What Drives and what Hinders Development of Broadband in the Czech Republic

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Abstract

Development of broadband access and e-services in the Czech Republic is accelerating. However, the penetration of broadband access lines is still much lower compared with most of the old EU member states. In the paper, drivers of and barriers to faster development of broadband in the Czech Republic are identified.

Introduction

Although access to the Internet via cable modems has been available since 2000 in the Czech Republic, significant development of broadband started only in 2003, when ADSL became available. In August 2004, ADSL outnumbered cable modems. By mid-2006, the number of broadband access lines based on all wireline as well as wireless technologies exceeded 800 000 which corresponds to about 8 broadband lines per 100 inhabitants. The demand for broadband access to the Internet is driven by increasing availability of e-services but there are still many obstacles to be overcome. These have been identified in the national Broadband Strategy approved by the Czech government on January 26th, 2005.

The Strategy relies primarily on private investment in developing the infrastructure and fast development of broadband services that would drive demand for broadband access. The governmental and municipal bodies are expected to be among the major providers of e-services followed by commercial service providers.

The barriers to faster development of broadband in the Czech Republic are manifold. They include immature regulatory environment, unavailable broadband infrastructure in rural areas and low purchasing power of the population and PC illiteracy especially of the older generation. Overcoming these barriers is a complex problem since all the issues have to be tackled simultaneously. This paper provides an overview of the situation in the development of broadband in the Czech Republic and attempts to identify the main factors affecting further progress in this area.

E-Services available to Czech Population

Demand for and availability of services provided over the broadband infrastructure is the main precondition for successful development of broadband in any country. In the Czech Republic e-services are provided by public institutions as well as by commercial subjects.

E-Government

There is a government portal set-up and run by the Czech Ministry of Informatics that integrates the whole sector of the government (ministries and all other central authorities), regional and local authorities and provides links to many sources of information (websites) useful for the citizens.

The possibility to submit over the Internet various documents, especially those of financial nature (e.g. tax declaration, invoices recognized by the Tax Office), is hindered by problems connected with practical application of e-signature even though there is a special law dealing with this issue. In spite of this hurdle, there are a few successful public services in operation.

A list of companies offering secure computer programmes for submitting applications to the Czech Social Security Administration is displayed on the web. In this way, the data needed for determining the pension support is collected from employers. A Central register of Czech entrepreneurs is also available. The government solicits delivery of communications technology for the state administration electronically through e-market. A project to link all state administration offices through an intranet is underway. All schools and public libraries will also be connected to this intranet.

E-Learning

Computers are being routinely utilized at higher Czech education establishments. However, with the government project of connecting all schools to the Internet almost completed, e-learning is becoming a possibility also in secondary and primary schools. Teachers are also trained in using the computers and the Internet.

The CESNET (academic) consortium is running its own e-learning project aimed at promoting distance education at the university level. It offers tools for recording, processing, storing and presentation of multimedia data and tools for remote collaboration. A portal has been established as part of this project.

E-Health

The most important practically oriented project in this area is the IZIP project offered by a commercial subject but heavily sponsored by the largest Czech health insurance company VZP. Under this project patients' records are stored and accessed by authorized persons over the Internet. In June 2006, more than 954 000 patients and over 8 000 healthcare workers were registered in the project. All main Czech hospitals have been involved in the projects.

E-Business

There are many web servers in the Czech Republic enabling to purchase goods over the Internet. Also, all Czech banks offer internet banking. Unfortunately, no data is available about how widespread are the B2B transactions.

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Readiness of Czech Population to Use e-services

Demand for e-services strongly depends on how well the population is prepared for using the services.

According to Czech statistical office (CSO) [9], in 1st Q. of 2005 about 50% of Czech households were equipped with a PC and about 19% of all households were connected to the Internet, 5% over broadband. These numbers are increasing rapidly – the growth rate over the last years was about 30%. The PCs were used mainly for education and training (50%), work (41%), connection to the Internet ((41%) and to meet children´ wish (35%). The other half of households not having the PC or an internet connection quoted the following reasons for this: They did not need it (30%), high price (28%), not interested in information technologies and did not know how to operate the PC (13%). A positive development is that about every fifth household planned to buy a PC within a year. The ICT market is booming in the Czech Republic.

