gouv.fr/boccrf/2008/08_04bis/c2007_181_sfr_9cegetel.pdf

519 OECD Regulatory Reform in France: Regulatory Reform in the Telecommunications Sector (2003).

520 TeleGeography, GlobalComms Database, DT Company Overview (updated March 2009).

E. Germany

Introduction

Germany was an early leader in liberalizing telecommunications markets, and was the first European country to implement local loop unbundling. However, it struggled for years to fully implement these policies. The national regulatory agency has faced pressures from the incumbent Deutsche Telekom (DT), on the one hand, and ongoing pressure from the European Commission to more effectively implement its policies, on the other. Germany's broadband market is dominated by DSL. Cable, while widely deployed, did not develop as a significant competitor until quite recently. DT owned most of Germany's cable television infrastructure at the inception of broadband. Subsequent owners of cable infrastructure have upgraded the networks with the intent to provide VDSL-competitive speeds in 2010, but their small overall share of the market is further fragmented by regulatory prohibition of mergers. Four different wireless operators compete in the 3G market. A much-anticipated auction of the so-called "digital dividend" frequencies, freed up by the digital television transition, is slated for 2010.

Market Highlights

Overall, 49.6% of households in Germany have broadband access.⁵²¹

	Fiber / LAN	Cable	DSL	Other	Overall ⁵²²
Subscriptions per 100 people ⁵²³	0.0	1.9	25.4	0.0	27.4

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	14	Maximum advertised speed, OECD	9	Price low speeds, combined	15
Household penetration, OECD	16	Average advertised speed, OECD	6	Price med speeds, combined	13
3G penetration, Telegeography	13	Average speed, Akamai	15	Price high speeds, combined	11
Wi-Fi hotspots per 100000, Jiwire	14	Median download, speedtest.net	6	Price very high speeds, combined	9
		Median upload, speedtest.net	10		
		Median latency, speedtest.net	14		
		90% Download, speedtest.net	7		
		90% Upload, speedtest.net	16		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis

521 OECD Broadband Portal, Table 2a, from EU Community Survey, from 2007.

522 Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

523 OECD Broadband Portal, Table 1d, supplied by the German government, as of 2008.

Broadband development to date

Germany is Europe's largest broadband market by raw numbers, but its penetration per household and per 100 inhabitants lags behind most of its neighbors. The state of broadband in the country is best understood in the context of the gradual privatization of DT. After privatization in 1995, DT retained an unusually high market share. In 2001, it still had 97% of the broadband market, and as recently as 2004 DT still served 88% of the market.⁵²⁴ At that point, the German government still owned 40% of the shares. DT's primary mode of lowering their retail market share between 2004 and 2006 was resale through one selected competitor, United. That arrangement was found to be on anticompetitive terms vis-à-vis other, smaller competitors by the German regulator, BnetzA, which forced DT to offer all its resellers identical (higher priced) terms. While cable is widely deployed in Germany, it was initially owned by DT, which did not use it to serve broadband. After DT divestment from cable, various limitations on coverage and size kept cable market share of broadband low. Cable is now growing rapidly, but still accounts for less than 10% of the German broadband market. Two providers, KabelBW and KDG, are in the process of rolling out DOCSIS 3.0 that will allow download speeds on the order of 100 Mbit/s.⁵²⁵

Fiber-to-the-Home (FTTH) has developed slowly in Germany. The two leading regional projects, M-Net and NetCologne, continue to serve a small portion of the market. Their approach of bringing fiber all the way to the home differs from DT's, which is based on fiber-to-the-node. However, DT has recently partnered with M-Net in order to support its VDSL service via a shared fiber network.⁵²⁶ FTTH in Germany is in very early stages.⁵²⁷

3G services emerged in Germany after the country held spectrum auctions in 2000. Although six licenses were initially awarded, only four players (E-Plus, T-Mobile, Telefonica O2, and Vodafone) were ultimately able to achieve viability. Each has rolled out its service using the higher-speed HSDPA standard. They all appear poised to migrate to 4G LTE services and are expected to be active in the upcoming "digital dividend" spectrum auction. WiMax has been deployed in some rural areas where wireline service is less practical but is typically offered at significantly higher monthly subscription fees than comparable wired service.⁵²⁸

Market share and key players

Germany is primarily a DSL country. DT owns the last-mile copper infrastructure as a result of its former-monopoly status. The German government still owns a portion of DT. Despite nominal unbundling in 1998, the company managed to maintain the vast majority of retail customers, 97% in 2001 and 88% as late as 2004. Its reduction of market share between 2004 and 2006 was largely through a resale arrangement which was later ruled discriminatory by Germany's reconstituted regulatory authority, BnetzA. In 2006, after the regulatory reorganization, unbundling and wholesale mandates were implemented more effectively. Currently, the same arguments that initially raged around unbundling of copper now extend to unbundling of fiber-to-the-node and VDSL facilities. DT now serves 47% of the broadband market.

524 Bullingen, F. (2006). Development of the Broadband Market in Germany. M. Fransman (ed.), *Global Broadband Battles*, Stanford University Press: 195-218.

525 http://www.kabelbw.de/kabelbw/cms/InternetUndTelefon/CleverKabel_100/
http://www.telegeography.com/cu/article.php?article_id=30302

526 http://www.telegeography.com/cu/article.php?article_id=27625

527 <http://www.heise.de/tr/artikel/Im-Kriechgang-in-die-Glasfaser-Zukunft-813748.html>

528 See, eg: <http://www.televersa.com/>

DT has sought to define the VDSL market as distinct from the existing DSL market. While it resists regulatory mandates, DT has recently sought out cooperative arrangements with competitors.⁵²⁹ It remains to be seen whether the regulator will perceive this as genuine cooperation that leads to infrastructure sharing without regulatory mandates, whether the rates are seen as reasonable, and whether such a distinction can be maintained despite EC skepticism.

United Internet is the leading alternative DSL provider in Germany, with a total customer base of 3.5 million after its May 2009 acquisition of Freenet's DSL assets, making up just over 14% of the market.⁵³⁰ Arcor/Vodafone trails by just a few hundred thousand subscribers, with just under 14% of the market. United's business consists of reselling capacity, not only of DT but also of Arcor/Vodafone. Arcor/Vodafone itself combines its own extensive infrastructure with unbundled copper loops from DT. HanseNet, which is owned by Telecom Italia, maintains about 2.3 million lines. Telefonica of Spain owns the fifth largest provider, O2. A variety of other companies make use of unbundling or wholesale access to offer retail DSL.⁵³¹

Cable subscribership has grown in recent years, but still sits below 10% of the overall wireline market. This is largely a result of the legacy user base of DSL. It is possible that the rollout of DOCSIS 3.0 will help cable to continue to increase market share. The cable market is somewhat fragmented with different operators at different layers of the network. In some cases, competition concerns have prevented merger of cable firms. Various pieces of different firms have been consolidated and broken up in recent years.

T-Mobile Germany (DT) leads the 3G wireless market with 9 million subscribers—37% of the market. Vodafone is a close second with 34% of the wireless broadband market. E-Plus Mobilfunk and Telefonica O2 hold 16% and 13%, respectively.⁵³²

Regulatory framework and political economy

Germany's national regulatory agency for telecommunications is the Bundesnetzagentur (BnetzA). The communications sector's previous regulator, the Regulatory Authority for Telecommunications and Post (RegTP), was merged with the BnetzA in 2005. Germany's overall broadband market is governed by the Telecommunications Act (Telekommunikationsgesetz, or TKG), which was revised in 2004 to bring it in line with the European Union's legislative framework for telecommunications. Under the Act, the BnetzA can impose obligations on companies with "significant market power" in individual markets regarding the services they offer in those markets.⁵³³

The German government's history of effectively implementing its regulatory goals has been checkered. For instance, various hiccups and delay tactics in the unbundling process allowed DT to continue to exercise control over potential competitors for many years. In 2004, the OECD observed, "DT has successfully used judicial review of regulatory decisions to delay, indeed block, the enforcement of regulatory decisions. While unbundling of the local loop was mandated back in 1997, through delays in the provision of leased lines, price-squeeze tactics, artificially low retail prices for DSL services, etc.,

529 http://www.telegeography.com/cu/article.php?article_id=29206

530 <http://www.telecompaper.com/news/article.aspx?cid=673378>

531 TeleGeography GlobalComms Database, March 2009.

532 TeleGeography GlobalComms Database, March 2009.

533 Deutsche Telekom Annual Report 2008.

<<http://www.annualreport2008.telekom.de/en/konzernlagebericht/wirtschaftliches-umfeld/index.php?page=63>>

DTAG has virtually precluded competition and retained or even recently established a dominant position such as in broadband services.”⁵³⁴

With the reorganization of BnetzA, the regulator appears to be able to enforce its goals more effectively. Unbundling increased significantly after 2006, and pricing for resellers was made nondiscriminatory, after the agency challenged DT special deals with United.

Much of the regulatory action has now shifted to the next generation, which in Germany is still very much focused on VDSL networks. In 2006, just as BnetzA imposed a more effective unbundling regime on DT, the German legislator passed a regulatory holiday for DT with regard to VDSL investments. The European Commission brought action against this law, arguing that it amounted to giving the national monopolist a head start against competitors. In December 2009, the European Court of Justice invalidated the law as restrictive of competition. BnetzA responded with new access rules that apparently require access to ducts for competitors to run their own fiber and access to some dark fiber. It also requires DT to install DSLAMs in its VDSL network points. As of this writing, it is too soon to tell how effective these new rules will be. As the case of regulatory holidays suggests, the European Commission plays an important role in Germany’s regulatory framework, as BnetzA and the legislature seem to be susceptible to pressure from DT prompting greater intervention from Brussels than appears to be the case for Ofcom in the UK or ARCEP in France.

Broadband strategy

The German government published a high-level broadband strategy in February of 2009 that sets a goal of nationwide broadband access to every home in the country by the end of 2010. It also aims at transmission rates of at least 50Mbit/s by 2014 for 75% of German households.⁵³⁵ The plan envisions cooperation with federal states (Länder), local authorities and industry to boost broadband development in Germany.⁵³⁶ The effort builds on the government’s practice of forming commissions to analyze broadband conditions and policy. In 1999, the D21 broadband initiative was launched, aiming to "support and promote the development of the information society by bringing together national governmental bodies and industry to study broadband strategy, conduct workshops, and prepare policy documents."⁵³⁷ The government had identified broadband as central to fostering the “Information Society,” producing reports in 2003 and 2005, and setting a goal of reaching 50% residential adoption by 2010.⁵³⁸

The February 2009 broadband plan includes a four-pillar strategy:

1. Capitalize on synergies from infrastructure projects: Public and private infrastructure providers have to become more open to collaboration in the near future. If they were to allow third-party access to their own systems, costs could be reduced significantly and there would be a win-win situation for business as well as for the economy as a whole.
2. Establish supportive spectrum policies: These policies aim in particular on making optimum use of the frequency band of 790 to 862 MHz, made available in the digital television transition. This dividend should be used to close broadband gaps, especially in rural areas.

534 OECD, Regulatory Reform in Telecommunications in Germany, June 7, 2004.

<<http://www.oecd.org/dataoecd/46/19/32408088.pdf>>

535 Federal Ministry of Economics and Technology. (2009) The Federal Government's Broadband Strategy. p. 5.

536 Federal Ministry of Economics and Technology. (2009) The Federal Government's Broadband Strategy. p. 5/6.

537 Atkinson, Robert; Correa, Daniel & Hedlund, Julie (2008). Explaining International Broadband Leadership. p 21.

538 Ibid.

3. Financial aid: There is often poor immediate broadband uptake in rural areas without government support. Therefore, the government will provide incentives in these areas through support programs to enable internet access in households that do not yet have broadband access.
4. Regulation geared to growth and innovation: Regulation is seen as having promoted competition in the telecommunications market and fostering investment and growth. There will be no significant change in the national legal framework in the near future.⁵³⁹

The plan goes on to describe 15 actions:

1. Optimize shared use of existing infrastructure and facilities
2. Compile an infrastructure atlas
3. Compile a database of construction sites
4. Needs-based collaboration on installing ducting and joint creation of infrastructure
5. Improve broadband uptake in the home
6. Rapidly reaping the benefits of the digital dividend
7. Improved conditions of funding in the joint tasks
8. Additional finance for the expansion of infrastructure
9. Improved planning certainty for companies
10. Define the main features of regulation geared to growth and innovation
11. Requirements related to incentives and investment stimulus in the EU regulatory framework
12. Active and participatory public relations
13. Set up a broadband center of excellence
14. Set up a Government-Federal States taskforce
15. Draft an annual monitoring report⁵⁴⁰

These actions warrant significantly more definition. The government took the first steps in doing so in a series of “eckpunkte” (or “cornerstones”) released in May of 2009.⁵⁴¹ These cornerstones themselves warrant further definition, but generally echo the principles in the initial plan. They include support for infrastructure sharing, a commitment to regulatory certainty, encouragement of universal service, targeted subsidies, an “infrastructure atlas”, and more.

539 Federal Ministry of Economics and Technology. The Federal Government's Broadband Strategy. 2009, p. 10 f & www.i-policy.org/2009/02/german-government-introduces-national-broadband-strategy-pledges-to-auction-digital-dividend-.html & www.zukunft-breitband.de/BBA/Navigation/breitbandstrategie.html.

540 Federal Ministry of Economics and Technology. (2009) The Federal Government's Broadband Strategy. p. 10 f.

541 <http://www.bundesnetzagentur.de/media/archive/16268.pdf>

Policy interventions and outcomes

Government investment in infrastructure

The German government has made a series of investments in infrastructure in recent years.

Date	EC Decision	Budget (in millions)
10/23/07	N 570 / 2007	~ € 6
7/2/08	N 115 / 2008	€ 141
11/5/08	N 150 / 2008	€ 8
11/5/08	N 237 / 2008	€ 16
11/5/08	N 266 / 2008	€ 20
2/23/09	N 238 / 2008	€ 60
8/14/09	N 243 / 2009	€ 80
		Total: € 332

For instance, in 2008 it announced plans for EUR141 million to “support investments necessary to ensure access to broadband services in rural and remote areas of Germany where there are currently no or insufficient broadband services available and where there are no plans for coverage in the near future (“white areas”).”⁵⁴² At least 40% of the funds will come from municipalities, with the remaining amount coming from state (Länder), federal, or EU funds. The EC approved the plan in 2008.⁵⁴³ It requires that each municipality carries out a market analysis, noting that, “aid may only be granted if, after such a consultation, there is no sufficient broadband offer provided by the market or expected to be provided in the near future.”

Competition policy

All telecommunications companies deemed to have “significant market power” (SMP) are subject to rate regulation.⁵⁴⁴ Furthermore, SMP providers are now obliged to offer line access and interconnection agreements if these remedies are essential for a competitive market. Germany’s “simultaneity rule” bars SMP providers from offering new services unless their competitors also have the opportunity to offer a similar service.⁵⁴⁵

In 1998, Germany became the first of the European countries to introduce local loop unbundling to foster intramodal competition. But since that time, German regulators have struggled to ensure that DT offers competitive LLU fees such that DT still served close to 90% of the market in 2004. Since 2006, however, unbundling-based access increased significantly, although the following years saw continuous skirmishing. BnetzA cut DT’s access charges by 1.3% in 2007; Vodafone and O2 complained of delays in access provisioning in 2007, followed by a BnetzA complaint that was withdrawn after DT cleared the long queues in 2008; and most recently, in April 2009, the regulator rejected DT’s proposal to raise LLU fees, and instead cut rates again by 2.9%. Despite, or perhaps through, this process, Germany now appears to have catalyzed extensive unbundling- and wholesale-based competition through the effective enforcement of unbundling and wholesale mandates. The debate now has shifted, in large measure,

⁵⁴² http://ec.europa.eu/comm/competition/state_aid/register/ii/doc/N115-2008-WLWL-en-02%2007%202008.pdf

⁵⁴³ <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/1096>

⁵⁴⁴ TeleGeography GlobalComms Database, March 2009, p. 3.

⁵⁴⁵ Ibid.

from unbundling of copper to unbundling of fiber-to-the-node VDSL facilities. Past experience suggests that the debate will not end with the most recent decision by the European Court of Justice that invalidates the regulatory holiday that the German legislator provided DT in late 2006 as a way of allowing it to recover its investments in VDSL plant.

Perhaps in anticipation of the European ruling or perhaps in response to announcements by Vodafone of plans to invest in its own bypass VDSL network, DT had reached voluntary agreements with both Vodafone/Arcor and United to provide access to its VDSL network before the recent ECJ decision. Moreover, DT has announced small scale experiments in a cooperative investment strategy for deploying FTTH in which it will invest in its service area and exchange facilities with competitors who invest in FTTH in their respective service regions.

Spectrum policy

In Germany, operators using wireless spectrum need to be assigned frequency by the regulatory authority. The national radio frequency spectrum allocation table (Frequenznutzungsplan, or FreqNP) dictates which frequencies are given to which purposes. In August 2000, the BnetzA auctioned six UMTS licenses to T-Mobile, Vodafone, E-Plus, O2, Group 3G and freenet. The two latter companies later returned the licenses to the regulatory body.⁵⁴⁶ In 2005, the Ministry of Defense freed up E-GSM frequencies that were consequently awarded to O2 and E-Plus.⁵⁴⁷

In 2010 Germany plans to auction the largest amount of spectrum since the original UMTS auctions a decade ago. It appears that the terms of the auctions contemplate the emergence of only three winners. This has raised concerns that Germany's upcoming spectrum auction would put the smaller carriers at a disadvantage relative to T-Mobile and Vodafone, the country's largest mobile carriers, which already have significant holdings in the 900MHz channel. The concern raised by the smaller carriers is that if either Telefonica's O2 or KPN's E-Plus does not gain substantial new holdings in the lower frequency bands, that company will be put at a substantial competitive disadvantage in the future mobile market. It is unclear why this threat would not be reflected in higher bids from these two companies, but this remains to be seen in the upcoming auction.

⁵⁴⁶ TeleGeography GlobalComms Database, March 2009.

⁵⁴⁷ TeleGeography GlobalComms Database, March 2009.

F. Japan

Introduction

Japan is often cited as a global leader in broadband technology, speed, and price. The Japanese government has maintained and adapted an aggressive broadband policy since the late 1990s, which has included low-interest loans and tax deductions for infrastructure build-out. Both NTT, the formerly government-run monopoly, and MIC, the regulatory agency, were reorganized in 1999 in order to facilitate removal of legacy technology-specific regulations and to add safeguards to ensure competition. Competition in DSL was strongly influenced by entry of Softbank BB into the Japanese market, using unbundled access to NTT's network. Fiber deployment was driven by competition between NTT and cable and power companies. Today, regulators have embraced a user-centric policy framework that focuses on ubiquitous access and a “layers-based” regulatory framework. The government aims to encourage facilities-based competition with access to poles and rights-of-way. WiMax is not widely deployed, but 3G wireless penetration is high, with providers evolving to 4G. KDDI is expanding Wi-Fi integration as an aspect of fixed-mobile convergence.