Status of Broadband Infrastructure in the Czech Republic

Backbone networks

Apart from the incumbent (Telefónica O_2 Czech Republic, formerly Czech Telecom [5]), at least five nation-wide alternative operators offer their *optical fibre backbones* employing WDM technology with each wavelength carrying up to 10 Gb/s. The largest alternative operator in the Czech Republic is GTS Novera. It owns and operates a high-capacity DWDM transport network with a ring topology to which metropolitan area networks covering major cities in the Czech Republic are connected. Its fibre-optic backbone is laid mainly along the electric power distribution lines.

Two other alternative backbone operators are spin-offs of public utilities taking advantage of rights of way of their (former) mother companies. The Net4Net company [6] uses fibre links laid along the gas pipelines, the CDT (Ceske drahy telematika) company [**7**]) owns and operates optical fibre links along railway lines with radio relay extensions to its (wholesale) customers.

The Czech National Research and Education Network (NREN) CESNET 2 [8] operates a technologically very advanced multi-Gb/s optical fibre network. Apart from academic and research organizations it can serve governmental institutions and certain non-profit organisations.

There are about 20 *metropolitan area networks* in the Czech Republic, the major ones operating in Prague, Brno, Ostrava and Plzen.

Access networks

The access part of the telecommunication network consists mainly of twisted copper pairs, wireless links and CATV networks equipped with modems. The remaining technologies have a marginal share of the Czech broadband market.

The prevailing access technology in the Czech Republic is based on ADSL implemented on twisted copper pairs (TCP), 98.4% of them owned by the incumbent. ADSL services are offered at bit rates ranging from 512 to 5120 kb/s downstream and 128 to 512 kb/s upstream.

CATV access networks equipped with cable modems

Optical fibres have been deployed mainly by the two leading CATV operators - UPC Czech Republic and Karneval Media, converting some of their networks into Hybrid Fibre Coax (HFC) type. For the return channel the 5 to 45 MHz frequency band is used. The cable modems at the customers´ premises are, as a rule, of the EURODOCSIS standard and together with the CMTS equipment located at the Head End can provide broadband access to the Internet. The access bit rates range from 64 to 12 288 kb/s downstream and 32 to 2048 kb/s upstream.

Wireless solutions of broadband access to the Internet

Wireless cellular network utilizing *CDMA (Code Division Multiple Access) technology* for provisioning broadband access to the Internet is operated by Telefónica in the 450 MHz frequency band offering downstream bit rates ranging in practice between 200 and 600 kb/s upstream between 80 to 100 kb/s. 3G/UMTS networks are currently operated by two of the three mobile operators, but their coverage is still very limited. (mainly to the capital Prague). Telefónica operates a classical FDD-based UMTS network with HSDPA enhancement, while T-Mobile Czech Republic opted for a TDD-based data-only solution.

Broadband access based on IEEE 802.11 standards: The WiFi technology has been used in the unlicensed 2.4 GHz (according to IEEE 802.11b/g standard) and since mid 2005 also in the dedicated 5 GHz (according to IEEE 802.11a standard) frequency band to provide access to the Internet.

Two licences have been granted to operate the BFWA (*broadband fixed wireless access)* in the 3.5 GHz frequency band for nation-wide coverage and several tens of licences for covering specific regions.

Access to the Internet over *optical fibres (FTTx)* is provided since 2005 by a few companies. They offer access to the Internet through FTTx at speeds ranging between 256 kb/s and 10 Mb/s to SMEs as well as to households. In most cases, the last bits of the access lines are realized by other means than fibre.

Access to the Internet *via geostationary satellites* is offered by several companies providing down stream speed up to 3 200 kb/s.

At least two companies offer commercially broadband access to the Internet with the aid of power line communication systems.

State Policies and Regulation Affecting Broadband Development in the Czech Republic

National broadband strategy

The National Broadband Strategy of the CR was approved by the government on January 26th, 2005. It calls for connecting all state institutions, libraries and other public bodies to broadband Internet by the end of 2006 and at least 50% of the population by 2010. No financial incentives by the state were introduced, with the exception of special cases. A National Broadband Server, as a point of reference and source of information on broadband

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development and deployment in the Czech Republic was set up on May 31st, 2005 but was not filled with any valuable content yet.

A Broadband Forum as an advisory body to the Ministry of Informatics with members representing service providers, end-users, experts from public administration and academia and independent experts was established in May 2005. Its mission was to help the Ministry in updating its broadband policy, providing guidelines for filling the content of the National Broadband server and evaluating proposals of the projects submitted for financial support from the Broadband Fund. In January 2006 the Forum evaluated over 200 projects submitted to the Ministry to get financial support but it has not fulfilled the other tasks. In May 2006 it was dissolved by the Minister.

Funding of broadband projects

The National Broadband Strategy permits financial support from the state only in some special cases that are unattractive for private investment. Two main sources of public money for providing financial support to selected projects are assumed:

- Structural Funds and other EU Instruments: the European Regional Development Fund (ERDF) and projects like IDABC, eTEN and eContent Plus
- The (Czech) Broadband Fund: with rules for funding compatible with EU rules.

According to rules recommended by the Broadband Forum, three types of broadband projects were eligible for support from the Broadband Fund:

- Projects aiming at building broadband access and metropolitan area networks. The networks had to be owned by municipalities but be "open" to any service provider
- Projects that would result in generating e-content and providing e-services
- Projects promoting education, marketing e-services and logistic support.

Up to 70% of a project budget can be provided from the fund. But such support must not be used for generating profit nor constitute public support as defined by the National Competition Authority.

For 2006, the Czech government has provided approx. 7 million € for the Broadband Fund. In January 2006, 47 out of over 300 applicants were selected to receive funding. As shown in Table 1 preference was given to projects that promised to provide content, organize education and support marketing.

A controversial project submitted by Prague´s municipality that applied for (co)funding "free (wireless) municipal Internet" was rejected on the ground that Prague is attractive enough for private investors. Recently, the city of Prague successfully applied for support of the EU to provide wireless access to the Internet in some underserved areas of Prague where just some services are provided free.

An example of a project supported from different public resources is the ROWANet optical fibre backbone serving the Vysocina region [1]. ROWANet is being built in co-operation with private and academic partners and is funded by the regional authorities (50%), the EU (40%) and the state (10%). Apart from serving the public administration, the network provides services to public non-profit organizations (schools, libraries, public hospitals, etc.) for free or for a small regular contribution from these organizations towards OPEX expenses. ROWANet is a non-profit making partnership.

Table 1. Allocation of Grants to Projects Supported from the National Broadband fund.

Area	Number of projects	Total funding proposed [€]
Infrastructure	26	0.7 million
Content and services	12	3.3 million
Marketing, education and support	9	1.25 million

Regulatory bodies

There have been three bodies regulating the electronic communications sector in the Czech Republic:

1. Czech Telecommunication Office
2. Antimonopoly Office
3. Radio and Television Council.

The Ministry of Informatics prepares proposals for relevant legislation and strategic policy documents. The Ministry also represents the CR in EU bodies and international organizations.

The Czech Telecommunications Office (CTO) oversees the implementation of the Law on electronic communications, issues secondary legislation, co-ordinates utilization of the frequency spectrum, performs analysis of relevant markets, etc.

The role of Antimonopoly Office is to ensure that the market is not distorted by anticompetitive behaviour of subjects operating in any sector of the national economy.

Radio and Television Council regulates the content broadcast by radio and television companies and distributed by CATV operators.

Situation in the Czech Market of Broadband Access

The market conditions determined by legislation and regulation of wholesale local loop market affect the situation on the market that in turn reflects penetration of broadband access in the country.

Wholesale market

In compliance with the LLU (Local Loop Unbundling) rule, the incumbent offers ADSL connectivity on a wholesale basis to alternative providers of ADSL retail services. However, the market share of the incumbent of ADSL services is rising in the Czech Republic as opposed to the rest of the EU. Resale is the only viable option, but it gives the alternative ADSL service providers little chance to change the services which they resale. Neither ADSL interconnection nor Wholesale Line Rental (the resale of monthly subscription) exists on a commercial basis yet. The only available real alternative is LLU-based DSL but its penetration is still minimal, compared to the penetration of DSL lines by the incumbent (see Table 2).