Market highlights

Overall, 67.6% of households in Japan have broadband access.⁵⁴⁸

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	17	Maximum advertised speed, OECD	1	Price low speeds, combined	5
Household penetration, OECD	14	Average advertised speed, OECD	1	Price med speeds, combined	1
3G penetration, Telegeography	1	Average speed, Akamai	2	Price high speeds, combined	1
Wi-Fi hotspots per 100000, Jiwire	29	Median download, speedtest.net	4	Price very high speeds, combined	1
		Median upload, speedtest.net	1		
		Median latency, speedtest.net	17		
		90% Download, speedtest.net	3		
		90% Upload, speedtest.net	1		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis



	Fiber / LAN	Cable	DSL	Other	Overall ⁵⁴⁹
Subscriptions per 100 people ⁵⁵⁰	11.3	3.2	9.1	0	23.6

548 OECD Broadband Portal, Table 1e, from EC Community Survey, as of 2007.

549 Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

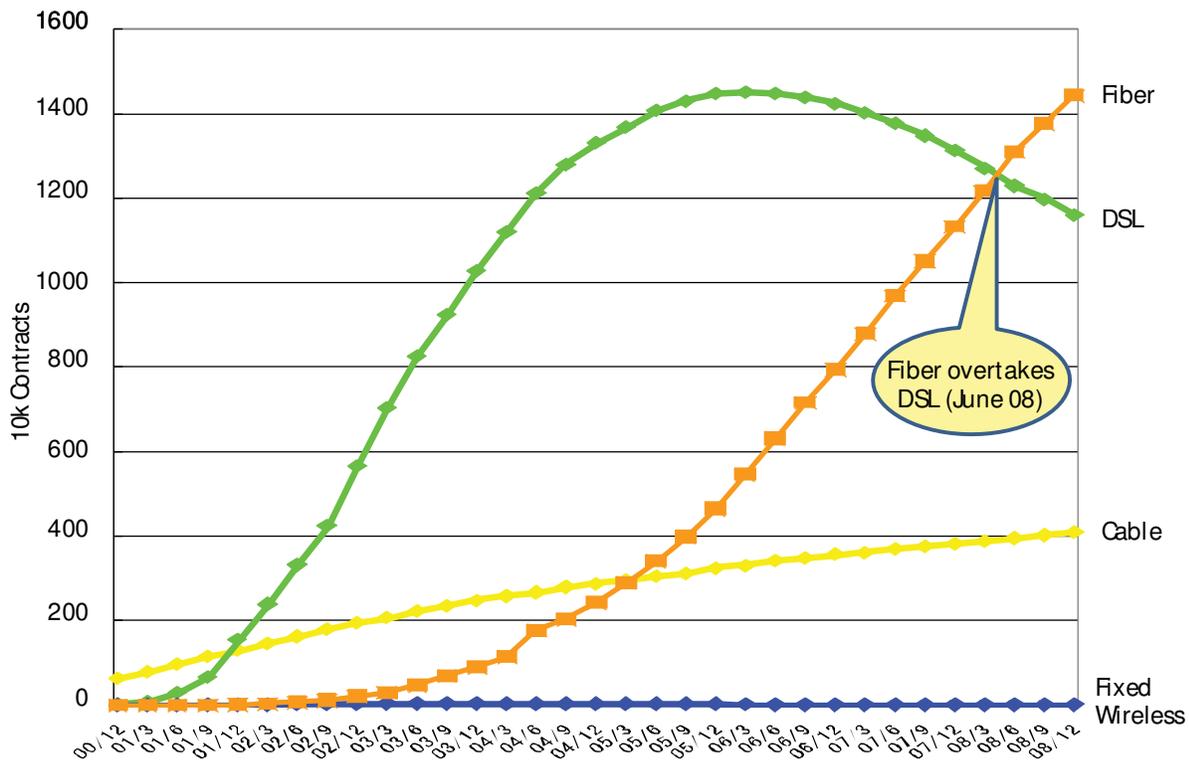
550 OECD Broadband Portal, Table 1d, data supplied by Japanese Government, as of 2008.

Broadband development to date

Cable was the leading source of broadband access early in Japan, but it was eclipsed by the rapid growth of DSL. DSL took off after the establishment of local loop unbundling, interconnection, and “dark fiber” backbone leasing rules for dominant firms in 2000 and 2001. New entrants like Softbank took advantage of these rules to roll out DSL that was both faster and cheaper than NTT’s service. NTT’s service had up to that point focused on more expensive ISDN services. As DSL proved successful, others entered the market and NTT followed suit, triggering a period of aggressive price-slashing and deployment.⁵⁵¹

By this time, NTT’s fiber network had begun to reach most urban households, and the company planned to charge a premium for a proprietary non-IP service. However, it quickly faced facilities-based IP competition from utility company subsidiaries like K-Opticom and TEPCO. This pushed NTT to abandon their proprietary plans and compete on open Internet service.⁵⁵² NTT’s fiber-to-the-home facilities are bound by unbundling and interconnection rules due to their status as a dominant wireline carrier, and thus NTT is also subject to service-based competition from firms like Softbank.

Figure 1: Market Share by Technology



Source: Japan MIC

551 Yasu Taniwaki, *Broadband Competition Policy to Address the Transition to IP-Based Networks: Experiences and Challenges in Japan*, Tokyo, Japan: International Foundation for Information Technology, October 2006.

552 Takanori Ida, *Broadband Economics: Lessons from Japan*, Routledge, 2009.

The next phase of service development likely involves packaging of fiber/DSL and 3.5/4G mobile wireless to provide ubiquitous service—ultra high-speed from the home and increasingly high speed mobile. These partnerships will likely take the form of NTT East/West with NTT DoCoMo, Softbank BB with SoftBank mobile, and the utility subsidiaries with KDDI/au.

Market share and key players

NTT's legacy as a formally state-owned monopoly continues to be reflected in its market share, which hovers above 50% in the wireline access business. Softbank is the largest competitor, with approximately 14% of the market made up primarily of DSL subscriptions (although fiber subscribership over NTT's Flet's Hikari service is beginning to grow), followed by eAccess (DSL). The remaining competitors include a variety of DSL and fiber competitors that take advantage of the interconnection and unbundling of NTT's network, as well as the emergent facilities-based fiber competitors.⁵⁵³

In the wireless market, NTT likewise commands about 50% market share through its wireless arm, DoCoMo. However, the remainder of the market is less fragmented, with au (KDDI) commanding nearly 30% of the market and Softbank Mobile capturing most of the remainder.⁵⁵⁴ However, new entrant eMobile (owned by eAccess) has aggressively deployed its W-CDMA network, and recently became the first to roll out HSPA+ services that offer a theoretical maximum of 21Mbps.⁵⁵⁵ All four competitors are on track to begin 4G LTE service in 2010 or 2011, with DoCoMo and Softbank likely to skip HSPA+ and go straight to LTE.⁵⁵⁶ Recent rules have facilitated the entry of Mobile Virtual Network Operators. Several companies have WiMax deployments planned or in trial, but these currently have relatively small market share.

Regulatory framework

Wireline broadband access falls under Japan's Telecommunications Business Law, regardless of the technology in question. This regulatory approach reflects a "layers" oriented approach that distinguishes between physical (access), service, platform, and content. Jurisdiction belongs to the Ministry of Internal Affairs and Communications (MIC), which is exploring how to further modify the underlying legal structures to an explicitly layers-based approach. The result of this framework is that competition, speed, availability, and discrimination are examined within each layer, but integration between services in different layers is not prohibited. The MIC sees this as a deregulatory approach that nevertheless maintains market and social safeguards.

Wireless services fall under a separate regulatory regime that includes interconnection stipulations and equal treatment of operators, depending on market share. However, the MIC seems to be interested in unifying its regimes using the layered approach.⁵⁵⁷ This might help rationalize assessment of the increasingly vertically integrated wireline and wireless markets. These vertically integrated offerings are not considered substitutable, but instead components of new "Fixed Mobile Convergence" services that introduce new competitive considerations.

553 TeleGeography, GlobalComms Database, Country profile, Japan, updated March 2009.

554 TeleGeography, GlobalComms Database, Country profile, Japan, updated March 2009.

555 <http://www.emobile.jp/cgi-bin/press.cgi?id=671>

556 http://www.rethink-wireless.com/index.asp?article_id=1544

557 MIC, Presentation by Kiyoshi Mori on ICT Policy in Japan at PTC'08 30th Anniversary Conference, January 13, 2008.

<<http://www.ptc.org/ptc08/participants/speakers/papers/MoriFinalSlides.pdf>>

Political economy

The history of the telecommunications political economy in Japan is defined primarily by the battle between the government and NTT. After NTT was privatized in 1985, the company began to wrestle with its regulator, the Ministry of Posts and Telecommunications (MPT). MPT argued for the breakup of NTT in 1990 and 1996, and, although it never succeeded, it did manage to force NTT to be transformed into a holding company and to give certain concessions. MPT was reorganized into the Ministry of Internal Affairs and Communications (MIC) in 1999. At the same time, the Cabinet Office charged with IT promotion was strengthened and began to push back against NTT as well. One of the key issues was interconnection, since the government sets the price and terms of use for competitors that enter the market and use NTT lines. However, these measures did not address the needs of new competitors like eAccess that sought to collocate their equipment within NTT's facilities. The government took further steps to encourage greater competition as Japan lost its global lead in connectivity. In 2000, the new "Basic IT Law" gave the government clear jurisdiction and a mandate. In the same year, the Fair Trade Commission issued a warning to NTT and the MIC compelled NTT to define its terms of collocation, and the ministry required NTT to provide access to its dark fiber and local loop. Japan has evolved from a relatively static but weak "managed regulation" approach to a "strategically liberalized" structure in which the government permits vertical and horizontal integration while facilitating competitive entry to the marketplace.⁵⁵⁸

Broadband strategy

As Japan took major steps to empower its regulatory agencies and to establish new competition rules, the Cabinet Office and the MIC cooperated on broadband strategy. In November 2000, the government issued its "Basic IT Strategy" that described Japan as "backwards" with respect to IT, and proposed a high-level strategy.⁵⁵⁹ In January 2001, in order to enable the rapid and efficient implementation of its strategy, the Japanese government set up the IT Strategy Headquarters. The headquarters is led by the Prime Minister and consists of all Cabinet members plus a number of industry experts. Soon after its inception, the IT Strategic headquarters announced the "e-Japan Strategy,"⁵⁶⁰ a policy program that focused on broadband infrastructure and also set specific penetration and price targets. In 2003, the e-Japan Strategy II was adopted, which noted that many of the infrastructure targets of the initial e-Japan Strategy had been met, and turned to usage and uptake.⁵⁶¹ It promoted the use of ICTs in areas such as medical care, food, living, small business financing, employment, and government services. In 2004, the MIC launched a new "u-Japan strategy."⁵⁶² That strategy is based on the vision that networks should be ubiquitous—available anytime, anywhere, to anyone. These goals were echoed in the complementary "New IT Reform Strategy" released by the IT Strategy Headquarters in 2006.⁵⁶³ Each of these initiatives began with high-level targets, backed up by a strong executive and regulatory bureaucracy, and reinforced in a series of more granular policy packages.⁵⁶⁴

558 Kenji E. Kushida and Seung-Youn Oh. The Political Economies of Broadband Development in Korea and Japan. *Asian Survey*, 47(3): 481-504, 2007.

559 http://www.kantei.go.jp/foreign/it/council/basic_it.html

560 http://www.kantei.go.jp/foreign/it/network/0122full_e.html

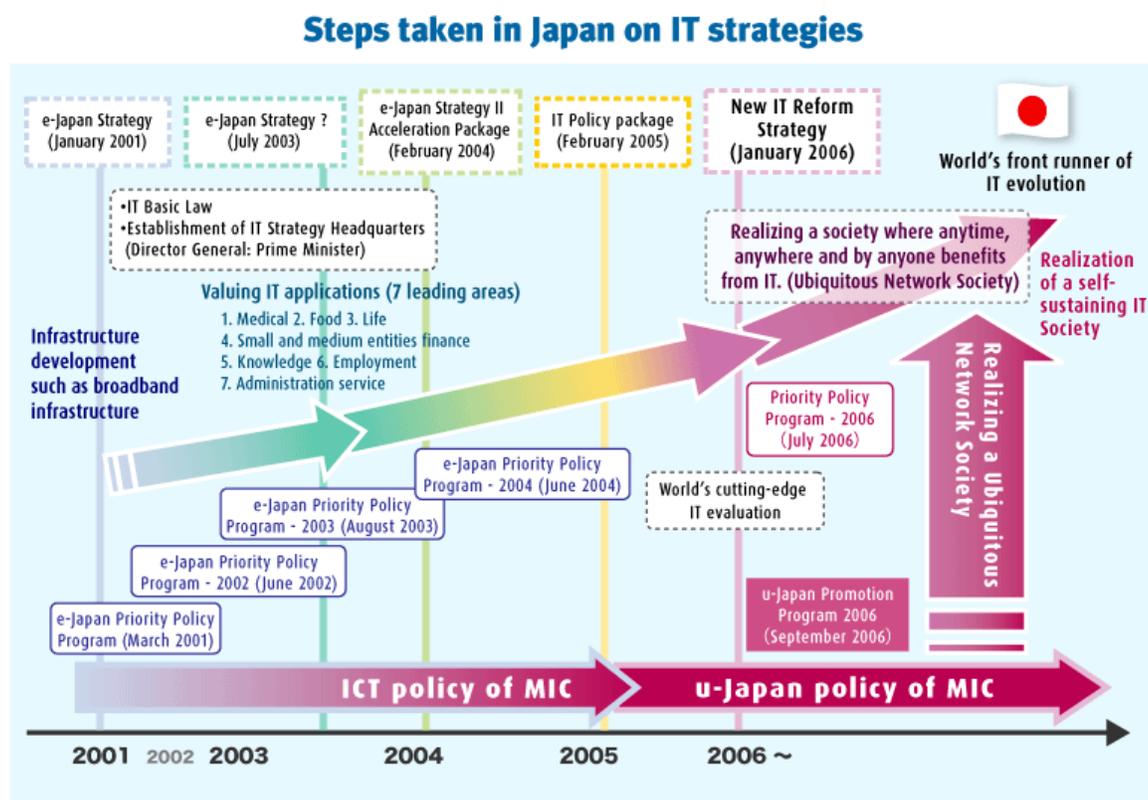
561 http://www.kantei.go.jp/foreign/policy/it/0702senryaku_e.pdf

562 http://www.soumu.go.jp/menu_seisaku/ict/u-japan_en/index.html

563 http://www.kantei.go.jp/foreign/policy/it/index_e.html

564 http://www.kantei.go.jp/foreign/it_e.html and http://www.soumu.go.jp/menu_seisaku/ict/u-japan_en/index.html

Figure 2: Strategies in Japan



Source: MIC

Policy interventions and outcomes

Government investment in infrastructure

The Japanese government has offered loans and tax deductions designed to incentivize broadband build-out since the mid 1990s, but its efforts dramatically accelerated in 2000 as the Basic IT Law went into effect and the national strategies began. The policies introduced over the next several years included a series of tax incentives, including a highly accelerated depreciation schedule for capital investments in telecommunications. These incentives were described at a 2007 ITIF event, along with lowered fixed asset taxes for designated network equipment.⁵⁶⁵ The government-owned Bank of Japan also began to guarantee loans for network infrastructure, which allowed relevant companies to borrow money at lower rates.⁵⁶⁶ NTT itself, however, offers a different interpretation, suggesting that the proportion of investment based on government money was in fact low.⁵⁶⁷ In order to support underserved areas and stimulate infrastructure development, a grant-in-aid system for promoting local telecommunication infrastructure was created in 2006, which has disbursed funds every year to date since its inception. The 2008 “Strategy on the Digital Divide” built on these efforts, and also sought to eliminate “zero broadband” areas. As part of its economic recovery efforts, Japan has committed 185 billion Yen (1.9

⁵⁶⁵ “Understanding the Japanese Broadband Miracle,” presentation at the Information Technology and Innovation Foundation, April 4, 2007 <http://www.itif.org/files/Ebihara_Japanese_Broadband.pdf>

⁵⁶⁶ Thomas Bleha, “Down to the Wire,” *Foreign Affairs*, May/June 2005 <www.foreignaffairs.org/20050501faessay84311/thomas-bleha/down-to-the-wire.html>

⁵⁶⁷ NTT comments to Berkman Center Next Generation Connectivity, FCC GN Docket No. 09-47. November 16, 2009.

billion USD) for “...eliminating the digital divide, promoting the development of wireless broadband and fostering digital terrestrial broadcasting.”⁵⁶⁸

Skill building, education, and demand programs

Several of the policy packages that were part of Japan’s national broadband strategies have included skills and demand programs. For instance, the u-Japan strategy described one of its goals as, “By 2010, 80% of the population to appreciate the role of ICT in solving social problems.” It then spelled out specific policy interventions to promote the use of information technology in health care, public security, education, and the environment.⁵⁶⁹ The government also aggressively pushed its services online, resulting in a high percentage of internet-based citizen-to-government transactions.

Popular services from the private sector have also stimulated broadband demand. For example, IP-based digital video is offered by most major providers, including Softbank’s DSL video service. VoIP rapidly gained popularity and helped motivate adoption. Likewise, content from the entertainment and gaming industries has motivated consumers to subscribe to higher tiers of broadband service.

Competition policy

The government generally views competition in a layered model, and tends to work more aggressively to preserve competition at the physical layer. After the long battle to break up NTT resulted in a compromise that left the company intact, the government focused heavily on these service-based competition measures. This motivated copper unbundling, dark fiber open access, and the 2009 rules intended to ensure unbundling of Next Generation Networks (NGNs). The government sees no evidence that these policies have diminished NTT’s incentives to invest in infrastructure.⁵⁷⁰

The government has not fundamentally restricted horizontal or vertical integration of services. As the fixed-mobile convergence trend continues, mobile companies are likely to work closely with wireline providers. Likewise, providers might increasingly integrate vertically. Potential market abuses are addressed through open access to the physical layer as well as a strong ex-post dispute resolution system. Much of this is outlined in the “New Competition Promotion Program 2010.”⁵⁷¹

The Telecommunications Business Dispute Settlement Commission is charged with realizing fair and effective competition in the telecommunications business sector and the quick and efficient settlement of disputes based on the Telecommunications Business Law. The Commission conducts mediation or arbitration pursuant to an application by a telecommunications carrier. It deliberates and reports to the Minister when there is an enquiry concerning an order for consultation or an award to the Commission. The Commission also makes the necessary recommendations relating to rule development to the Minister.⁵⁷²

568 OECD, *The Impact of the Crisis on ICTs and Their Role in the Recovery*, July 2009.

<<http://www.oecd.org/dataoecd/33/20/43404360.pdf>>

569 http://www.soumu.go.jp/menu_seisaku/ict/u-japan_en/new_pckg02_menu.html

570 Comments to the FCC by the Government of Japan, FCC Docket 09-51.

571 New Competition Promotion Program 2010, 19 September 2006, Ministry of Internal Affairs and Communications (MIC), http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/pdf/060928_1.pdf

572 TBDSC Secretariat, *Overview of Telecommunications Business Dispute Settlement Commission*, June 2009, http://www.soumu.go.jp/main_sosiki/hunso/english/pdf/overview.pdf

Network non-discrimination

The Japanese government has articulated clear principles of neutrality that will guide its policy making process and evaluation of network providers, including:

- Free access to the content and application layer;
- Use of networks at an affordable price;
- Free connection with any terminal that meets technical standards.⁵⁷³

These principles drive specific interventions that seek to preserve open access between layers, and especially access to the lower telecommunications layer. The MIC delivered a “Report on Network Neutrality” in September of 2007, which outlines a framework to maintain “fairness in network cost sharing,” and “fairness in network use.”⁵⁷⁴ It acknowledged that it might be the case that content-neutral traffic shaping could address congestion issues, but the MIC sought further comment on “packet shaping guidelines.” Overall, the report notes that in the context of unbundling and open access provisions, some of the discrimination concerns were mitigated by effective facilities-based or service-based competition.

Spectrum policy

Japan has relied heavily on a licensed model of spectrum use, and has used comparative hearings as the means of allocation. One exception to the licensed model has been Wi-Fi, but even in this case the government originally intended to charge fees for operation and to require firms to obtain a license, but later backed down. On the mobile side, the government typically seeks proposals from interested providers and chooses the winners, who are then required to pay standard fees. This approach has the advantage of making spectrum available relatively quickly, but the well-known disadvantage of working outside of the dynamic market. Japan has been criticized for continued reliance on “beauty contests,” and continues to face pressure to adopt an auction-based model.⁵⁷⁵ The 4G LTE licenses were nevertheless allocated to four providers, as determined by the government.⁵⁷⁶ The new regime has promised to consider auctions, “as appropriate.”⁵⁷⁷ Japanese broadcasters have been resistant to unlicensed operation in TV “white spaces,” and the conversation has not progressed. The MIC conducts a yearly survey of actual radio use, and adjusts its policy accordingly in the “Action Plan for Radio Spectrum Reallocation.”⁵⁷⁸

573 Yoshihiro Katagiri, Recent Regulatory Reform in Japanese Telecommunications, April 24, 2008.

[http://www.wik.org/content/erc/Katagiri%20Reg%20Reform%20in%20Japan%20\(for%20WIK\)rev.pdf](http://www.wik.org/content/erc/Katagiri%20Reg%20Reform%20in%20Japan%20(for%20WIK)rev.pdf)

574 http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/pdf/070900_1.pdf (“informal” English translation)

575 Matsunaga, Hironori. Assignment of exclusive spectrum licenses in Japan : use of an auction for the licensee selection process. Thesis (S.M.), Massachusetts Institute of Technology, Engineering Systems Division, Technology and Policy Program, 2006. <http://hdl.handle.net/1721.1/34521>

576 http://www.soumu.go.jp/menu_news/s-news/2009/090123_8.html (The Japanese government refers to these as “3.9G” licenses.)

577 <http://www.dpj.or.jp/policy/manifesto/seisaku2009/06.html>

578 http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/Releases/Telecommunications/news081107_2.html

G. The Netherlands

Introduction

The Netherlands has been a global leader in broadband deployment, with longstanding high rates of penetration and near-ubiquitous wireline availability via both DSL and cable. In line with EU rules, the Dutch government has unbundled both copper and fiber lines to the home. Cable television was widely deployed at the advent of broadband, which led to a high rate of cable modem subscriptions. Former government telco monopolist KPN was forced to migrate from ISDN to DSL in order to compete.

Strong competition between the platforms persists today complemented by infra-platform competition enabled by unbundling. The copper infrastructure was largely built out by KPN, but the initial cable build-out was often done locally and later purchased by cable firms. Municipal public-private partnerships to promote investments in FTTH have played an important role in shaping the Netherlands' strategy for deploying next generation networks, with an emphasis on cooperative open access models. 3G deployment and adoption has been slower than in similar countries. An auction for additional 2.6GHz and 3.5GHz spectrum, which might serve as the platform for 4G evolution, was delayed until Q1 2010.

Market highlights

Overall, 73.8% of households in the Netherlands have broadband access.⁵⁷⁹

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	2	Maximum advertised speed, OECD	8	Price low speeds, combined	7
Household penetration, OECD	3	Average advertised speed, OECD	5	Price med speeds, combined	9
3G penetration, Telegeography	25	Average speed, Akamai	5	Price high speeds, combined	15
Wi-Fi hotspots per 100000, Jiwire	13	Median download, speedtest.net	2	Price very high speeds, combined	8
		Median upload, speedtest.net	3		
		Median latency, speedtest.net	1		
		90% Download, speedtest.net	5		
		90% Upload, speedtest.net	9		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis

	Fiber / LAN	Cable	DSL	Other	Overall ⁵⁸⁰
Subscriptions per 100 people ⁵⁸¹	0.6	13.4	21.8	0.0	35.8

⁵⁷⁹ OECD Broadband Portal, Table 2a, from EU Community Survey, from 2007. Some recent estimates near 90%.

⁵⁸⁰ Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

Broadband development to date

The earliest Internet access in the Netherlands that surpassed dial-up speeds was ISDN, offered over KPN's copper loop. Following EC policy and regulatory initiatives, the government liberalized the sector over the period of 1996-1997. It removed restrictions on offering telecommunications services and introduced various network access requirements.

ISDN service doubled from 1997 to 1998, reaching over 1.5 million lines (mostly business).⁵⁸² During this same period, cable providers began to offer broadband Internet service. Cable television infrastructure was already widespread, having been deployed by municipalities or public associations in many cases. These groups built and owned the infrastructure, proving its viability and would often subsequently sell the facilities to larger companies years later. Cable modem subscribership rapidly surpassed the user base of ISDN. KPN was forced to respond by introducing ADSL, and spent the next several years catching up with the cable.

Some copper local loop unbundling had been mandated by OPTA as early as 1997, but the regulator did not initially implement "full unbundling."⁵⁸³ By 2002, however, the Netherlands was in compliance with the European Commission unbundling regulations. That same year, KPN was forced to offer bitstream access as well. Since then, the cost of unbundled copper services has dropped dramatically. DSL overtook cable in 2003, enjoying roughly a 60% share of subscribership since.⁵⁸⁴ In the meantime, the many smaller cable operators were mostly consolidated in companies like Ziggo and UPC.

Fiber has been slower to deploy in the Netherlands than in some other countries, in part due to the ability of the cable and copper infrastructure to be stretched to support higher speeds.

As FTTH trials expanded in the mid 2000s, cable providers upgraded their networks to support higher speeds. The major cable companies are now in the process of deploying Euro DOCSIS 3.0, which aspires to speeds of 60-120Mbps.

KPN and its competitors have deployed ADSL2+ and are in the process of rolling out VDSL in an effort to remain competitive with lower-end fiber offerings. KPN has executed its FTTH strategy in narrowly targeted fashion, but ultimately intends to abandon its copper infrastructure. The company recently formed a joint venture with fiber infrastructure owner Reggefiber. Reggefiber gained a majority stake in the Amsterdam CityNet project, which was initially seen as a model case for public investment pushing the commercial viability of FTTH. While this project has fallen short of its anticipated subscription targets, several other municipality-level projects have fared better and have helped to sustain interest in locally funded efforts. To date, European Commission rules on state aid have made the government skittish to invest in fiber – in contrast with the municipally-aided cable build-out that helped fuel the initial broadband energy in the country. However, this stance may be shifting.

Wireless penetration is very high, but 3G build-out and adoption has lagged behind many European and Asian countries. 3G deployment ramped up later than many other nations. The number of 3G subscriptions as a percentage of all mobile subscriptions is less than half that of neighboring countries

581 OECD Broadband Portal, Table 1d, supplied by the Dutch government, as of 2008.

582 Nico van Eijk, "Broadband Services and Local Loop Unbundling in the Netherlands," *IEEE Communications Magazine* October 1999, p. 2-5.

583 OECD, "Developments in Local Loop Unbundling," DSTI/ICCP/TISP(2002)5/FINAL, September 10, 2003.

584 TeleGeography GlobalComms Database, March 2009.

Belgium and Germany.⁵⁸⁵ Intel-backed Worldmax is the only company that has deployed WiMax, and it serves only some areas of Amsterdam. Its plans for future build-out are unclear.

Market share and key players

DSL enjoys a roughly 60% market share, with alternative (non-KPN) DSL providers capturing somewhere between 10% and 20% of the DSL market.⁵⁸⁶ Tele2-Versatel is the leading unbundled DSL provider using ADSL2+ for speeds of up to 24 Mbps, including TV service. In August of 2009, Tele2 announced the rapid rollout of their VDSL2 network, which is designed to provide download speeds of up to 60Mbps and is intended to be available to a million homes in 2010. The next-closest competitor, BBned has an established ADSL/VDSL network capable of slightly slower speeds and has not yet announced plans to migrate to VDSL2. BBned embraces an “open provisioning” model in which partners can also provide Internet service over their network. BBned’s owner, Telecom Italia, has stated its intention to sell the company but no buyers have yet surfaced.

With about a 40% market share overall, cable providers have maintained a strong presence. Over the years, the municipal networks and smaller commercial entities have been acquired by larger entities. Today two firms – Zesko and UPC – capture most of the cable market, with the few remaining regional operators maintaining a small share. Zesko acquired several smaller providers in 2008 and, via its Ziggo brand, serves roughly double the number of subscribers as UPC.

FTTH still constitutes a small portion of broadband subscriptions nationwide, but it is showing some signs of more rapid growth. KPN has stated its intentions to build out fiber nationwide and phase out its copper infrastructure.⁵⁸⁷ KPN has entered into a joint venture with leading fiber operator Reggefiber (KPN has a 41% stake in the company). The Amsterdam CityNet project is an example of a fiber public-private partnership that won buy-in from commercial providers.⁵⁸⁸ In Phase 1 of the project, serving 43,000 homes, Draka Comteq won the rights to build out the “passive” physical layer of the network, and BBned won the rights to provide the “active” internet service. In Phase 2, Reggefiber/KPN won the rights to provide these services to another 100,000 homes and also acquired a majority stake in the group that owns the fiber project.⁵⁸⁹

In the 3G wireless market, KPN commands about a 50% share, with the remainder split fairly evenly between T-Mobile and Vodafone. Five providers narrowed to these three when, in 2005 KPN, acquired Telefort(O2) and in 2007 T-Mobile acquired Orange. There is an active MVNO market, serving over 3 million customers.

In 2010, the government will auction six new licenses in the 2.6GHz and 3.5GHz range. It is unclear at this stage whether any of these new frequencies are likely to be used for WiMax, or if instead they will all be used for UMTS (3G or LTE) service.⁵⁹⁰

585 TeleGeography GlobalComms Database, March 2009.

586 TeleGeography GlobalComms Database, March 2009.

587 KPN has negotiated a Memorandum of Understanding (MoU) with the major retail providers currently using its copper infrastructure, especially its MDF access points. This MoU facilitates their interconnection at alternative locations and contributes to the associated costs of transition. <http://www.kpn.com/corporate/en/Press/pressrel/KPN-signs-MoUs-for-alternatives-to-MDF-Access-with-Tele2Versatel-Orange-and-BBNed.htm> and <http://www2.opta.nl/asp/en/publications/document.asp?id=2354>

588 Norbert Gaal, Lambros Papadias and Alexander Riedl, “Citynet Amsterdam: an application of the market economy investor principle in the electronic communications sector,” EC Competition Policy Newsletter 2008, 1.

589 http://www.telegeography.com/cu/article.php?article_id=27124

590 <http://it.tmcnet.com/news/2009/09/21/4380464.htm>

Regulatory framework

Wireline regulation in the Netherlands is primarily done via the OPTA (Independent Post and Telecommunications Authority), with help from competition authority NMa and some additional oversight from the Ministry of Economic Affairs. Wireless is also regulated primarily by the OPTA, but the Agentschap Telecom does frequency allocations.

In the 1990s, the government shifted from a regulated monopoly model to a liberalized approach that allowed open competition across sectors. In 2004, a revised Telecommunications Act went into effect, which (among other things) brought the Netherlands into line with the EU Regulatory Framework. European Commission law and regulation control a great deal of what the national regulatory agencies are permitted to do.

The Dutch government describes its approach as being market-oriented.⁵⁹¹ This commitment is implemented through engaged regulation: unbundling and competitive requirements, and regular reviews by the regulator. OPTA has set maximum prices for unbundled services, and reviews these and other requirements on a regular schedule to determine whether significant market power is being used to extract rents that are substantially higher than actual costs.⁵⁹² Similarly, NMa worked with OPTA to achieve competitive concessions before approving the KNP/Reggefiber joint venture.⁵⁹³ OPTA has indicated a willingness to apply a light touch when firms choose an open model that permits competition.⁵⁹⁴

Political economy

Much of the political economy in the Netherlands involves the regulator's attempt to balance the benefits of the incumbent's infrastructure and the creation of incentives to stimulate competitive entry. OPTA and KPN regularly spar over terms of interconnection, tariffs, and the like. The regulator has generally managed to carve out jurisdictional and enforcement powers to mandate the terms of competition in the presence of significant market power (which almost invariably is assumed to exist in the case of KPN, but not others). These efforts have controlled profits for KPN and encouraged opportunistic entry by alternatives.

As with all European Union states, there is an additional level of political economy at work. OPTA, and the government as a whole, does not have complete latitude to set the terms of regulation. The European Commission sets guidelines and recommendations across Europe, and differences often emerge. For instance, OPTA and the EC have recently debated the economic models used for fiber unbundling.⁵⁹⁵ Municipal fiber deployments have also been subject to approval at the EC level, under its state aid guidelines. More broadly, the Commission is in the process of drafting a Recommendation on access to Next Generation Access (NGA) networks.⁵⁹⁶ This will shape the relative power of national level regulatory agencies and broadband providers across Europe.

591 See, e.g., <http://www.opta.nl/nl/actueel/recente-publicaties/publicatie/?id=3015>

592 <http://www.opta.nl/nl/actueel/alle-publicaties/publicatie/?id=2957>

593 NMa Decision 6397.

594 "In recent years new parties have opted to establish fiber optic networks, such as building companies, municipalities, and housing cooperatives. Many of these investors employ an open model: service providers may compete with each other in the network. The extent to which OPTA intervenes depends directly on the extent to which this model is open."

OPTA, Focus on 2009, <http://www2.opta.nl/asp/en/publications/document.asp?id=2826>.

595 European Commission, Case NL/2009/0868, Letters of February 17, 2009 and May 20, 2009.

596 http://ec.europa.eu/information_society/policy/ecommm/library/public_consult/nga_2/index_en.htm

Broadband strategy

The broadband strategy of the Netherlands has been roughly articulated in a series of documents released by the government or government-convened expert panels. These planning documents are largely coherent in their vision and prescriptions, but because they are authored by various groups, they often differ in particulars or emphasis. Broadband is generally defined as consisting of a lower tier from 1Mbps to 10Mbps, and a higher tier that supports the full range of broadband activities.

One coordinated national effort to define broadband strategy was the 2002 document, “Nederland Breedbandland.”⁵⁹⁷ The government convened an “expert panel” of industry leaders and academics, which outlined a high-level multi-year plan. The group recognized the high capital costs of next-generation infrastructure build-out and embraced a diversity of financial strategies. This is included the note that, “In geographical areas where market parties will not invest in new infrastructure themselves, public-private partnership can be a powerful instrument in encouraging the development of broadband,” and that, “In most cases, a particular neighbourhood will be financed by a combination of various stakeholders, such as a housing association and local traders and public bodies.” It also explained, “The Government will have to continue to place the role of competition in the broadband market at the forefront of its incentive policy. This means, inter alia, that the unbundling of networks and open, transparent and non-discriminating access for service providers will be basic principles in developing new business models for local broadband networks.”

In 2004, the Ministry of Economic Affairs published an outline of broadband strategy going forward.⁵⁹⁸ The paper echoed many of the conclusions of the expert panel’s document, including an emphasis on the municipal role in build-out, the need for open access to physical infrastructure, and the importance of coordinating standards nationwide. It recommended several action areas, including government-funded research, guidelines for municipalities and provinces, direct stimulus for local broadband build-out, a public-private convening group, and a variety of knowledge-sharing initiatives. A new convening group, NBL sought to develop a platform for knowledge-sharing in the Dutch “kennisbank” (knowledge bank) model.⁵⁹⁹ The government also supported a project called “Connecting the Dots” that sought to support best practices sharing between local initiatives. The recommendations included the creation of the E-Norm Task Force, which brought together industry players to establish a reference model for broadband technology.⁶⁰⁰ The paper also established an “impulse committee” on broadband, which published more detailed guidelines for implementing the Ministry’s vision.⁶⁰¹ Some of these guidelines were ultimately implemented, while others (such as subsidies) were not.

Much of the on-the-ground strategizing in the wireline market has taken place at the local level. The overall structure of broadband strategy in the Netherlands consists of high-level decisions or vision-setting on the national level with substantial latitude for localized solutions.

597 <http://www.expertgroepbreedband.nl/>

598 Ministry of Economic Affairs (NL) “The Broadband Paper; A question of pace and better utilisation” (May, 2004)

599 <http://www.nederlandbreedbandland.nl/> (The group has the same name as the 2002 panel report, but is distinct)

600 Jan Burgmeijer, “Interoperability of Services in an Open Broadband Market: Cases from The Netherlands,” B@Home WP0, Deliverable D0.9, 2006. <http://www.freeband.nl/FreebandKC/keywords?document=File-65402>

601 Bekkers, R., S. Maltha, J. Poort & S. van Geffen, “Naar een nationale strategie voor breedband, Advies van de Impulscommissie Breedband,” Utrecht, 2004.

Policy interventions and outcomes

Government investment in infrastructure

Historically, the Dutch government has offered considerable aid for the build-out of new technologies. This was inherent in the era of the public monopolist, but the government has also actively invested in cable and fiber. In the “Kenniswijk” (Knowledge District) project, the government designated one geographical region as a test bed for residential fiber rollout. From 2000 to 2005, it offered subsidies up to 50% of the cost of build-out and helped with the formation of public-private partnerships.⁶⁰² This included the fairly successful OnsNet project in Nuenen and Eindhoven.

However, government-funded models have been encumbered by measures at both the EU level and the national level that have sought to limit state investment in the interest of avoiding market distortion. From the time of the updated EU Regulatory Framework in 2002, there has been confusion regarding what would be permitted under state aid guidelines. For example, in 2005, the European Commission ruled against public investment by the city of Appingedam,⁶⁰³ but permitted a public-private joint venture in Amsterdam a year later.⁶⁰⁴

From 2004 to 2007, Dutch parliament debated various revisions to the Telecom Act. Ultimately, new language introduced limits on municipal entry or ownership of infrastructure, above and beyond the EC limitations. Some existing municipal investment projects were allowed, and other communities found ways to work within the rules to encourage local deployment. For example, the Amsterdam CityNet project appears poised to serve upwards of 140,000 households using a model in which the city is a partner with private firms.⁶⁰⁵ There appears to be renewed interest in municipal projects in the Netherlands on the part of both private investors and public stakeholders, based on the experiences of more than a dozen municipal projects. This emerging model for public-private participation in the Netherlands suggests a broader role for service-based competition in next generation networks.⁶⁰⁶

The Commission recently clarified its position, appearing to support a relatively liberal set of scenarios in which government investment will be permitted.⁶⁰⁷ Some important distinctions, like which networks will be considered “Next Generation,” remain unclear. Secretary of Economic Affairs Frank Heemskerk has indicated broader support for municipal investment and for revisions to the Telecommunications Act to facilitate this.⁶⁰⁸ The explanatory text accompanying these revisions notes, “The current economic situation makes reconsideration of the statutory restrictions necessary. The possibilities for governments to responsibly contribute to economic growth should not be limited more than is absolutely necessary. One such possibility is to encourage the construction of broadband networks... Cases such as Amsterdam fiber show that the involvement of a municipality can be the proverbial push in the back.

602 Kramer, R. D., Lopez, A., and Koonen, A. M., “Municipal broadband access networks in the Netherlands - three successful cases, and how New Europe may benefit,” Proceedings of the 1st international Conference on Access Networks, Athens, Greece, September 4-6, 2006. *AccessNets '06*, vol. 267. ACM, New York, NY, 12.

603 Decision on the measure C 35/2005 (ex. N 59/2005), October 20, 2005.

604 Decision on the measure C 53/2006 (ex N 262/2005), December 12, 2006.

605 <http://fibresystems.org/cws/article/magazine/37080>

606 For more detailed context, see: Sadowski, B. M., Nucciarelli, A. and de Rooij, M., “Providing Incentives for Private Investment in Municipal Broadband Networks: Evidence from the Netherlands,” *Telecommunications Policy*, 33: pp. 582-595.

607 <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/1332>

608 <http://www.fd.nl/artikel/12868632/ruim-baan-snel-internet-gemeenten>

Right now lenders have become reluctant by the economic crisis, but the involvement of municipalities can be an important incentive for banks and other lenders to participate.”⁶⁰⁹

Competition policy

The overarching competition philosophy of the Netherlands consists of managed facilities-based competition. These competitive facilities do not include the access networks in the last mile, but rather the backbone up to the unbundled copper or fiber lines to the home. OPTA has maintained unbundling controls on the incumbent, and has extended these controls to new fiber networks.

OPTA also recently took steps to force cable providers to open access to their networks for television service (but not broadband).⁶¹⁰ However, this has also affected the broadband market, because it has enabled DSL-based providers such as Tele2 to announce plans for more robust triple-play offerings.⁶¹¹ Generally speaking, the competition policy of the Netherlands seeks to refrain from regulation except in cases of significant market power, per EC guidelines.