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Table 2. Evolution of ADSL Market Share in the Czech Republic. (Source: CTO)

	2003	2004	1H2005	2005
Czech Telecom (self-supply)	60.97%	77.78%	76.69%	80.30%
New entrants (resale of incumbent's DSLs)	39.03 %	21.85%	21.75%	17.25%
LLU-based DSL	0 %	0.37 %	1.56 %	2.44 %

Retail market

Retail market is not regulated in the Czech Republic. Table 3 shows the overall number of broadband connections to the Internet estimated at the end of March 2006 and the share of access lines implemented by the particular technologies. The annual increase is 15.4%. However, official statistics by the CTO, and also by the UE, OECD and others, do not include Wi-Fi, CDMA, BFWA and "other" technologies".

Table 3. Estimated number of broadband access lines in the Czech Republic at the end of 1Q/2006

Technology/type of connection	**Estimated number of broadband access lines**
ADSL	352000
WiFi	200000
HFC/cable modems	176000
CDMA	78000
FTTx	9000
BFWA 3,5 GHz	6000
Other technologies	10000
Total	**831000**

There are about 40 providers of ADSL services in the CR. Most of them simply resale the incumbent's ADSL services. Only Czech On Line, GTS Novera and Radiokomunikace take advantage of LLU and offer ADSL services through their own DSLAMs.

Telefónica is the major provider of ADSL-based broadband access to end users. Out of the 352 000 registered ADSL subscribers about 340 000 ADSL lines have been realized provided by Telefónica (this number includes wholesale as well as retail services) and the remaining 12 000 were provided by Radiokomunikace, GTS Novera and Czech On Line over local loops unbundled by Telefónica or over their own infrastructure (GTS Novera). This corresponds to an increase by 23.5% since the end of 2005. Table 4 shows the development of ADSL-enabled access networks in the CR over the last 4 years to the end of 1Q/2006.

Table 4. Growth of the Number of ADSL Lines in the Czech Republic over the last 4 years

(End of) year	2002	2003	2004	2005	31.3.06
ADSL lines	0	16000	100000	285000	352000

On February 1, 2006 the incumbent substantially increased the connection speed over its ADSL lines without increasing the prices for the connection. Development of prices over the last 3 years for ADSL connection provided by the incumbent is shown in Fig. 1.

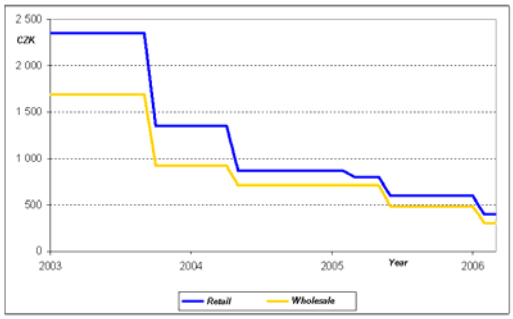

Figure 1. Development of monthly retail and wholesale rates charged by Czech Telecom over the last three years for 512/128 kb/s ADSL lines with 1:50 aggregation. (1 € = cca 28 CZK).
Source: Czech Telecomunications Office [2].

The *CATV sector* in the Czech Republic is still very fragmented. At the end of 2005 there were two major players - UPC Czech Republic and Karneval Media holding about 75% of the CATV market, and over 120 companies out of which 34 offered access to the Internet over their networks. CATV penetration of the Czech households is about 30%. Broadband connections to the Internet via the CATV networks in the CR increased by 18.9% compared with the end of 2005.

Wireless access, though not officially regarded as broadband, plays a significant role in the CR (see Table 3). The number of customers of the Eurotel Data Expres service provided by Telefónica based on CDMA technology has increased by about 11.4% since the end of 2005. There are about 600 commercial and community wireless networks based on the *802.11 family of standards WiFi)* providing the service to the public or private users. In addition, about 800 utility companies provide free access to the Internet via their WiFi networks (restaurants, shopping centres, petrol stations, etc.). Altogether, there are about 10 000 public WiFi access points (hot spots) in operation in the CR now. Broadband access to the Internet utilizing *BFWA 3.5 GHz technology* is provided by circa 35 companies via about 300 access points.

No data are available on how the estimated 9000 *FTTx broadband access* connections are shared by the individual FTTx providers. In most cases, fibre is brought to the building (multiple dwelling units).

The *"other technologies"* in Table 3 include access to the Internet *via satellites* provided by at least 12 companies serving 2 to 5 thousand customers, *SHDSL, BFWA at 26*

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and 28 GHz, UMTS and access over electrical power lines (*PLC*) offered by Digitline [3] and SOFTEX NCP [4].