Network non-discrimination

Network discrimination has not been a prominent issue in the Netherlands. There has, however, been recent discussion of the issue in the context of cable operator UPC’s protocol-specific bandwidth caps.⁶¹² The Dutch consumer organization Consumentbond has accused UPC of unfair business practices due to lack of disclosure of traffic management practices.

Much of the debate around network non-discrimination is occurring at the European Union level, as the so-called “Telecoms Package” (a review of the existing set of EU directives for electronic communications from 2002) is hammered out. In a recent round of debate, some new language was introduced that appeared to permit network discrimination in some cases. The French advocacy organization La Quadrature du Net has organized resistance to this language in EU countries, but it remains to be seen what will be contained in the final language.⁶¹³

Spectrum policy

The Dutch government has relied on auctions for all recent spectrum allocations. The last major auction, for 3G frequencies, took place in 2000. Historically, auctions in the Netherlands have not realized the high prices seen by other European countries. In 2009, Agentschap Telecom, announced a new auction of 2.6GHz and 3.5GHz frequencies, but after some resistance and complications, the auction was postponed until 2010. The government also added a requirement that 20% of the bandwidth be auctioned to new entrants.⁶¹⁴ After the government’s protracted battle with KPN over whether the company could keep the warehoused 2G spectrum that was acquired in the Telfort buy-out, KPN

609 Dutch Lower House. (September 23, 2009). Kammerstukken 32127, nr. 3.

610 <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/245> (On October 24, 2006, Dutch Parliament voted in favor of a more expansive cable unbundling proposal, but this never progressed to implementation. Kammerstukken 30800 XIII, nr. 18)

611 <http://www.broadbandtvnews.com/2009/02/11/ec-gives-green-light-for-dutch-open-cable/>

612 <http://yro.slashdot.org/story/09/08/23/1921206/First-European-Provider-To-Break-Net-Neutrality>

613 http://www.laquadrature.net/Telecoms_package

614 http://www.telegeography.com/cu/article.php?article_id=28137

returned the spectrum to the government for re-auction in 2010.⁶¹⁵ This outcome was the result of the Dutch government's desire to have all allocated spectrum actively in use.

615 <http://www.telecompaper.com/news/article.aspx?cid=684135>

H. South Korea

Introduction

Due to a regulatory regime based on competition, privatization, and aggressive government programs focused on boosting demand, South Korea has become a world leader in broadband by several measures.⁶¹⁶ After the privatization of the state-run telecommunications provider (Korea Telecom, or KT) and the encouragement of new entrants into the broadband market in the late 1990s, DSL and cable broadband services expanded rapidly. KT has since regained its majority market share in fixed broadband, and both the fixed and mobile markets have consolidated in recent years. Nonetheless, South Korea maintains a competitive mobile broadband market, with three companies offering 3G service across the country. The government has provided substantial loans to support network deployment, funded public information technology training programs, and encouraged broadband access through a building certification program. The South Korean government is now promoting the Broadband Convergence Network and the IT839 programs, both of which envision the convergence of wireline, wireless, and RFID networks to allow ubiquitous connectivity through a panoply of mobile and fixed devices.

Market highlights

Overall, 94.1% of households in South Korea have broadband access.⁶¹⁷

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	6	Maximum advertised speed, OECD	3	Price low speeds, combined	16
Household penetration, OECD	1	Average advertised speed, OECD	2	Price med speeds, combined	16
3G penetration, Telegeography	2	Average speed, Akamai	1	Price high speeds, combined	9
Wi-Fi hotspots per 100000, Jiwire	7	Median download, speedtest.net	1	Price very high speeds, combined	3
		Median upload, speedtest.net	9		
		Median latency, speedtest.net	3		
		90% Download, speedtest.net	1		
		90% Upload, speedtest.net	8		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis



616 Jyoti Choudrie, Anastasia Papazafeiropoulos, and Heejin Lee, "A web of stakeholders: a case of broadband diffusion in South Korea," *Journal of Information Technology* 18 (December 2003), 281.

617 "OECD Broadband Portal", Table 2a, 2007. This includes broadband access modes such as xDSL, cable, other fixed and wireless broadband via computers, and mobile phone access.

	Fiber / LAN	Cable	DSL	Other	Overall ⁶¹⁸
Subscriptions per 100 people ⁶¹⁹	13.8	10.5	7.7	0.0	32.00

Broadband development to date

South Korea began its broadband rollout in the late 1990s with the rapid expansion of both cable broadband access and DSL using copper infrastructure. Cable broadband access grew with the entry of Thrunet into the broadband market. Thrunet used cable plant leased from Kepco, the government-owned power company that owned cable facilities but did not provide broadband.⁶²⁰ Hanaro Telecom entered the market in 1997 and, like other new entrants, found that competing against incumbent KT in the data sector was more profitable than competing in the wireline telephone market. Hanaro sparked a price war by offering broadband DSL as a free addition to wireline telephone service.⁶²¹ In response, KT abandoned its ISDN plans and invested in DSL. By 2002, 70 out of 100 South Korean households had broadband subscriptions.⁶²² By that time, KT had gained a majority share in the broadband market⁶²³ due to its geographic reach and competitive pricing.⁶²⁴ It was only then that the South Korea regulator mandated unbundling of local loop network elements.⁶²⁵

Over 80 % of Koreans live in dense, urban housing, an arrangement that has produced significant economies of scale for the expansion of broadband service.⁶²⁶ Moreover, because landlords, rather than incumbent KT, own local loop facilities, competitive carriers are able to negotiate with multi-dwelling unit owners rather than KT.⁶²⁷ Today, South Korea is moving toward a fiber-to-the-home (FTTH) model. Although development has been slowed by high costs, ADSL and VDSL subscriptions continue to decline as Ethernet connections to fiber nodes grow in popularity.⁶²⁸

By the end of 2007, fiber connections constituted one-third of all South Korean Internet connections.⁶²⁹ The South Korean government is now promoting the Broadband Convergence Network and the IT839 program, both of which envision the convergence of wireline, wireless, and RFID networks to allow ubiquitous connectivity through a panoply of mobile and fixed devices.⁶³⁰ The combined plan calls for a network aimed to support a list of eight services, three infrastructures, and nine growth engines. By 2013, the program expects speeds of both fixed and wireless broadband to be up to 10 times faster than at the beginning of 2009.⁶³¹

By mid-2005, the rollout of W-CDMA mobile networks had stalled in South Korea. Following regulatory intervention, South Korea's two largest mobile providers accelerated the deployment of W-

618 This table does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

619 OECD Broadband Portal, Table 1d, supplied by the Korean government, as of 2008

620 Robert D. Atkinson, Daniel K. Correa, and Julie A. Hedlund, "Explaining International Broadband Leadership," ITIF, F3, May 2008. See also, Kenji Kushida and Seung-Youn Oh, "The Political Economies of Broadband Development in Korea and Japan," *Asian Survey*, Vol. XLVII, 2007. 494.

621 Kushida and Oh. 495.

622 Ibid. 483.

623 Heejin Lee, Robert M. O'Keefe, and Kyounglim Yun, "The Growth of Broadband and Electronic Commerce in South Korea: Contributing Factors", *The Information Society*, 19:81 (2003), 86-91.

624 Kusida and Oh. 496.

625 Robert D. Atkinson, et al. F3; OECD Directorate for Science, Technology and Industry, "Developments in Local Loop Unbundling", 10 September 2003. 17- 20.

626 DTI Global Watch Mission Report "Exploiting the Broadband Opportunity: Lessons from South Korea and Japan", December 2005, 23. Available at: <http://www.broadbanduk.org/content/view/full/182/7/1/1/>; "The Growth of Broadband and Electronic Commerce in South Korea," 88-89.

627 Robert D. Atkinson, et al. F3.

628 Ibid.

629 Ibid.

630 Ibid.

631 TeleGeography, *GlobalComms Database*, South Korea Country Overview.

CDMA, and by March 2007, SK Telecom offered HSDPA service nationwide, along with competitor KTF Corp.

By March 2008, three companies were offering 3G wireless service in South Korea, two using a combination of 1xEV-DO and W-CDMA technologies and one with a more recently deployed EV-DO Rev A network.⁶³² As of May 2009, KTF offered 5.76 Mbps service in major South Korean cities.⁶³³ In 2008, the Korean Communications Commission announced plans to allocate various blocks of 700MHz, 800MHz, and 900MHz spectrum from SK Telecom to smaller operators.⁶³⁴ Since then, wireless penetration in South Korea has reached 94 percent.⁶³⁵ South Korea is the only country in which 100% of mobile phones subscriptions are 3G.

The South Korean government licensed spectrum for WiMax in the 2.3 GHz band in 2005. In April of that year, Hanaro Telecom returned its license in light of doubts raised by investors regarding the business case for WiMax technology.⁶³⁶ KT Corp launched WiMax service in South Korea, called WiBro (wireless broadband), in 2006.⁶³⁷ Following intensive marketing by KT in 2007, the service gained 10,000 subscribers per month in 2008 and, according to one report, is expected to serve 2.5 million people by 2011. Today, two providers, KT and SKT, provide mobile WiMax service in South Korea.⁶³⁸ In late 2008, the KCC endorsed a voice-over-WiMax standard that may speed deployment of voice service over WiMax in 2009.

Market share and key players

Despite losing customers to new entrants such as Hanaro Telecom in the late 1990s, the former state-run monopolist KT rebounded; as of 2005, KT enjoyed approximately a 52% share in the fixed broadband market of 130 ISPs.⁶³⁹ However, despite the plethora of providers, three companies controlled 85% of the market as of 2006.⁶⁴⁰ By 2007, fiber, DSL, and cable service each held roughly one-third of the fixed broadband market, with cable service including leased access over power lines.⁶⁴¹

The wireline and wireless broadband markets have experienced some consolidation in recent years. For example, in February 2008, South Korea's largest mobile provider, SK Telecom, purchased Hanaro Telecom, which held a 23% fixed broadband market share as of 2005.⁶⁴² KT merged with second-largest mobile provider KTF in 2009, to form KT.

Competition in the South Korean wireless market is intense. SK Telecom controls approximately 50% of the market and holds one of three 3G spectrum licenses. Rival KTF Corp holds a 3G license and controls approximately 31% of the market. LG Telecom, the smallest 3G license-holder, controls approximately 18% of the market, and although its relatively late network deployment has put it at a

632 Ibid. 7.

633 Ibid. 7-8.

634 Ibid. 6-7.

635 Ibid. 9.

636 Tammy Parker, "WiBro is first step in WiMAX," *Mobile Communications International*, 1 June 2005. Available at <http://www.allbusiness.com/computer-electronic/communications-equipment/969991-1.html>

637 Michelle Robart, "Over 2.5 Million Mobile WiMAX Users in South Korea by 2011," *TMNet*, 27 June 2008. Available at <http://4g-wirelessevolution.tmcnet.com/topics/4g-wirelessevolution/articles/32612-year-2011-more-than-25m-south-korean-mobile.htm>

638 Ibid.

639 DTI Global Watch Mission Report. 23.

640 Robert D. Atkinson, et al. F3.

641 Ibid. 25.

642 TeleGeography, *GlobalComms Database*, South Korea Country Overview.

competitive disadvantage vis-à-vis KTF Corp and SK Telecom, its exclusive use of EV-DO Rev A—which has a lower deployment cost than the W-CDMA networks utilized by its competitors—may allow LG Telecom to pass savings to customers.⁶⁴³

In 2008, wireless network costs grew and subscriber growth slowed. In response, South Korean wireless operators have begun to offer bundled services in conjunction with fixed line partner companies.⁶⁴⁴ In April 2009, Korean regulators ordered KTF to open its mobile data network to third party services and providers as a term of KTF's merger with KT. SK Telecom must also open its mobile data network per government fiat.⁶⁴⁵

Regulatory framework

In March 1992, the Korea Communications Commission was established under the Framework Act on Telecommunications, which was originally enacted in December 1983. The creation of the KCC coincided with the initiation of a competition policy that emphasized deregulation and privatization in South Korean telecommunications markets.⁶⁴⁶ In 2008, the KCC absorbed the Korean Broadcasting Commission and the Ministry of Information and Communication (MIC) in an effort to vest regulatory authority for various communications media in a single body.⁶⁴⁷ The KCC oversees competition, consumer protection, and arbitration of unfair practices in the regulated industries.⁶⁴⁸

South Korea categorizes service providers as facilities-based providers, resale providers, or value-added service (VAS) providers.⁶⁴⁹ These classifications govern the type of services providers may offer and other legal obligations, such as contribution to the universal services fund. In 2009, the KCC announced that it would begin working on a new regulatory framework to take account of IP-based services.⁶⁵⁰

In South Korea, mobile network operators must hold spectrum licenses, and the KCC is expected to announce new methods of spectrum allocation by the end of 2009. Few regulatory barriers, however, bar entrance into the fixed broadband market.⁶⁵¹ As of 2002, the Korean government mandated unbundling of local loop facilities, and between 2008 and 2009, required the two largest mobile data network operators to open their networks to third party services and providers.⁶⁵²

Political economy

The first major step in the privatization and deregulation of South Korean telecommunications markets took place between 1987 and 2002 with the privatization of KTA, the state-owned incumbent wireline provider.⁶⁵³ The government, with strong support from elected officials, gradually divested itself of KTA, later renamed KT, and concluded a bargaining agreement with KTA's labor union to limit foreign

643 Ibid. 9.

644 Ibid. 8-9.

645 Ibid.

646 Lee, et al. 84.

647 Ibid. 6.

648 TeleGeography, *GlobalComms Database*, South Korea Country Overview.

649 Ibid. 12.

650 Ibid.

651 Lee, et al. 87.

652 TeleGeography, *GlobalComms Database*, South Korea Country Overview.

653 Kenji Kushida and Seung-Youn Oh, "The Political Economies of Broadband Development in Korea and Japan, *Asian Survey*, Vol. XLVII, 2007. 490.

ownership.⁶⁵⁴ Mid-1990s legislation gave the MIC strong regulatory authority, and the president appointed IT experts to serve as MIC ministers.⁶⁵⁵

Despite its emphasis on privatization and deregulation, the KCC has proven an aggressive regulator. Prior to 2007, Korean regulators resisted SK Telecom's and KT's desire to offer bundled services by citing the providers' dominant market positions in the mobile and wireline markets, respectively. Though the regulatory bodies clashed on this issue, the ban was dropped in April 2007. In an effort to accelerate the deployment of converged services, further rate deregulation of bundled services followed.⁶⁵⁶ The KCC has issued numerous fines for price fixing in the leased line, landline, and broadband sectors and for uncompetitive trade practices. In 2008, the KCC temporarily banned KT from new broadband signups in response to that company's illegal sharing of customer information with telemarketers. The Korean government limits foreign direct ownership of telecommunications companies to 49%.

Broadband strategy

In 1987, South Korea passed the Framework Act on Information Promotion in support of the development of information technology.⁶⁵⁷ This legislation established the National Information Society Agency (NIA) to oversee network construction.

Since the early 1990s, South Korea's broadband deployment strategy has focused on the cultivation of a "knowledge-based society."⁶⁵⁸ In 1993, the NIA launched the plan for the Korea Information Infrastructure (KII), which ran from 1995 to 2005.⁶⁵⁹ In 1995, South Korea enacted legislation to drive the KII comprehensive plan for a national broadband backbone.⁶⁶⁰ After KII, South Korea implemented a series of 5-year programs to invest government funds in broadband deployment. The country also provided network build-out incentives for providers and used public education projects targeting specific demographics, including military personnel, farmers, and housewives, to bolster broadband demand and use.⁶⁶¹ In addition, the government has provided tax breaks to businesses that invest in broadband communications systems.⁶⁶²

More recent government programs, including IT839 and the Broadband Convergence Network, promote network convergence and investment in emerging technologies by Korean companies that may export technology overseas.⁶⁶³ Through these programs, the Korean government has provided over \$70 billion in loans to service providers.⁶⁶⁴ Korea also required KT, as a term of its privatization, to provide broadband service of at least 1 Mbps to all homes and villages. The "Digital Divide Closing Plan" provided loans of \$926 million between 2001 and 2005 to offset the cost of connecting all 144 telecom service districts to the national broadband backbone.⁶⁶⁵

654 Ibid. 491.

655 Ibid.

656 TeleGeography, *GlobalComms Database*, South Korea Country Overview.

657 Robert D. Atkinson, et al. . F1.

658 Lee, et al. 84.

659 See Choongok Lee and Sylvia M. Chan-Olmsted, "Competitive advantage of broadband Internet: a comparative study between South Korea and the United States," *Telecommunications Policy* 28 (2004). 58-59.

660 Lee, et al. 84.

661 Ibid. 87.

662 Robert D. Atkinson, et al. F2.

663 DTI Global Watch Mission Report. 15.

664 Robert D. Atkinson, et al. F2.

665 Ibid.

Policy interventions and outcomes

Government investment in infrastructure

As noted in the previous section, South Korea has provided numerous loans to broadband service providers in support of the deployment of broadband networks. These include: an initial USD 77 million in preferred loans to facilities-based providers in 1999, an additional USD 77 million in loans for non-urban areas in 2000,⁶⁶⁶ USD 70 billion in loans through the IT839 and Broadband Convergence Network programs, (an investment that recipients pledged to match), and USD 926 million for rural broadband to KT as a condition of its privatization. In 1997, the government began the Cyber Building Certificate system, under which residential and commercial buildings are certified as providing specified tiers of broadband access speeds.⁶⁶⁷ This program has motivated builders to invest in broadband, as many Koreans apparently want to live in buildings with high-speed broadband capacity.⁶⁶⁸

Skill building, education, and demand programs

South Korea has long sought to boost demand in the information technology sector via various government-supported educational programs, such as the PC for Everyone program in 1996, a computer literacy program in 1998, and Cyber Korea 21, a program focused on digital literacy, in 1999.⁶⁶⁹ South Korea's Ten Million Internet Education project sought to expose 10 million people to various Internet programs in 2000; that year, 3.4 million people learned basic Internet skills.⁶⁷⁰ The government has also deployed educational programs targeted at specific demographic groups, such as the One Million Housewife Digital Literacy Education Project,⁶⁷¹ and provided Internet training subsidies targeting 2 million people in 2002.⁶⁷² South Korea has also funded and constructed thousands of free public access sites and provided personal computers in every school in the country.

Competition policy

Competition policy has governed South Korean telecommunications regulatory approaches from the late 1980s especially in the wake of the privatization of KTA (later renamed KT). In 1997, the MIC instituted procedures for selecting a competitor to challenge KT, which Hanaro Telecom won.⁶⁷³ Competition in the broadband market exploded in the late 1990s with the entrance of Hanaro and cable provider Thrunet, but re-regulation following KT's resurgence shows that the government has kept a close eye on market competition.⁶⁷⁴ The government identified KT's dominance as a barrier to competition and, since 2004, has subjected the company to stricter regulations relative to its competitors.⁶⁷⁵

South Korea did not mandate the unbundling of local loop network elements until 2002, well after DSL and cable broadband offerings had gained significant ground.⁶⁷⁶ The relatively late unbundling mandate

666 Jyoti Choudrie, Anastasia Papazafeiropolous, and Heejin Lee, "A web of stakeholders: a case of broadband diffusion in South Korea," *Journal of Information Technology* 18 (December 2003). 285.

667 Lee, et al. 87-88.

668 Choudrie, et al. 285.

669 Robert D. Atkinson, et al. F3.

670 Lee, et al. 84.

671 Kushida and Oh. 497.

672 Ibid.

673 Arnold Picot and Christian Wernick, "The Role of Government in Broadband Access", *Telecommunications Policy* 31 (2007). 669.

674 Kushida and Oh, 498.

675 Ibid.

676 Robert D. Atkinson, et al. F3. Also see: "Developments in Local Loop Unbundling", *OECD Directorate for Science, Technology and Industry*, 10 September 2003. 17, 20.

partly reflects the strong platform-based competition that characterized the South Korean market in the early years of broadband development. The absence of unbundling in Korean broadband development should not, however, be overstated, given that initial entry by Thrunet depended on infrastructure leased from Kepco, the government-owned cable company, which was required to lease access to its cable facilities.⁶⁷⁷ South Korea has also mandated open access conditions on cable providers⁶⁷⁸ and the opening of South Korea's two largest mobile data networks.⁶⁷⁹

Network non-discrimination

South Korea has no strict network non-discrimination rules but has mandated open access and line-sharing, which may have obviated the need for a more rigorous net-neutrality regime.⁶⁸⁰ Despite these policies, however, South Korea has not been free from non-discrimination controversy in recent years. In 2006, for example, several network operators slowed or blocked Hanaro Telecom's new IPTV service, claiming it consumed excessive bandwidth. The KCC forced the affected companies to negotiate but made no lasting policy declaration.⁶⁸¹

Spectrum policy

In 2006, the Korea Radio Promotion Agency (KORPA) was established to manage South Korean radio spectrum.⁶⁸² Wireless operators require a spectrum license from the KCC to offer wireless service, though only three mobile network operators hold licenses, which permit both 2G and 3G services. 3G licenses were allocated by auction in 2001. The two winners, SK Telecom and KTF Telecom, were allocated the B-band at 1940 MHz to 1960 MHz and the C-band at 1960 MHz-1980 MHz, respectively.⁶⁸³ LG Telecom, which failed to win a license at auction, was later awarded the A-band at 1920 MHz-1940 MHz.⁶⁸⁴ Spectrum licenses run for 10 years, after which providers can apply for renewal. The MIC has revoked operators' spectrum concessions for failing to launch services and has demanded payments from operators to reserve unused frequencies.⁶⁸⁵

Other spectrum allocations include the following: KTF holds spectrum in the 1700 MHz band, which it uses for 2.5G CDMA services. It also holds spectrum in the 2100 MHz band, which it uses for 3.5G W-CDMA services. LG Telecom holds 1700 MHz spectrum for 2.5G and 3.5G CDMA and EV-DO Rev A services. SK Telecom holds 800 MHz spectrum for 2.5G and 3G CDMA services and 2100 MHz spectrum for 3G and 3.5G W-CDMA services.⁶⁸⁶

Wireless regulation in South Korea is currently in flux. South Korean regulators are now considering allowing mobile virtual network operators (MVNOs) to offer services using license-holders' networks.⁶⁸⁷ Moreover, the KCC is in the midst of an 800 MHz redistribution resulting from SK Telecom's previous monopoly over the desirable 800 MHz band. In 2011, SK Telecom will be forced to give 20 MHz of its 800MHz band spectrum to smaller operators, which will receive a total of 40 MHz.

677 See Kushida and Oh. 494.

678 Ibid.

679 TeleGeography, *GlobalComms Database*, South Korea Country Overview.

680 Brad Reed, "What the U.S. can learn from International Net Neutrality, Broadband Policies," *Network World*, February 12, 2009. Available at <http://www.networkworld.com/news/2009/021209-international-net-neutrality.html>

681 Scott Walsten and Stephanie Hausladen, "Net Neutrality, Unbundling, and their Effects on International Investment in Next-Generation Networks," *Review of Network Economics* 8 (March 2009). 111.

682 TeleGeography, *GlobalComms Database*, South Korea Country Overview.

683 Ibid.

684 Ibid.

685 Ibid.

686 Ibid. 8.

687 Ibid. 6.

KTF and LG Telecom may be forced to relinquish their 1.8 GHz licenses in exchange for 800 MHz spectrum concessions.⁶⁸⁸

⁶⁸⁸ Ibid.

I. Sweden

Introduction

Sweden committed a decade ago to providing comprehensive national broadband coverage and has subsequently emerged as one of the top performers in broadband provision and adoption, scoring well in terms of broadband penetration, speed, and affordability. The Swedish government has been actively involved in rolling out broadband infrastructure through public investments, both at the federal and municipal levels, and public-private partnerships that have contributed to the deployment of a broadband internet infrastructure that now reaches 98% of the country's residential population.

Swedish regulators have intervened at several junctures in broadband markets to enact strong open access rules in the telecommunications sector, starting with the introduction of a local loop unbundling requirement in 2001 in accordance with EU regulation. This was consolidated further in 2004 with a mandate that TeliaSonera, the incumbent telecommunications company, provide bitstream access for broadband entrants. In 2007, the regulatory authority went a significant step further, proposing legislation that would require TeliaSonera to functionally separate its network and retail services divisions. This legislation entered into force on 1 July 2008, but has not been used by the regulator as a result of TeliaSonera's voluntary compliance. Open access provisions in Sweden now apply both to the copper and high-speed fiber infrastructure.

Sweden's open access policies have helped shape a market structure in which the four larger companies—which together account for 95% of subscriptions—compete across several platforms, including copper, cable, fiber, and wireless. As reflected in the price offerings and consumer options, the level of competition in Swedish broadband markets is strong. Sweden has been a leader in deploying fiber in municipal networks in various combinations of public and private sector involvement. Sweden ranks third in the world in fiber/LAN connections behind South Korea and Japan, with over 450,000 subscribers. Future broadband plans include expanding the reach of fiber networks and achieving full residential internet access at speeds of 2 Mbps or higher.

In the recent Broadband Strategy for Sweden, the government has put forth a goal that 90% of households should have access to a broadband connection of at least 100 Mbit/s by 2020. This development is intended to be driven by the market rather than public funding.

Market highlights

Overall, 66.6% in Sweden have broadband access.⁶⁸⁹

	Fiber / LAN	Cable	DSL	Other	Overall ⁶⁹⁰
Subscriptions per 100 people ⁶⁹¹	6.5	6.2	19.1	0.2	32.0

⁶⁸⁹ OECD Broadband Portal, Table 2a, from EU Community Survey, from 2007.

⁶⁹⁰ Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

⁶⁹¹ OECD Broadband Portal, Table 1d, as reported by individual governments, as of 2008.

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	7	Maximum advertised speed, OECD	3	Price low speeds, combined	4
Household penetration, OECD	6	Average advertised speed, OECD	13	Price med speeds, combined	2
3G penetration, Telegeography	6	Average speed, Akamai	3	Price high speeds, combined	3
Wi-Fi hotspots per 100000, Jiwire	1	Median download, speedtest.net	3	Price very high speeds, combined	2
		Median upload, speedtest.net	2		
		Median latency, speedtest.net	4		
		90% Download, speedtest.net	2		
		90% Upload, speedtest.net	2		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic
Berkman Center analysis



Broadband development to date

Over the past decade, internet use in Sweden has shifted rapidly from a reliance on low bandwidth dial-up to higher speed services. In 2001, the number of broadband users tripled; by the end of year, about 455,000 private customers "were connected to the internet via some form of access with higher transmission capacity."⁶⁹² DSL and cable respectively accounted for 9% and 4% of internet customers.⁶⁹³ Internet penetration among households with a capacity of 2Mbps or more was at 2.6% in 2001.⁶⁹⁴ In 2002, subscriptions for IP telephony in broadband networks were introduced.⁶⁹⁵ Household penetration of fixed internet connections in 2003 was up to 20% while household penetration for connections with capacities of 2 Mbps or more had increased to 4%.⁶⁹⁶

Household broadband use surged from 2004 to 2005 as the number of households with internet access of 2 Mbps or more grew by 40% to serve 21% of households. The overall rate of fixed connections stood at 39%.⁶⁹⁷ By January 2005, all municipalities had a connection to the national backbone and interurban networks and "all urban areas with more than 3,000 inhabitants have a local network in some part of the urban area."⁶⁹⁸ The rise in broadband users coincided with a continued increase in the number of independent ISPs competing for the residential and business markets, which cut into the incumbent's market share. Two cable companies, Com Hem and UPC, together accounted for 16% of the consumer market. Other entrants took advantage of Swedish policies that opened up the TeliaSonera's network to competitors. Two of these entrants, Bredbandsbolaget (B2) and Glocalnet, had accumulated 20% and 6% of the market.

⁶⁹² The Swedish Telecommunications Market 2001, p.32 et sq.

⁶⁹³ The Swedish Telecommunications Market 2005, p.78

⁶⁹⁴ The Swedish Telecommunications Market 2001, p.61.

⁶⁹⁵ The Swedish Telecommunications Market 2003, p. 19.

⁶⁹⁶ The Swedish Telecommunications Market 2003, table 33, p.81.

⁶⁹⁷ The Swedish Telecommunications Market 2005, table 32, p.81.

⁶⁹⁸ <http://www.pts.se/en-gb/Documents/Reports/Internet/2005/Broadband-in-Sweden-2005---PTS-ER-200524/>

In 2000, Sweden issued four UMTS wireless licenses for a nominal fee, although these licenses came with an aggressive deployment requirement that over 99% of the population have access within two years. Interestingly, the four recipients of the licenses—Tele2, Vodafone Sweden, Hi3G, and Orange Sverige—did not include the incumbent Telia. (Telia subsequently entered in to a joint venture with Tele2 to return to the market.) The ambitious coverage targets were not met. By 2005, three of the four licenses were in use and only 90% of the targeted coverage had been achieved.⁶⁹⁹ Even though the coverage targets were not met, Sweden still had the best 3G coverage in Europe.

In 2008, broadband subscriptions in Sweden greatly outnumbered ISDN or dial-up connections with DSL technology constituting 41% of all subscriptions. Mobile broadband Internet subscriptions accounted for 21% of the total while fiber and fiber-LAN subscriptions had risen to 14%.⁷⁰⁰ The total number of broadband internet subscriptions had grown by 20% over the previous year and subscriptions with 2 Mbps (fixed and mobile) grew by 45%.⁷⁰¹ Household fixed broadband penetration was 60% in 2008. Among broadband subscribers, 83% had connections of 2 Mbps downstream or higher, up from 69% a year earlier.⁷⁰² There were 153 local fiber/LAN broadband networks and more than 98% of the population was covered by a high-speed network.⁷⁰³ In the wireless market, there were approximately 3.5 million UMTS and CDMA 2000 subscriptions.⁷⁰⁴

Market share and key players

The Swedish market for local, long-distance and international telephony was liberalized in 1993 opening up telecommunications markets to competition.⁷⁰⁵ In 1996, three years after liberalization, the government-owned former monopoly operator, Telia, had a share of 71% of the telecommunications market.⁷⁰⁶ At that point, Telia was the only operator in Sweden that offered a public ISDN network.⁷⁰⁷

In 2002, Telia merged with the Finnish state telecommunications company, Sonera, to form TeliaSonera. The TeliaSonera merger followed a failed merger attempt with the Norwegian telecommunications company, Telenor, which is now its largest competitor in Sweden. The governments of Sweden and Finland still hold minority ownership stakes in the company, which is still the dominant fixed line and mobile operator in Sweden. In mid-2008, TeliaSonera held 39% of the market for broadband subscriptions.⁷⁰⁸

Telenor expanded its presence in Sweden through the purchase of several local broadband services, including Bredbandsbolaget (B2) and Glocalnet. Both of these companies established themselves in the Swedish market by accessing consumers on existing infrastructure made available to them through Sweden's open network policies. Telenor currently accounts for about one fifth of the broadband market in Sweden. The cable television provider, ComHem—a former subsidiary of TeliaSonera—offers consumers broadband service over its cable network as well as triple play options. Com Hem, which in 2006 had acquired its largest rival in the cable market, UPC, now accounts for 18% of the broadband market. Tele2, the Stockholm-based telecommunications company, serves 15% of the

699 The Swedish Telecommunications Market 2005, p.30.

700 The Swedish Telecommunications Market 2008, table 15, p.93

701 The Swedish Telecommunications Market 2008, table 34, p.98

702 The Swedish Telecommunications Market 2008, table 34 (cont.), p.99

703 TeleGeography, GlobalComms Database, Country profile, Sweden, p.15.

704 The Swedish Telecommunications Market 2008, table 15, p.74.

705 TeleGeography, GlobalComms Database, Country profile, Sweden, p.2.

706 The Swedish Telecommunications Market 1996, p.10.

707 The Swedish Telecommunications Market 1996, p.19.

708 TeleGeography, GlobalComms Database, Country profile, Sweden, p. 15.

broadband market. Together, these four companies account for 95% of household broadband subscriptions in Sweden; the rest of the market is shared by several smaller players.

DSL connections account for over 40% of household broadband connection. Fiber and fiber-LAN networks have a slightly bigger share of the market than cable, holding 14% and 13%, respectively.⁷⁰⁹ Sweden trails only South Korea and Japan in household fiber penetration rates.

TeliaSonera is the largest single owner of fiber, accounting for approximately 45% of the whole optical-fiber coverage in 2009. Publicly-owned fiber-infrastructure in the hands of government, the Swedish National Rail Administration, Vattenfall, Svenska Kraftnät, and municipal enterprises jointly accounted for 45% of the total.⁷¹⁰ Municipal networks alone control 20 to 25% of the coverage.⁷¹¹ Among the more than 150 local fiber/LAN networks in 2008, a majority are owned by municipal authorities or municipally run companies.⁷¹²

The market for wireless broadband, which grew by 229% from mid-2007 to mid-2008,⁷¹³ is also dominated by TeliaSonera with 39% of active subscriptions, ahead of Tele2, Hi3G Access and Telenor with 25%, 19% and 15%, respectively.⁷¹⁴ Each of the four major players operates 3.5G networks and is expected to deploy 4G service in 2010.⁷¹⁵ Tele2 has also secured a 2.6GHz license to be used for WiMAX services.⁷¹⁶

Regulatory framework

The 2003 Electronic Communications Act (EkomL) lays out the regulatory structure for all electronic communication networks and services in Sweden, covering both wireline and wireless communications systems. The passage of this act, enacted during a period of rapid growth in broadband, represented the transposition of the 2002 EU Regulatory Framework to Swedish law and provided a regulatory framework to promote wide-scale broadband internet coverage and adoption.

The act of 2003 aimed to “ensure that electronic communications are as accessible and efficient as possible and are open to free competition.” The act further states, “We wish to give an authority power to force market-dominating companies to allow competitors access to their networks or to limit their prices to the end-customer to what is reasonable.”⁷¹⁷

The passage of this new telecommunications act strengthened and expanded the regulatory authority of the Swedish Post and Telecom Agency (PTS, short for Post och Telestyrelsen) to intervene where market players with significant market power were hindering competition for broadband services. In essence, the legislation aimed to open communications markets by attenuating the market power of TeliaSonera.

PTS, which is overseen by the Ministry of Enterprise, Energy, and Communications, also acts as an adviser to the government with respect to broadband development and IT strategy. The Swedish legal

709 The Swedish Telecommunications Market 2008, table 30, p.93

710 <http://www.pts.se/en-gb/Documents/Reports/Internet/2009/Dark-fibre---one-year-later---PTS-ER-200924/>

711 Dark Fibre, Market and State of Competition, p.22 et sq.

712 TeleGeography, GlobalComms Database, Country profile, Sweden, p.15.

713 TeleGeography, GlobalComms Database, Country profile, Sweden, p.15

714 TeleGeography, GlobalComms Database, Country profile, Sweden, p.8.

715 TeleGeography, GlobalComms Database, Country profile, Sweden, p.11 et sq.

716 TeleGeography, GlobalComms Database, Country profile, Sweden, p.12.

717 <http://www.regeringen.se/content/1/c6/01/84/54/5ae98894.pdf>

and regulatory framework for the IT sector is influenced substantially by EU policy; competition laws and EU legislation such as the Framework Directive are of particular salience to the telecommunications sector.

Political economy

The political economy of Sweden's broadband industry is dominated by the interplay between state controlled former monopoly TeliaSonera and industry watchdog PTS. As the incumbent telecommunication provider, TeliaSonera owned a large majority of the nation's copper and fiber networks and benefited from significant market power in different industry sectors. The PTS in turn began to exert its regulatory power to promote competition by ordering local loop unbundling or through price setting. TeliaSonera has consistently sought to maintain its competitive advantage and preserve control over its network infrastructure, resisting PTS plans to open the incumbent's networks to competitors. Frustrated with the slow progress in opening up TeliaSonera's networks to other entrants, PTS has progressively enacted a series of more stringent open access measures designed to enhance competition.

TeliaSonera is not alone in benefiting from (former) public ownership: Tele2 used a strategic partnership with the National Swedish Rail Administration to gain access to the railway communication infrastructure.⁷¹⁸ Municipalities and publicly-owned companies have joined forces to build local fiber networks, thereby adding to the picture of a sector heavily influenced not only by regulatory power struggles but also by cooperative public-private partnerships. Such initiatives have meant increasing competitive pressure on TeliaSonera.

Broadband strategy

Sweden initiated its current broadband policy more than a decade ago. With the 1999 release of IT Bill 1999/2000:86, the country embarked on a plan to create "an information society for all." The policy described a reliance on market forces in conjunction with public-private partnerships to deploy broadband across the large and sparsely populated country.

The Swedish Government formed an ICT commission and embraced its recommendation to fund a fiber network.⁷¹⁹ In addition to national projects, the Government allocated funds to regional and local broadband projects, allowing "operators to choose their preferred access platform...to best suit each region targeted."⁷²⁰ Involving municipalities and regional operators had already been part of the national broadband infrastructure program of the IT bill.

An updated IT policy, published in 2004, lays out three central objectives:

- IT must contribute to a better quality of life and help improve and simplify everyday life for people and companies.
- IT must be used to promote sustainable growth.

718 Explaining International Broadband Leadership, Appendix G: Sweden, p.G3.

719 Broadband Stimulation in France, Ireland, and Sweden, p.15.

720 TeleGeography, GlobalComms Database, Country profile, Sweden, 14.

- An effective and secure physical infrastructure for IT, with high transmission capacity, must be available in all parts of the country so as to give people access to, among other things, interactive public e-services.⁷²¹

The bill refers to public confidence in IT and coordination as two key elements needed to achieve these objectives, with the first condition supported by education and countering threats to security. The plan calls for the state to take responsibility in organizational, logistical, and technical issues in order to meet the coordination objective.⁷²²

Operating in its policy role, PTS published its own strategic plan in 2007, entitled "Proposal for Swedish broadband strategy." This document established as a goal that the entire Swedish population should have access to infrastructure with at least 2 Mbps downstream capacity by 2010.⁷²³ To meet this short-term objective, public-private partnerships and government funding are critical to increased broadband access, as has been the case in the past.⁷²⁴

In October 2009, the Swedish government presented its Broadband Strategy for Sweden. The strategy includes a goal that 90% of households should have access to a broadband connection of at least 100 Mbit/s by 2020. This development is intended to be driven by the market rather than public funding.

Policy interventions and outcomes

Government investment in infrastructure

In 1999, the Swedish government committed over EUR 600 million for the installation of a national backbone, "which has resulted in the deployment of some 200 metro networks in more than one hundred towns."⁷²⁵ The roll out was carried out by Svenska Kraftnät, the Swedish National Grid operator.⁷²⁶ The government allocated an additional EUR 700 million to regional and local broadband projects.⁷²⁷ Tax breaks were also used as an incentive to promote the spread of broadband.⁷²⁸ Consistent with the stated goal of coordinating public and private investments, private operators spent an estimated USD 1 billion between 2001 and 2007 as part of the process.⁷²⁹

PTS recommends that the government should continue to support the rollout of broadband infrastructure by providing an additional SEK 1.1 billion (over USD 150 million at current exchange rates), half of which could be covered by funds associated with the EU structural funds and rural development plans.⁷³⁰ Without this financial support from central Government, PTS believes it is "unreasonable to assume that commercial forces alone are sufficient to achieve the objective of broadband for all by 2010

721 See: From an IT policy for society to a policy for the information society, Summary of the Swedish Government Bill 2004/05:175, p. 7 et sq.

722 From an IT policy for society to a policy for the information society, Summary of the Swedish Government Bill 2004/05:175, p. 8 et sq.

723 p.22 et sq.