65.1% of the overall number of broadband access lines have been realized over cable infrastructure (xDSL, HFC/CATV), the remaining 34.9% used radio links. Fig. 2 shows the share of the individual technologies of the Czech broadband access market: ADSL accounts for 42.6%, WiFi for 24.1%, cable modems for 21.2% and CDMA for 9.3%. The remaining 2.8% is attributed to other technologies.

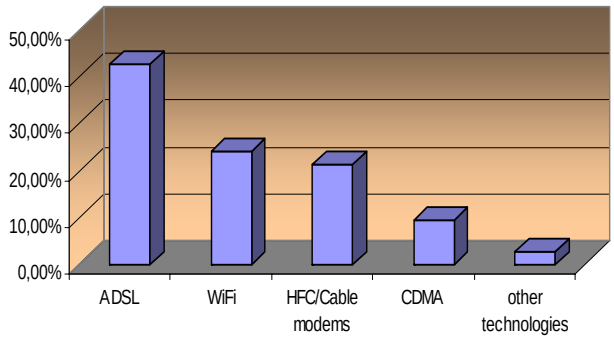

Figure 2. Share of individual technologies in the broadband access market in the Czech Republic

In 1st Q. of 2006, 95.9% of towns and villages with their own administration (hereby called "municipalities") were served by ADSL-enabled central offices, 93.8 were covered by WiFi hot spots, 64.2% by CDMA networks, in 30.9% of the municipalities FWA was available, in 20.6% of them the access to the Internet over CATV network was on offer (CATV is available in 55.9% Czech municipalities). Table 5 compares these numbers for years 2005 and 2006.

Table 5. Comparison of availability of broadband access by using various technologies in Czech municipalities

Technology/ type of access	**Availability as of 30.9.2005**	**Availability as of 31.3.2006**
ADSL	92,5%	95,9%
WIFI	92,0%	93,8%
CDMA	63.7%	64.2%
HFC/CABLE MODEMS (CATV)	18.8% (52.8%)	20.6% (55.9%)
BFWA 3,5 GHZ	26.3%	30.9%

What Hinders Faster Development of Broadband in the Czech Republic?

ADSL on twisted copper pairs is, and in the foreseeable future will remain, the dominant means in the Czech Republic for realizing true broadband access of end users to the Internet. Therefore, it is vital for the regulator to ensure that this resource is used to the maximum. By properly regulating the wholesale market of ADSL it has to create competitive environment so that the alternative operators have a chance to succeed in the retail market. The following issues will have to be addressed:

- too high ADSL market share of the incumbent
- pure resale of the incumbent's ADSL services by the alternative operators
- bit stream and ADSL interconnection are not available
- specific volume limits on data that the user can download and/or upload imposed by the incumbent in its offer of the wholesale DSL services
- the effective speed is often much lower than 80% of the nominal speed (requested by the National broadband strategy)
- the "naked DSL" service, i.e., without having to pay a fixed charge for renting the line, is not available
- Security of using e-services especially for financial transactions, e-government, e-health, etc.
- Unclear situation concerning the obligation to unbundle optical fibre access lines
- Still high price for broadband access with respect to the purchasing power of average Czech citizen
- Education of population to use computers and access the Internet.

Conclusions

To get broadband to the home is a complex process requiring continuous attention and effort by the authorities at all levels and of the regulators. They must adopt consistent policies in order to create the right competitive environment. The existing Law on electronic communication has to be refined, the regulator still has to complete analyses of the relevant markets and take appropriate regulatory measures.

At the same time, other measures have to be taken that would stimulate the demand for broadband: extend the scope of e-services that enable online communication of citizens with the state institutions, organize education and training in using the Internet and set up clear rules for private public partnerships.

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References

1. www.rowanet.cz
2. www.ctu.cz/main.php?pageid=2
3. www.digitline.cz
4. www.cisnet.cz.
5. www.telecom.cz/web/cz/home/index.html
6. www.net4net.cz
7. www.cdt.cz
8. www.cesnet.cz
9. CSO Authors Team, "Czech information society in numbers", *Convergence*, No. 11/2005, pp. 4-9,
10. J. Slavik, J. Luxemburk and A. Hrstka, J., "High-speed access to electronic communications services", TESTCOM Praha, Research Report 2006-03v2 (in Czech).