724 Proposal for Swedish broadband strategy, p.54. See also section "Government investment in infrastructure"

725 <http://www.bbwo.org.uk/broadband-3045>

726 Ibid.

727 TeleGeography, GlobalComms Database, Country profile, Sweden, 14.

728 Explaining International Broadband Leadership, Appendix G: Sweden, p.G2.

729 Ibid.

730 Proposal for Swedish broadband strategy, p.54.

and that the possibility of imposing obligations on a party to provide universal services cannot be viewed as a means of achieving this objective."⁷³¹

An early notable government-funded project is the dark-fiber network funded by the city of Stockholm in 1994. This project, Stokab, was initiated after the refusal of the private sector operator, Telia, to provide fiber capacity. Stokab later expanded its operations to other municipalities and the model became a key piece of Sweden's broadband infrastructure policy.⁷³²

Skill building, education, and demand programs

In addition to the large public investments in infrastructure, the Swedish government also supports initiatives to promote demand for broadband access by fostering digital literacy, increasing access to personal computers, and encouraging the use of broadband for education.⁷³³ As early as 1998, tax breaks were introduced for companies that supplied employees with personal computers.⁷³⁴ In a later push for digital literacy in education, the government "introduced a USD 25 million project to raise IT literacy among schoolteachers."⁷³⁵ In addition, the government also carries out initiatives pursuing quality and sustainable growth—two other sub-goals of its IT policy—by promoting, for example, improvement of e-services in the health care sector and promotion of IT skills in SMEs, which, among other things, are likely to boost demand for broadband.⁷³⁶

Competition policy

Swedish government regulators have acted aggressively to open up broadband markets to competition with a focus on providing competitors access to TeliaSonera's network. Unbundling was introduced in 2001, though it was slow to take hold. In 2003, PTS ordered TeliaSonera to lower the wholesale price for access to its network, asserting that TeliaSonera had engaged in discriminatory pricing practices that favored some operator over others. In 2004, TeliaSonera accepted a PTS ruling clarifying further unbundling requirements of its last mile copper network, but chose to appeal to the courts the ruling that required it to provide wholesale bitstream access to its competitors. TeliaSonera eventually complied with this mandate in 2007 after losing in the courts.⁷³⁷ The rulings at the time did not include TeliaSonera's fiber-optic network. However, TeliaSonera's copper network remains an issue of critical interest for PTS and one of three principal topics of the agency's 2007 "Proposal for Swedish broadband strategy".⁷³⁸ Another important ruling by PTS in 2005 required TeliaSonera to offer naked DSL in 2005 so customers would have the option to take telephony and internet services from different operators.⁷³⁹

In 2007, PTS submitted a statutory proposal for non-discrimination and openness in the local loop which states that, "the market that currently deals predominantly with access to TeliaSonera's metallic loop is not a functioning marketplace...the authority can conclude that there is neither sufficient transparency nor equal treatment in the market. The current situation falls far short of the goals of effective and competition-neutral access, nor does it establish adequate conditions to gradually loosen the regulation

731 Proposal for Swedish broadband strategy, p.66.

732 <http://www.ictregulationtoolkit.org/en/PracticeNote.aspx?id=3244>

733 Explaining International Broadband Leadership, Appendix G: Sweden, p.G4.

734 Swedish commitment to broadband both in the cities and in the countryside, p.13

735 Explaining International Broadband Leadership, Appendix G: Sweden, p.G4.

736 see From an IT policy for society to a policy for the information society, Summary of the Swedish Government Bill 2004/05:175

737 TeleGeography, GlobalComms Database, Country profile, Sweden, p.15

738 Proposal for Swedish broadband strategy, p19 et sq.

739 Explaining International Broadband Leadership, Appendix G: Sweden, p.G3.

to promote competition on the route to more sustainable competition."⁷⁴⁰ PTS proposed as a remedy "that the ability of the public authority to impose functional separation on a dominant stakeholder should be introduced, meaning that the parts of the operation representing bottleneck resources should be separated from the rest of the organization"⁷⁴¹ TeliaSonera announced its agreement to comply with this quasi-voluntary functional separation and in early 2008 created a subsidiary, TeliaSonera Skanova Access, to serve wholesale customers of its passive network. TeliaSonera has committed to a policy of equal treatment of external and internal customers to its wholesale products and has established an Equality of Access Board with external members to monitor and report on equal treatment issues. Although the functional separation legislation entered into force on 1 July 2008, it has not been used by the regulator as a result of TeliaSonera's voluntary compliance.

Network non-discrimination

Network neutrality violations have not been the source of any complaints to PTS and the agency therefore has not seen any reason to take action in this space.⁷⁴² Of possible relevance, the Electronic Communications Act in Chapter 6, Section 17 prohibits processing of a message by others than the relevant users or in special situations.

Spectrum policy

In 2006, PTS produced a spectrum policy, in which the agency makes the following recommendations (inter alia): neutrality of service and technology, licenses should be allocated by auction, "second-hand trading shall be promoted," and "spectrum allocation shall be harmonized with other countries as far as this is possible."⁷⁴³

Licenses may be awarded to cover either the whole nation, a region, or a municipality, while bidders are limited to a maximum of one license per municipality. Contrary to requirements that came with the 3G licenses, authorities have not attached any rollout obligations to the licenses auctioned recently.⁷⁴⁴

In its 2009 Strategic Policy paper, PTS makes the liberalization of spectrum management a priority, and "covers lowered entry barriers and measures to facilitate technology and market development by formulating conditions for using and liberalizing frequencies. One important objective for 2009 is for market players to have access to more spectrum than last year, on terms that are technology and service neutral."

740 Improved broadband competition through functional separation, p.59.

741 Improved broadband competition through functional separation, p.79.

742 Network neutrality, memorandum, p.7.

743 PTS spectrum policy, p.6.

744 TeleGeography, GlobalComms Database, Country profile, Sweden, p.14.

J. Switzerland

Introduction

Switzerland has experienced strong results in broadband deployment taking a substantially different approach than other countries that have performed well in this space. Until recently, Switzerland has relied primarily on inter-platform competition between the incumbent telecommunications company that offers DSL and cable companies. Unlike the majority of its European neighbors, Switzerland chose not to require local loop unbundling throughout much of the first broadband transition, although it did ultimately adopt this policy in 2007. It is difficult to attribute the Swiss success solely to regulatory abstention, given that Swisscom continues to be majority owned by the Swiss federal government, and that the government continues to exercise control over some of its investment decisions. Furthermore, Swisscom has operated under the threat of continuing efforts by the national regulatory authority to implement local loop unbundling since 2003.

The political discourse about broadband over the past two years has centered around three core themes: first, the likely effects of local loop unbundling as introduced in 2007; second, a possible amendment to the Law on Telecommunications to allow ex-ante regulation and to recast the regulatory framework into one that is technology-neutral; and third, extension of the regulatory power of the Federal Communications Commission (ComCom) to the regulation of fiber networks.

Switzerland is moving towards an innovative strategy for sharing the costs and risks of deploying the next generation of higher capacity infrastructure for the country, adopting a cooperative approach to deploy fiber directly to homes in Switzerland and to provide subscribers with access to multiple service providers through the same infrastructure. This strategy appears to be the result of Swisscom's response to competition both from cable company upgrades and from municipal utilities' investments in building fiber-to-the-home networks.

Market highlights

Overall, 52.8% of households in Switzerland have broadband access.⁷⁴⁵

	Fiber / LAN	Cable	DSL	Other	Overall ⁷⁴⁶
Subscriptions per 100 people ⁷⁴⁷	0.4	9.7	23.2	0.3	33.5

⁷⁴⁵ OECD Broadband Portal, Table 2a, from EU Community Survey, from 2006.

⁷⁴⁶ Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

⁷⁴⁷ OECD Broadband Portal, Table 1d, supplied by the Swiss government, as of 2008.

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	4	Maximum advertised speed, OECD	17	Price low speeds, combined	3
Household penetration, OECD	8	Average advertised speed, OECD	21	Price med speeds, combined	5
3G penetration, Telegeography	15	Average speed, Akamai	4	Price high speeds, combined	8
Wi-Fi hotspots per 100000, Jiwire	2	Median download, speedtest.net	7	Price very high speeds, combined	6
		Median upload, speedtest.net	11		
		Median latency, speedtest.net	6		
		90% Download, speedtest.net	8		
		90% Upload, speedtest.net	14		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic
Berkman Center analysis

Broadband development to date

DSL is by far the most popular broadband access technology in Switzerland, accounting for more than two-thirds of subscriptions in 2009.⁷⁴⁸ Cable ranked second with somewhat less than a third of broadband connections, a great majority of which are provided by Cablecom. The rising popularity of DSL reflects a marked change in Swiss broadband markets; in 2002, cable held a majority of the broadband market with a 56% share. The historic popularity of cable modems may be explained by the existence of cable TV networks in most parts of the country at the time of liberalization of the telecommunications market in 1998. In addition, cable companies were the first operators to roll out commercial high-speed Internet in 2000. Swisscom, in contrast, only made limited efforts to introduce ADSL in 1998 and did not start its commercial roll-out until 2001.⁷⁴⁹ In July 2003, Switzerland witnessed a relatively equal split between cable and DSL. Since then, however, the market has shifted substantially with the spread of DSL. Observers attribute this decline of cable modem access to several factors, including broader coverage (currently, about 98% of all households can be reached with DSL, compared to 93% reached by cable)⁷⁵⁰ and advertising campaigns launched by the resellers of the Swisscom wholesale products.⁷⁵¹ Swisscom has for many years offered wholesale products to its direct competitors for resale. However, according to analyses by the independent regulator ComCom, Swisscom's resale products offered by its competitors are not able to effectively compete with Swisscom. The new entrants were not able to establish a competitive position in the liberalized telecommunications market (see Figure 1).⁷⁵² Swisscom's main competitor Cablecom, by contrast, was arguably not able to maintain momentum—even based upon the initial advantage of broad TV penetration—since it is covering less than 55% of the cable TV market (Switzerland has about 40

748 OFCOM (2009). *The Swiss telecommunications market- an international comparison: Extract from the 14th European Union Implementation report extended to include Switzerland*. p. 106.

749 GlobalComm (2009). *Country overview Swiss section. Broadband Market Commentary*.

750 OECD (2009). *Communications Outlook 2009*. p. 136/205.

751 OFCOM (2009). *The Swiss telecommunications market- an international comparison: Extract from the 14th European Union Implementation report extended to include Switzerland*. p. 106.

752 ComCom (2008). *Annual report 2007*. p. 10.

regional or local cable-providers).⁷⁵³ Cablecom is currently seeking to catch up by investing in higher performance cable technology (DOCSIS 3.0),⁷⁵⁴ which will make it possible to offer consumers download speeds of 100 Mbps or higher.⁷⁵⁵

Although optical fiber connections are not as widespread as in other European countries, there has been much activity in that area recently that illustrates fiber's growth potential. Swisscom already operates a network with optical fiber lines, although this network usually ends at street cabinets (FTTC, fiber-to-the-cabinet) and doesn't yet extend to homes or small and medium-sized enterprises. However, more than 10 local power utilities—mostly (but not exclusively) owned by municipalities and cantons—have announced plans to invest in fiber-to-the-home (FTTH) networks. These relatively small power companies are becoming new players in the broadband market and have challenged Swisscom, which, in response, announced plans in 2008 to bring fiber to 100,000 homes by the end of 2009 along with large investments in fiber-to-the-home networks over the next six years. The strategic rationale for the movement of the small power companies into this market is multifaceted. One of the main reasons put forward is that power companies are facing the challenge to maintain client loyalty in a liberalized and therefore increasingly competitive energy market environment, where consumers will be able to switch easily from one provider to another. Such advanced services in combination with increased user choice require a reliable and high-quality communication infrastructure in order to monitor and manage the customer relationship, often referred to as "smart metering."⁷⁵⁶ In addition, power companies often have the technical expertise at hand to deploy such networks, since they already maintain their own broadband network between power plants. Further, the conduits that bring power lines to homes often have enough space remaining to accommodate additional fiber cable. These several factors result in low market entry costs for power companies. Also, the broadband business is similar to their core business and therefore recognized by the utility companies as an attractive opportunity.⁷⁵⁷ Finally, the ownership structure of many of the power companies matters: cities and municipalities, which are often owners or shareholders of such companies, view open access telecommunications infrastructure as a key factor for the attractiveness of their location and argue that open access should become part of the universal service concept.⁷⁵⁸

In addition to these developments, the federal regulatory authority of the telecommunications industry, ComCom, launched a series of fiber-to-the-home roundtable talks to coordinate plans of potential investors, broadband providers, and other interest groups. By October 2009, the participants of the roundtables had agreed on technical standards to deploy new fiber into buildings, which will make it easy for customers to switch providers and will ensure that different network and service providers can reach customers.⁷⁵⁹

In 2000, ComCom awarded four 3G licenses. Three of them were sold to existing telecommunication companies (Swisscom, Sunrise, and Orange) and one to a newcomer (3G Mobile AG, formerly Sonera) for a total amount of about USD 29.5 million. In 2002, ComCom was forced to relax the deadline set for the launch of the 3G licenses, since the operators weren't able to meet the conditions set forth in the licenses. In the wireless market, 3G (UMTS/HSPA) is currently the fastest growing technology,

753 GlobalComm (2009). *Country overview Swiss section. Broadband Market Commentary.*

754 <http://www.cablecom.ch/en/index/kabelanschluss/netupgrade.htm?setlang=4> (last visited 9 September 2009).

755 Neue Zürcher Zeitung (4 July 2009). *Interventionsgelüste im Telekommarkt.* p. 19.

756 Staub, Richard (2009). *Glasfaserkabel für alle Haushalte.* in: *Elektrotechnik* (May 2009). p. 62-63.

757 City Council of St. Gallen (2008). *Vorlage Stadtparlament: Pilotprojekt für Breitbandnetz auf der Basis "Fibre tot he Home" (FTTH).* p. 6-7.

758 City Council of St. Gallen (2008). *Vorlage Stadtparlament: Pilotprojekt für Breitbandnetz auf der Basis "Fibre tot he Home" (FTTH).* p. 1.

759 <http://www.comcom.admin.ch/aktuell/00429/00457/00560/index.html?lang=en&msg-id=29395>

covering 60% of the country in 2008.⁷⁶⁰ Nevertheless, the penetration rate is still low compared to the OECD average (20% in 2007).⁷⁶¹ In 2006, ComCom revoked the 3G license from 3G Mobile AG as the company couldn't meet the conditions stipulated in the license.⁷⁶² Swisscom recently announced plans to invest in HSPA+ in the next several years. Handsets supporting this technology are expected to be sold in 2010.⁷⁶³ At the end of 2008, five GSM-licenses were in use (Swisscom, Sunrise, Orange, Tele2, and In&Phone), with coverage of nearly 100% of the population.⁷⁶⁴

WiMAX still plays a marginal role in the broadband market. In 2007, a license was awarded to Inquam Broadband.⁷⁶⁵ The provider is expected to launch a mobile WiMAX service.⁷⁶⁶ Swisscom decided in 2008 to use satellite connection for universal access services rather than WiMAX.

Satellite Connections (Eutelsat) are used to provide broadband connections to remote areas that cannot be served with DSL or cable networks. The market share of this technology within Switzerland is small, and, with DSL coverage of about 98%, the situation is unlikely to change in the near future.

Although the Swiss government hasn't developed any policy concerning the deployment of wireless hotspots, the telecom industry has been actively investing in the spread of hotspots. Again, Swisscom is the major player in the field and has installed over 1,200 wireless hotspots in Switzerland, especially around railway stations. Furthermore, the federal railway company (SBB) is working closely with Swisscom to enable consumers to surf the Internet during their travels.⁷⁶⁷ On a local level, there are a growing number of open wireless city networks, which provide city centers with Internet free of charge.⁷⁶⁸

Market share and key players

Swisscom is by far the most important provider of wireline and wireless services in the Swiss market. The company is the former national telephone company. Although the liberalization of the telecommunications market took place in 1998,⁷⁶⁹ the federal government still holds a 56% stake in the company.⁷⁷⁰ Complete privatization had been planned at that time, but the Swiss parliament decided against a full implementation in 2006.⁷⁷¹ Since 1998, four major wireline and wireless providers have competed with Swisscom in the broadband market, namely Sunrise (formerly TDC Switzerland), Tele2 (now merged with Sunrise), Cablecom, and Orange.

In 2007, ComCom awarded Swisscom with a 10-year universal service license. The license contains, among other things, the obligation to provide broadband connections to all households and serve all geographic areas of Switzerland. The minimum transmission rate is set to 600/100kbits/s and a maximum price was set at CHF 69 per month.⁷⁷² However, the consequences of this obligation are quite

760 ComCom (2009). *Annual Report 2008*. p. 21.

761 OECD (2009). *Communications Outlook 2009*. p. 103.

762 ComCom (2007). *Annual Report 2006*. p. 20.

763 <http://www.computerworld.ch/aktuell/news/49049/> (last visited 6 September 2009).

764 ComCom (2009). *Annual Report 2008*. p. 21.

765 <http://www.news.admin.ch/message/index.html?lang=en&msg-id=12434> (last visited 10 September 2009).

766 GlobalComm (2009). *Country overview Swiss Section: Broadband Market Commentary*.

767 http://www.swisscom.ch/FxRes/Files/PWLAN/online_im_zug.pdf (last visited 11 September 2009).

768 <http://www.openwireless.ch/> (last visited 11 September 2009).

769 TeleGeography, GlobalComms Database, Country profile, Switzerland, *Section. Wireline Timeline*.

770 OECD (2009). *Communications Outlook 2009*. p. 46.

771 http://www.parlament.ch/ab/frameset/d/n/4712/221326/d_n_4712_221326_221327.htm (last visited 8 September 2009).

772 ComCom (2006). *Annual Report 2007*. p. 24.

limited due to the fact that the broadband network already reaches 98% of Swiss households.⁷⁷³ The universal service obligation does not stipulate any specific requirements for access technologies.⁷⁷⁴

The broadband market share of Swisscom is 55.3%, representing more than twice the share of its closest competitor, Cablecom (19.2%). In the summer of 2008, Sunrise had a market share of 12.8%. Sunrise later merged with its previous competitor Tele2, allowing the company to extend its market share to over 18% at the end of 2008.⁷⁷⁵

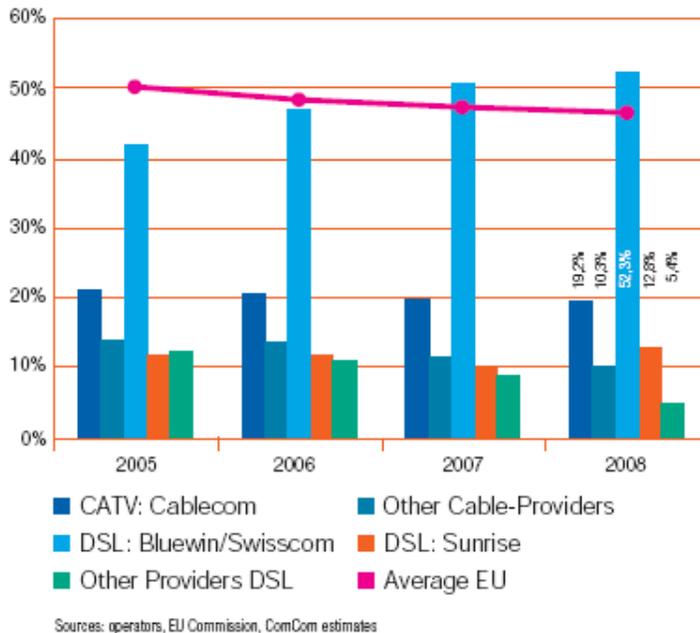


Figure 1: Market shares of broadband connections in Switzerland and in the EU, December 2008⁷⁷⁶

Swisscom was the only provider that increased its market share in 2008 (not taking into account Sunrise's merger with Tele2); direct competitors were unable to hold their market shares. This is remarkable, as Swisscom is one of the few incumbents in Europe that is outperforming its newly entered competitors.⁷⁷⁷ The dynamism of Swisscom can partially be explained by strong management with high public and political visibility, coupled with a very solid financial background.⁷⁷⁸ Observers argue that the fiber-to-the-home roll-out is somehow linked with the decision taken by Federal Council in 2005, according to which Swisscom is not allowed to make major investments in foreign companies as long as the Swiss government is its majority shareholder.⁷⁷⁹ Swisscom's high customer satisfaction rates may also contribute to their success and may help explain why better prices alone are often not incentive

⁷⁷³ OFCOM (2007). *Annual Report 2008*. p. 14.

⁷⁷⁴ ComCom (2009). *Annual Report 2008*. p. 21.

⁷⁷⁵ ComCom (2009). *Annual Report 2008*. p. 13.

⁷⁷⁶ ComCom (2009). *Annual Report 2008*. p. 11.

⁷⁷⁷ ComCom (2009). *Annual Report 2008*. p. 10.

⁷⁷⁸ http://www.swisscom.ch/GHQ/content/Investor_Relations/Ergebnisse_und_Berichte/Kennzahlen_Finanzergebnis/Wichtiges_in_Kuerze/?lang=en (last visited 17 September 2009).

⁷⁷⁹ http://www.admin.ch/ch/d/gg/pc/documents/1365/VL_Bericht_d.pdf (last visited 17 September 2009).

enough for consumers to change telecommunication providers. Overall, the company's image and customer trust in its reliability seem to contribute significantly to Swisscom's ongoing success.⁷⁸⁰

As already mentioned, new players are currently entering the Swiss market, as local power providers start to invest in fiber-to-the-home networks. As a result of this increased competition, Swisscom recently announced investments of over USD 2.64 billion in fiber-to-the-home connections over the next six years ("Fibre Suisse").⁷⁸¹ Swisscom's multi-fiber strategy is based on the deployment of four fibers to each home. One of these fibers would be used by Swisscom itself, the other three could be bought or rented by other providers.⁷⁸² Sunrise—Swisscom's strongest competitor—has entered a nation-wide cooperation with the former monopolist, agreeing to buy Swisscom's wholesale fiber products.⁷⁸³ The multi-fiber network is expected to reduce Swisscom's deployment costs and protect its market share. According to experts, the multi-fiber approach taken by Swisscom may even help the company to avoid regulation as it offers non-discriminatory access to competitors.⁷⁸⁴

In the wireless market, Swisscom has the largest market share (62% in March 2009), followed by Sunrise and Orange with 21 and 18%, respectively. In 2005, new competition in the corporate communications market came from In&Phone as they had been awarded a GSM-1800 license. In the same year, the two main Swiss retailers Migros and Coop launched their own products in cooperation with Swisscom and Orange.⁷⁸⁵

Regulatory framework

Although Switzerland is not a member of the European Union, the regulation of the Swiss telecommunications market is highly influenced by the EU telecommunications framework. The legislative framework is intended to serve the goal of universal service: broad access to reliable and affordable telecommunication services.

The most important law governing the telecommunications market in Switzerland is the Law on Telecommunications (LTC) and the corresponding Ordinance on Telecommunications and Services (TIO).⁷⁸⁶ Since its amendment in 2007, key elements of the LTC regime include local loop unbundling and an ex-post mechanism to set prices for network access. According to this ex-post approach, which is a target of considerable criticism, ComCom is only permitted to intervene in response to a respective request by a telecom company and under the condition that negotiations between the relevant competitors have failed for three months. The LTC establishes ComCom as the independent regulator for the Swiss telecommunications market. ComCom is attached to the Federal Office of Communication (OFCOM).

Optical fiber networks are not within the scope of LTC and remain therefore unregulated—a fact that has triggered discussions about the need to amend the LTC, as mentioned earlier.⁷⁸⁷ In light of this regulatory vacuum, ComCom has taken on the role of a facilitator, in addition to the role of a regulator,

780 NZZ am Sonntag (18 November 2007). "Preisvergleich mit Ausland hinkt". Interview with Carsten Schlöter, CEO of Swisscom. p. 5.

781 TeleGeography, GlobalComms Database, Country profile, Switzerland, *Section: Broadband Market Commentary*.

782 TeleGeography, GlobalComms Database, Country profile, Switzerland, *Section: Broadband Market Commentary*.

783 Neue Zürcher Zeitung (31 March 2009). *Wenn Stromer ins Telefongeschäft einsteigen*. p. 21.

784 TeleGeography, GlobalComms Database, Country profile, Switzerland, *Section: Broadband Market Commentary*.

785 TeleGeography, GlobalComms Database, Country profile, Switzerland, *Section: Wireless Market Commentary*.

786 TeleGeography, GlobalComms Database, Country profile, Switzerland, *Section: Broadband Regulations*.

787 Sonntag Zeitung (3 May 2009). "EW sollen Technik und Angebote vereinheitlichen". Interview with Marc Furrer, head of the independent regulator ComCom. p. 57.

and has recently organized a series of fiber-to-the-home roundtables to explore soft-law approaches to standardize and coordinate the roll-out of additional fiber infrastructure among the different stakeholders.⁷⁸⁸

Experts are calling for another amendment of the LTC to correct for deficiencies that they claim lead to uncertainty on the market and result in a sub-optimal environment for future investments. According to critics of the current regime, the reliance on ex-post regulatory mechanisms prevents regulators from taking the necessary steps to ensure a well functioning market. Moreover, they assert that the regulations should be technology-neutral, as opposed to the current regulatory structure that varies by technology. For example, ComCom is currently unable to intervene and impose solutions to market problems related to fiber networks.⁷⁸⁹

Political economy

The political economy of broadband policy in Switzerland revolves primarily around the efforts of Swiss regulators, with the support of newer entrants into the telecommunication markets, to secure additional regulatory powers that would allow them to act more forcefully in opening up Swisscom's infrastructure to competitors. The struggle over local loop unbundling, described in more detail below, dragged on for many years before Swisscom was ultimately forced to open its copper wire to its competitors.

Today, a newer version of the same debate is underway regarding further amendments to the LTC that would offer regulators expanded power to intervene in broadband markets, again pitting entrants against the incumbent. Swisscom seeks to avoid any further regulations, whereas its competitors, including the local power providers, want further amendment of the LTC to regulate fiber deployment. The disagreement over the practical and philosophical aspects of regulatory policy is occurring both in the marketplace and within government.⁷⁹⁰ On the one hand, ComCom is pushing for another amendment, whereas, on the other hand, the Federal Council argues that such a step would be premature in the light of the fact that the LTC was amended in 2007. In the meantime, independent experts are calling for a public mandate.⁷⁹¹ The outcome of this political debate is still open and hard to predict; no decisions have been made so far.

Occupying the far side of the political landscape is an ongoing process characterized not by antagonism but by cooperation. These recent round-table discussions, facilitated by ComCom and bringing together the most important stakeholders, including Swisscom, seek to frame a coordinated approach to deploying the next generation of fiber-to-the-home networks that will offer excellent transmission rates and be open to multiple service providers.

Broadband strategy

The Federal Council formulated an initial Strategy for a Swiss Information Society in 1998, which was updated and enhanced in 2006. The Federal Council's paper sets forth the basic principles of such a society and identifies the areas where action is most urgent. These guidelines are intended to inform the development of agency- and department-specific sub-strategies. In 2008, the Federal Council decided to

788 ComCom (2009). *Fibre to the home: third round table*. press release found on <http://www.comcom.admin.ch/aktuell/00429/00457/00560/index.html?lang=en&msg-id=26690> (last visited 10 September 2009).

789 ComCom (2009). *Annual Report 2008*. p. 5-6.

790 Sonntags Zeitung (31 August 2008). *Aus allen Lobbyisten-Rohren*. p. 65.

791 NZZ am Sonntag (14 December 2008). *Dünne Glasfasern sorgen bei Firmen für dicke Luft; Telekom-Unternehmen kämpfen mit harten Bandagen um die Gunst der Politik*. p. 36.

renew the mandate of the Interdepartmental Information Society Committee (ISSC). The committee has until 2011 to implement the Federal Council's strategic goals.⁷⁹²

The Swiss strategy regarding broadband development has four core areas and principles:⁷⁹³

- **Universal Service:** An economical, reliable, and high-quality technical infrastructure should be offered to all in Switzerland.
- **Non-discriminatory Access:** Equal and unimpeded access to information and communication technologies should be granted to all.
- **Federalism:** Clear legal regulations and voluntary cooperation should eliminate inefficiencies typical for a federal country.
- **Cooperation:** The government seeks to promote and facilitate an effective partnership among government, business, civil society, and science.

Switzerland has not yet formulated a more explicit and detailed strategy on broadband infrastructure at the federal level. However, OFCOM and ComCom are reportedly working on a white paper describing their broadband policies. The document is expected to be released in spring 2010.

On the local level, cities such as Zurich and St. Gallen have built strategic partnerships with local power utilities and broadband service providers to deploy fiber-to-the-home networks. These initiatives are long-term engagements (in the case of Zurich, for ten years) to develop and guarantee a non-discriminatory and open core infrastructure.⁷⁹⁴

Policy interventions and outcomes

Government investment in infrastructure

The Swiss federal government does not directly invest in broadband infrastructure. The primary task of the government is to build a sound regulatory framework that creates incentives and favorable conditions for market development.

In contrast to many other countries, the Swiss government has not made a commitment to use parts of the country's stimulus packages to invest in the national broadband infrastructure.⁷⁹⁵ A motion by a Swiss parliamentarian asked the Federal Council to support the regional development of the fiber roll-out. The Federal Council responded that it was too early to consider such measures.

At the local level, by contrast, there have been several initiatives aimed at strengthening the country's broadband infrastructure. For instance, in a 2008 vote, the people of Zurich approved a public loan of over CHF 200 million to support the local power company in providing fiber-to-the-home to all households. Another example is St. Gallen, where voters approved by a wide majority a CHF 78 million

⁷⁹² <http://www.bakom.admin.ch/dokumentation/medieninformationen/00471/index.html?lang=en&msg-id=23627> (last visited 17 September 2009).

⁷⁹³ Federal Council (2006). *Strategy of the Federal Council for an Information Society in Switzerland*. p. 2-3.

⁷⁹⁴ http://www.stadt-zuerich.ch/content/dam/stzh/portal/Deutsch/Abstimmungen%20%26%20Wahlen/070311/Abstimmungszeitung_1_07.pdf (last visited 10 September 2009).

⁷⁹⁵ http://www.stadt-zuerich.ch/content/dam/stzh/portal/Deutsch/Abstimmungen%20%26%20Wahlen/070311/Abstimmungszeitung_1_07.pdf (last visited 10 September 2009).

investment to create a FTTH network structured as a public utility. Local initiatives such as these have had an impact on national-scale broadband deployment strategies and influenced Swisscom's plans to expand investments through a cooperative approach to FTTH deployment through the Fibre Suisse plan.⁷⁹⁶

At the same time, several private-public partnerships were formed in about nine cities and villages in Switzerland, aimed at building open wireless networks (WLAN). The local utility provider owned by the City of St. Gallen, for example, invested about USD 150,000 in a local open wireless initiative.⁷⁹⁷

Skill building, education, and demand programs

The federal government has introduced a variety of different programs and strategies to support development towards an open information society. However, due to the strong federal system, cantons play a key role when it comes to educational or cultural initiatives and measures. Nevertheless, the following examples are illustrative of the variety of national initiatives:

e-Health:

The goal of this initiative is to formulate measures to gradually establish an electronic patient file and a portal with quality-assured online information and access to patient files by 2015. The strategy was implemented in 2007 with the intention of contributing to the development of a health system that is more reliable, more cost-efficient, and of higher quality. One objective is to help patients to better inform themselves of health care choices based on quality-assured information. In addition, the parliament took first steps toward introducing a national insurance card. This card will not only store information about the patient's insurance, but will also include specific health data that could be used by health care providers.⁷⁹⁸

e-Government strategy:

Designed as a joint strategy of the confederation, the cantons, and the municipalities, this initiative seeks to pursue three main objectives: "the economy carries out transactions with the authorities electronically; the authorities have optimized their processes and deal with each other electronically and the population can carry out important, frequent or time-consuming, transactions with the authorities electronically."⁷⁹⁹

e-Inclusion:

The aim of this project is to build a network for people who would normally be excluded from the information society, i.e., to bridge participation gaps. Since 2006, the Coordination Office Information Society has promoted different projects that provide support to "digital have-nots" and help them to acquire the skills needed to participate in the information society. The Swiss Integration Network's members have committed themselves to launch their own projects and support the implementation of the initiative.⁸⁰⁰

796 Further details of the Fibre Suisse initiative can be found in Section 4.13.2. of Next Generation Connectivity.

797 <http://sg.openwireless.ch/finanzierung> (last visited 10 September 2009).

798 <http://www.bakom.admin.ch/themen/infosociety/01689/index.html?lang=en> (last visited 8 September 2009).

799 <http://www.bakom.admin.ch/themen/infosociety/01688/index.html?lang=en> (last visited 8 September 2009).

800 <http://www.bakom.admin.ch/themen/infosociety/02104/index.html?lang=en> (last visited 8 September 2009).

Competition policy

Broadband competition in Switzerland has been most active at the intermodal level, principally between cable operators, led by Cablecom, and the incumbent, Swisscom, offering DSL service over copper lines. Proponents of intermodal competition can point to the fact that a large majority of Swiss households have access to both cable and DSL connections. Moreover, competition from cable service providers is likely to have played an important role in Swisscom's decision to invest in upgrading its Internet offerings, seen by some as a direct response to the entry of cable operators into broadband markets. More recently, Cablecom has started the process of upgrading its system to offer increased transmission rates with Swisscom responding with investments in fiber.

Despite these signs of viable competition among different proprietary platforms, Swiss regulators, in step with their European counterparts, have also pursued open access policies. The Swiss government decided to open the "last mile." Reasons can be found in the telecommunications market: Swisscom, the former monopolist, was still dominating the market and new entrants were struggling to find a way into the market. Swisscom's dominance was particularly overwhelming in the wireline telecommunication market. Although the situation looked better on the broadband market, where competition came from a relatively strong cable provider, the main problem was the dependence of the service providers on Swisscom's wholesale products. The Federal Council feared that this fact could have negative effects on future innovation in the broadband market.⁸⁰¹

Following a public consultation process in 2002, the Swiss Federal Council issued a decree in 2003 requiring local loop unbundling of Swisscom's network. After several years of resistance from Swisscom and regulatory uncertainty, an amendment to the Law of Telecommunications was completed in 2007 that would begin the implementation of opening up the incumbent's copper network to its competitors. This includes unbundled access to the local loop, bitstream access for four years, access to leased lines, and access to cable ducts. These policies apply only to the copper wire network.⁸⁰² As of January 2009, Swisscom had signed eight contracts with other operators and 31,000 access lines were effectively unbundled.⁸⁰³ The Federal Administrative Court confirmed in February 2009 that Swisscom is a dominant player and must therefore offer cost-oriented bitstream access.

In 2008, ComCom set the price for unbundling the local loop for the first time. Price will be reduced to CHF 18.18 (about USD 17) from the price charged by Swisscom of CHF 23.50 (about USD 22). In addition to the price setting for fully unbundled access to the local loop, the conditions for co-use of resources at the main distribution frame (co-location) and the interconnection were regulated as well.⁸⁰⁴

Competition policy for next generation networks is taking on a notably different form in Switzerland with the cooperative agreements to lay down fiber networks that are emerging. While cable providers will continue to offer competitive broadband services, the over-building strategy under development, based on four fiber lines into each house, offers the prospect of strong competition among internet service providers without mandated line sharing or price controls.

801 Federal Council (2003). *Botschaft zur Änderung des Fernmeldegesetzes (FMG)*. p. 7656-7957.

802 OECD (2009). *Communications Outlook 2009*. p. 55.

803 OFCOM (2009). *The Swiss telecommunications market- an international comparison: Extract from the 14th European Union Implementation report extended to include Switzerland*. p. 102.

804 OFCOM (2007). *Annual Report 2008*. p. 6/16.

Network non-discrimination

Net neutrality has not become a major issue in Switzerland. No complaints regarding discriminatory practices have been lodged with ComCom, and the agency has therefore not taken any action in this respect. None of the relevant agencies of the Swiss government, such as the Federal Council, ComCom, and OFCOM, have made any official statement regarding their position on network neutrality.

On a local level, the fiber deployment in the city of Zurich aims to avoid monopolization of the new network by granting all service providers discrimination-free access. Consumers are empowered to decide which provider they want to use.

Spectrum policy

Spectrum policy in Switzerland has been structured on the auction of licenses to competitive bidders. However, the anticipated level of competition for licenses has been disappointing. ComCom, the agency that is responsible for allocating licenses, decided in 1999 to reward the four UMTS licenses with an auction procedure, with a minimum price at CHF 50 million. Initially, ten telecom companies showed interest. Due to the difficult market situation in 2000, six companies decided to withdraw their initial offers. As a consequence, the four licenses were awarded to the four remaining companies for the minimum price.⁸⁰⁵ A similar situation arose in the award process for the broadband wireless access (BWA) licenses. ComCom sought to auction three licenses in 2006. However, Swisscom was the only company interested in this license after several competitors decided not to participate. In 2007, another BWA license was awarded for CHF 5.8 million, again to a sole bidder, Inquam Broadband.⁸⁰⁶

ComCom is currently preparing for a coordinated reallocation of the most important mobile phone frequencies which become available again in 2013 and 2016.

805 ComCom (2001). Bericht der Eidgenössischen Kommunikationskommission (ComCom) zuhanden des Bundespräsidenten betreffend die Vergabe der IMT-2000/UMTS-Konzessionen in der Schweiz. p. 2-9.

806 TeleGeography, GlobalComms Database, Country profile, Switzerland, section: Broadband Market Commentary.

K. United Kingdom

Introduction

Approximately two-thirds of households in the UK have access to the internet via a broadband connection. DSL is available to nearly the entire country and cable available to slightly over half. Fixed broadband prices are competitive in the UK having fallen by over 16% each year between 2006 and 2008. UK's performance on speed has lagged as measured by both advertised and actual speed. A recent government report noted that 11% of UK homes in fact have these low tier speeds not greater than 2 Mbps. In 2005, the UK became the first OECD country since the global shift to privatization of telecommunications markets to impose functional separation on its incumbent telecommunications provider, British Telecom (BT). The government has since set a goal of providing universal service of 2 Mbps to the entire UK by 2012. Only two carriers, Virgin Media and BT, have plans to deploy "super-fast" fiber networks. The government's plans to support a next generation network include a Next Generation Broadband fund raised from a 50 pence/month levy on all fixed connections. This fund will support deployment to the one-third of the UK that the government predicts the market will not service. Five carriers compete in the 3G wireless market, of which market share is relatively evenly divided.

Market Highlights

Overall, 56.7% of households in United Kingdom have broadband access.⁸⁰⁷

	Fiber / LAN	Cable	DSL	Other	Overall ⁸⁰⁸
Subscriptions per 100 people ⁸⁰⁹	1.0	13.7	10.3	0.9	25.8

Penetration Metrics	Rank amongst OECD 30 countries	Speed metrics	Rank amongst OECD 30 countries	Price metrics	Rank amongst OECD 30 countries
Penetration per 100, OECD	11	Maximum advertised speed, OECD	21	Price low speeds, combined	18
Household penetration, OECD	11	Average advertised speed, OECD	15	Price med speeds, combined	12
3G penetration, Telegeography	10	Average speed, Akamai	16	Price high speeds, combined	4
Wi-Fi hotspots per 100000, Jiwire	3	Median download, speedtest.net	18	Price very high speeds, combined	10
		Median upload, speedtest.net	21		
		Median latency, speedtest.net	17		
		90% Download, speedtest.net	17		
		90% Upload, speedtest.net	25		

Note: Details in Part 3
Source: OECD, TeleGeography, Jiwire, Speedtest.net, Akamai, Point Topic Berkman Center analysis

■ 1st quintile
■ 2nd quintile
■ 3rd quintile
■ 4th quintile
■ 5th quintile

807 OECD Broadband Portal, Table 2a, from EC Community Survey, as of 2007.

808 Does not include 3G Wireless. Since subscriptions are shared within a household, this number will never be 100.

809 OECD Broadband Portal, Table 1d, data supplied by UK Government, as of 2008.

Broadband Development to Date

In recent years, increasing access and decreasing price have characterized broadband deployment in the UK. Today, DSL is available to virtually the entire UK, and cable broadband is available to 52% of the country.⁸¹⁰ As of the first quarter of 2009, 65% of UK households had a fixed broadband connection. This figure represents growth of 7% year-over-year. UK fixed broadband subscriptions increased 10.7% in 2008.⁸¹¹ 92.1% of UK small businesses have broadband service.

The data on connectivity speeds varies depending upon the source. A September 2008, government-solicited study reported average connectivity speeds in the UK to be 5.9 Mbps.⁸¹² By our measures in this study, the UK is at the bottom of the third quintile in the OECD in speeds. The government's June 2009 *Digital Britain* report concluded that 11% of UK homes do not have access to a connection with speeds of greater than 2 Mbps.⁸¹³ UK broadband performance is comparatively better in price. In October 2008, OECD rankings showed the UK had the fifth cheapest broadband subscription prices in the world.⁸¹⁴ Our more extended study suggests that the UK was 11th, but had particularly attractive prices for high speed broadband. Broadband prices in the UK fell substantially between 2005 and 2009. British regulator Ofcom recently reported that an 8 Mbps connection in early 2009 cost as little as 20% of what the same connection cost in 2005.⁸¹⁵

Functional separation of incumbent BT in 2005 and the ensuing expansion of local loop unbundling appear to have played a large role in the price reductions in the fixed-line market and increasing consumer adoption. The UK had originally adopted unbundling in 2001. By late 2005, however, there were still only 200,000 unbundled loops in the entire country. At that point, Britain's regulator, Ofcom, forced BT to functionally separate its retail Internet access services from its network elements business, which were thereafter to be provided by Openreach on an open access basis. A period of intense competition for subscribers over unbundled loops followed including Carphone Warehouse, Tiscali UK, and BskyB. Several service providers led by Carphone Warehouse offered "free" broadband to those who signed up for bundled service in order to attract customers.⁸¹⁶ By the end of 2008, there were 5.5 million unbundled loops in the UK and 80% of UK households were connected to exchange with competitive offerings via unbundling compared to just 40% three years earlier.⁸¹⁷ BT is now moving its entire network to an IP platform, but its plans have been repeatedly delayed and the fixed line market in the UK has shrunk since 2002.⁸¹⁸

Two UK companies, British Telecom (BT) and Virgin Media, have plans to roll-out "super-fast" fixed broadband networks in the coming years. As of July 2009, Virgin Media has made fiber-based broadband of speeds "up to" 50 Mbps available to 12.5 million homes.⁸¹⁹ This is the only fiber service currently available in the UK. BT plans to deploy its super-fast broadband product of 40 Mbps via fiber-

810 Ofcom, "The Communications Market 2009," p. 55.

811 Ibid, p. 16.

812 The Next Phase of Broadband UK, p. 9.

813 Digital Britain, Final Report, June 2009, p. 53.

814 OECD, "Broadband Average Subscription Price, October 2008, USD PPP," available at <http://www.oecd.org/dataoecd/22/44/39575002.xls>; The Next Phase of Broadband UK, p. 9

815 Ofcom, "Impact of the Strategic Review of Telecoms," 29 May 2009, p. 4.

816 TeleGeography, GlobalComms Database, Country Profile, UK.

817 Ofcom, "The Communications Market 2009"

818 TeleGeography, GlobalComms Database, Country Profile, UK. p. 10.

819 Ofcom, "The Communications Market 2009," p. 15 (internal quotation marks omitted).

to-the-home or fiber-to-the-cabinet (node) to 40% of the UK by 2012.⁸²⁰ Though no other companies have announced such significant investments in next generation networks, some have begun discussions with Openreach, BT's functionally separated, wholesale open access provider, to upgrade access networks to support higher speeds.⁸²¹ The June 2009 *Digital Britain* report outlined a subsidy scheme to support the deployment of next generation, super-fast networks to the third of the UK that would not receive such service through the market alone. The report proposed a 50 pence "supplement" to be collected by all fixed-line operators, which would generate from £150m - £175m each year for a "Next Generation Fund" that could make connecting the "final third" commercially viable by 2017.⁸²² Despite these ambitions, UK regulator Ofcom does not believe that a transition from copper to fiber networks is likely in the near term.⁸²³ Indeed, *Digital Britain* also outlined a universal service plan to ensure a 2 Mbps connection to all Britons using existing networks by 2012.

Five carriers cover the UK mobile broadband market.⁸²⁴ In order of market share, they are O2 UK (29%); Vodafone UK (23%); T-Mobile UK (21%); Orange UK (20%); and Hutchison 3G UK ("3") (7%).⁸²⁵ The government originally facilitated competition in the 2G market with the release of 1800 MHz band spectrum. In April 2000, it awarded four 3G licenses in the 2100 MHz band to the four incumbent 2G carriers and one to new entrant Hutchison with the requirement that all carriers achieve coverage of 80% of the UK by the end of 2007.⁸²⁶ Today, the carriers report 3G coverage varying between 80% (O2) and 95% (Hutchison) of the UK population.⁸²⁷ All UK 3G networks use W-CDMA technology in various states of evolution. The UK today has 78.5 million wireless subscribers, 24% of which have 3G service.⁸²⁸ The UK is among Europe's leaders in deployment of Wi-Fi hotspots. Ofcom data show that as of 2007, the UK had 21 Wi-Fi hotspots per 100,000 people.⁸²⁹ BT has deployed thousands of Wi-Fi hotspots around the UK and Ireland as part of its Openzone program. Customers can buy vouchers from retail outlets for access or pay a monthly subscription fee.

Market share and key players

Although BT provides 65% of wireline connections in the UK, their broadband retail arm now holds just over one quarter of the broadband retail market. The cable provider, Virgin Media, accounts for 23% of the market. Carphone Warehouse serves about one quarter of the UK market after acquiring AOL UK and Tiscali; prior to being purchased by Carphone Warehouse, Tiscali had acquired several competitors. The television company, BskyB, commands 12% of the market and Orange Home 5%. Many smaller ISPs serve the remainder of the market.

Openreach has facilitated a fundamental shift in the market for fixed-line services. The functional separation of BT that began in 2005 has prompted a substantial increase in the number of homes with access to at least one additional operator competing via local loop unbundling. By the end of 2008, these unbundled offerings accounted for approximately one-third of all fixed line connections in the UK.⁸³⁰ The profusion of new operators in 2005 and intense competition for market share has subsidized

820 Ibid; The Next Phase of Broadband UK, p. 37.

821 The Next Phase of Broadband UK, p. 37.

822 Digital Britain, Final Report, June 2009, p. 65.

823 Ofcom, "Delivering Superfast Broadband in the UK: Promoting Investment and Competition," 3 March 2009, p. 62.

824 TeleGeography, GlobalComms Database, Country Profile, UK, p. 24-25.

825 Ibid. All figures are rounded to the nearest percent.

826 Ibid, p. 18.

827 Ibid, p. 21.

828 Ibid.

829 Ofcom, "The International Communications Market 2008," p. 242.

830 ECTA Broadband Scorecard, available at: <http://www.ectportal.com/en/REPORTS/Overview/>

somewhat over the past several years with the consolidation of several of the larger competitors. The connection share of the top five broadband providers, which stood at 73% in 2005, has now risen to over 90%, reflecting the trend towards consolidation in the market.⁸³¹

The wireless market in the UK is poised to consolidate. Orange and Vodafone announced in 2007 that they would share their 2G and 3G infrastructure.⁸³² Later that year, T-Mobile and Hutchison struck a similar agreement. In early 2009, O2 and Vodafone announced an international network-sharing agreement that includes the UK, Ireland, German, and Spain. MVNOs in the UK largely focus on the pre-paid market.⁸³³

Regulatory framework

The UK was an early leader in reforming telecommunications markets. The first version of Britain's independent telecommunications regulator, Oftel, was created in 1984 and oversaw the transition to a duopoly market. The duopoly approach was abandoned in 1991 and four years later, Oftel had made significant strides towards promoting service-based competition in UK with an agreement with BT for accounting separation and interconnection based on unbundled components, which had their most immediate effect on international calls competition. Between 1998 and 2000, Oftel issued a series of reports, and managed a series of consultations, that set the terms for wholesale and bitstream access to BT's network. Initially, Oftel and BT were planning to include only wholesale access, but in response to the EU process that later produced the 2002 Directives, Oftel expanded the process to encompass local loop unbundling as well.⁸³⁴

The UK overhauled its telecommunications regulatory regime in July 2003 to conform to a new EU framework. The new regulatory structure replaced the licensing system with "General Conditions of Entitlement" across telecommunications markets and "Specific Conditions" applicable to individual companies.⁸³⁵ The UK Communications Act of 2003 created a new regulatory body, the Office of Communications (Ofcom), an independent "super regulator"⁸³⁶ with responsibilities including managing spectrum, ensuring high-quality television and radio programming, and regulating broadband service.⁸³⁷ The Office of the Telecoms Adjudicator (OTA) resolves working-level disputes related to local loop unbundling, wholesale line rental, and Openreach.⁸³⁸ The creation of the OTA in 2004, along with the imposition of functional separation in 2005 and wholesale access price reductions in 2004 and 2005, are described by Ofcom as the key factors that led to greater retail broadband competition in the UK.⁸³⁹

Ofcom concluded a process entitled the Strategic Review of Telecommunications in December of 2005. Its conclusion changed the legal demands on BT, which had long resisted and stifled efforts of competitive carriers to enter the fixed-line market. Although the UK had adopted unbundling in 2001, by late 2005 there were still only 200,000 unbundled loops in the entire country.⁸⁴⁰ BT signed a binding Undertaking that imposed functional separation between its wholesale inputs business and its retail operations. The Undertaking created Openreach, whose operations were separate from BT's retail arm,

831 Ofcom, "The International Communications Market 2008," p. 203.

832 Ibid, p. 21

833 Ibid.

834 Regulatory Reform in UK. OECD. Available at: <http://www.oecd.org/dataoecd/46/30/2766201.pdf>

835 TeleGeography, GlobalComms Database, Country Profile, UK, pp. 35-36.

836 Ibid.

837 Ofcom, "Ofcom: a short guide to what we do," April 2008, available at <http://www.ofcom.org.uk/consumeradvice/guide/>

838 Office of the Telecoms Adjudicator, "Objectives," available at <http://www.offta.org.uk/vision.htm>

839 Ofcom, "The Communications Market 2009," p. 201.

840 Next Generation Connectivity, p. 160.

and which was placed under the obligation to deliver access to inputs, such as network elements, to other parts of BT using the same systems, under the same terms, and with the same timescales as it provides such access to all other non-BT carriers. Functional separation was implemented to enhance competition through neutral access to BT's network. This arrangement also offers greater transparency and is easier to regulate. In May 2009, following a review of the results of functional separation, Ofcom decided to retain the main features of the 2005 Undertaking.⁸⁴¹ It did, however, permit BT to increase its charges for access to unbundled lines.⁸⁴² For BT, the separation of its wholesale business and greater retail competition in this new regulatory environment also implies less regulation of its retail operations. Moreover, to promote investment in next generation networks, Ofcom decided in March 2009 to leave prices for wholesale "super-fast" broadband services unregulated.⁸⁴³

Political economy

UK telecommunications were highly regulated under the BT monopoly. Today, the regulatory landscape is largely pro-competition. Nonetheless, Ofcom's current administration is viewed as highly aligned with the Labour Party, and UK Conservatives are eager to reduce the regulator's powers. In a recent speech, British Tory leader David Cameron stated, "[w]ith a Conservative Government, Ofcom as we know it will cease to exist. Its remit will be restricted to its narrow technical and enforcement roles." In that speech, Cameron proposed to vest the Department for Culture, Media, and Sport with many of Ofcom's current responsibilities.⁸⁴⁴ The European Union would likely welcome a reduction in Ofcom's power. In 2007, the European Commission launched a proposal to subject telecommunications regulatory decisions of member states to a new, Europe-wide authority.⁸⁴⁵

Broadband strategy

In addition to the regulatory measures described above, the UK is now planning to ensure (1) universal broadband service in the UK of at least 2 Mbps and (2) the deployment of next generation, "super-fast" broadband networks. The universal service commitment, outlined in the June 2009 *Digital Britain* report prepared by former Ofcom head Lord Stephen Carter, aims to provide universal availability of broadband at speeds of at least 2 Mbps by 2012 using existing copper and wireless networks. Upgrades to these networks will be supported by £200m of direct government investment from funds leftover from the Digital Switchover, "commercial gain through tender contract and design, in-kind contributions from private partners," and more extensive obligations on mobile carriers, among others.⁸⁴⁶

The deployment of next generation networks will rely primarily on private investment. However, *Digital Britain* concludes that the market alone will lead to the deployment of next generation networks to only one-half to two-thirds of the UK. To reach the "final third," the report proposes a "Next Generation Fund" consisting of a 50 pence "supplement" on all fixed copper connections. This supplement is expected to yield from £150m - £175m per year. The entire scheme is expected to provide super-fast broadband to 90% of the UK by 2017.⁸⁴⁷ The report also recognized that other regulatory changes, such

841 Ibid, pp. 86-87.

842 TeleGeography, GlobalComms Database, Country Profile, UK, p. 37.

843 TeleGeography, GlobalComms Database, Country Profile, UK, p. 36.

844 Chris Williams, "Ofcom top of Tory deathlist," *The Register*, 6 July 2009, available at http://www.theregister.co.uk/2009/07/06/cameron_ofcom/

845 Juliette Garside, "EU moves in on telecoms regulation," *Telegraph.co.uk*, 11 November 2007, available at <http://www.telegraph.co.uk/finance/markets/2819325/EU-moves-in-on-telecoms-regulation.html>

846 *Digital Britain*, Final Report, p. 12, 53-58.

847 Ofcom, "The Communications Market 2009," p. 15.

as providing next generation broadband guidelines to homebuilders and relaxing overhead line installation regulations, may be helpful “in addition” to the Next Generation Fund.⁸⁴⁸

With respect to mobile broadband, *Digital Britain* proposes three objectives: (1) transitioning to high-speed mobile broadband; (2) universal 3G coverage; and (3) maintaining a “highly competitive mobile market.”⁸⁴⁹ Adopting the May 2009 recommendations of the government-appointed Independent Spectrum Broker, *Digital Britain* recommends clearing the 800 MHz band from the television Digital Switchover and auctioning this with other 3G spectrum in 10 MHz blocks with coverage requirements, imposing spectrum caps, and “liberalisi[ng] existing 2G spectrum in the hands of the existing operators.”⁸⁵⁰

Policy interventions and outcomes

Government investment in infrastructure

The UK has relied largely on market forces to deploy broadband service. Consequently, direct government investment in infrastructure is limited. As noted above, the government plans to support its universal service goal in the near term by devoting approximately £200m to upgrading existing copper and wireless networks. Furthermore, the Next Generation Fund, though composed of funds from private customers, will be collected pursuant to government mandate.

Skill building, education, and demand programs

Digital Britain highlighted an urgent need for greater IT skills training to satisfy the needs of British businesses. The report recommended a £30m funding increase⁸⁵¹ for the Technology Strategy Board, a public body established in 2007 that “stimulates technology-enabled innovation” through technology research and development, and commercialization.⁸⁵² Since 2006, the Train to Gain program, which provides some government funding for worker training, has helped 127,000 UK businesses train over 1 million workers, albeit primarily in “lower level skills.”⁸⁵³ In February 2009, the government began the Home Access Programme, a pilot project that provided grants for online access to homes with children attending state-run schools. *Digital Britain* reports that the program has been a success and that grants will be unlimited during the rollout of the national program in December 2009.⁸⁵⁴ The government also supports a network of 6,000 UK Online Centres, established in 2000. Each day, two million Britons use the centers, which are concentrated in “areas of high deprivation,” to access online government services or to take courses in digital learning.⁸⁵⁵ The UK is developing a national curriculum to provide digital learning opportunities in schools to ensure that future workers have essential digital skills. Curricular revisions will include “information and communications technology” (ICT) to a new “core competence” parallel to more traditional curriculum subjects.⁸⁵⁶

848 *Digital Britain*, Final Report, p. 65.

849 *Ibid.*, p. 14.

850 *Ibid.*

851 *Digital Britain*, Final Report, p. 168.

852 Technology Strategy Board, “About us,” available at <http://www.innovateuk.org/aboutus.ashx>

853 *Digital Britain*, Final Report, p. 182.

854 *Ibid.*, p. 35.

855 *Ibid.*

856 *Ibid.*, p. 173.

Competition policy

As noted above, local loop unbundling and the functional separation of BT into retail and Openreach wholesale components are central features of recent Ofcom competition policy. In terms of next generation network investment and services, Ofcom's regulatory principles aim to afford carriers regulatory certainty, allow for returns commensurate with the level of investment risk in next generation networks, and provide equal opportunities for wholesale access to promote competition.⁸⁵⁷ Ofcom defines two "main options" for competition in the next generation network market: "active" products, those provided by network owners; and "passive" products, those provided using network owners' infrastructure.⁸⁵⁸ Though Ofcom's super-fast broadband report recognizes the importance of active products to initial network investment, the regulator believes that significant market power justifies regulations requiring passive access.⁸⁵⁹ The report goes so far to state that if "active products on which competition can be based are not delivered in a timely way," then the regulator will consider ways in which passive products can inject competition.⁸⁶⁰ Ofcom also suggests that BT design its new networks in ways that will not lead to "foreclosure of future market entry."⁸⁶¹ Note that Ofcom announced in March 2009 that it would not subject wholesale "super-fast" broadband services to price regulation.⁸⁶²

Network non-discrimination

In 2007, Ofcom maintained that given the remedies for anti-competitive conduct available through the European framework, net-neutrality non-discrimination regulations in the UK were unnecessary. In May 2009, the European Parliament voted to allow ISPs the discretion to shape traffic over their networks in the Telecoms Rules of 2002, and the issue is unlikely to be debated again at the conciliation procedure in late 2009.

Spectrum policy

In 2000, Oftel – the predecessor of Ofcom – awarded 20-year 3G licenses to the four incumbent 2G wireless carriers and new entrant Hutchison 3G UK. Of the incumbents, T-Mobile, Orange, and O2 received one paired 10 MHz and one unpaired 5 MHz block and Vodafone received one paired 15 MHz block, all in the 2100 MHz band. Hutchison received one paired 15 MHz block, also in the 2100 MHz band.⁸⁶³ Ofcom began investigating the prospect of rebanding the 900 MHz band for 3G service in 2007 in the face of opposition from incumbent 2G licensees O2 and Vodafone.⁸⁶⁴ In 2006, Ofcom announced plans to auction 205 MHz of 2.6 GHz spectrum. In 2008, however, shortly before the auction, O2 and T-Mobile filed suit to delay the auction until the fate of the 900 MHz was resolved.⁸⁶⁵ Digital Britain endorsed making 3G spectrum licenses indefinite. It also proposed auctioning the 800 MHz band from the television Digital Switchover with other 3G spectrum (2.6 GHz) in 10 MHz blocks with coverage requirements, imposing spectrum caps, and "liberalisi[ng] existing 2G spectrum in the hands of the

857 Ofcom, "Delivering Superfast Broadband in the UK: Promoting Investment and Competition," 3 March 2009, p. 4.

858 Ibid, p. 5.

859 Ibid, p. 6.

860 Ibid, p. 35.

861 Ibid, p. 45.

862 TeleGeography, GlobalComms Database, Country Profile, UK, p. 39.

863 Ibid, pp. 18, 24.

864 Ibid, p. 18.

865 TeleGeography, GlobalComms Database, Country Profile, UK, p. 36.

existing operators.”⁸⁶⁶ Consequently, Ofcom delayed the 2.6 GHz auction and now plans to auction this spectrum consistent with the Digital Britain recommendation in 2010.⁸⁶⁷

⁸⁶⁶ Digital Britain, Final Report, p. 14.

⁸⁶⁷ TeleGeography, GlobalComms Database, Country Profile, UK, p. 36.