

## Chapter 12

# Best Practices in Designing Low-Cost Community Wireless Networks

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### ABSTRACT

*The Czech Republic (CR) has been ranked the 1st among the countries of the European Union (EU) countries in the growth rate of broadband access. The Internet penetration rate has increased by 48 percent between 2005 and 2011. This high growth rate is driven by the entry of new operators and the proliferation of Community Wireless Networks (CWNs). The CR holds the first place in EU in the number of newly entered operators. There are 1150 companies providing Internet access in 601 Czech towns and 5645 villages. In addition, a number of community wireless networks have emerged as an alternative of these commercial Internet Service Providers (ISPs). Their main purpose is to increase the affordability and penetration of broadband Internet in the country. This chapter discusses the contribution of CWNs to the proliferation and affordability of broadband access in the CR, focusing on the reasons for their success and popularity. Their key success factors include obtaining a non-profit status, engaging academics, and cooperating with government entities. They formed the CZFree.net forum for experts and volunteers to exchange information and best practices with respect to new technologies, design considerations, and technical and social issues. It also articulates on technology options and best practices for building low-cost CWNs. Furthermore, the chapter discusses the role of the Netural czFree eXchange association in aggregating their technical, financial, and personal resources of individual CWNs. Thanks to this association and the CZFree.net forum, CWNs in the CR have become influential competitors in the local telecommunication industry.*

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## **BACKGROUND**

The Czech Republic (CR) is currently ranked the 1<sup>st</sup> among all the 27 EU countries in the growth rate of broadband access (Eurostat, 2012). The number of Czech households with Internet connection has risen by 48 percent (from 19 to 67) in the period between 2005 and 2011. In addition, the number of households with broadband connection has increased by 58 percent (from 5 to 63) in the same period. Most of the growth is driven by the entry of new operators that have dominated about 67 percent of the fixed broadband market (European Commission, 2012). However, the most unique aspect of the CR case is its long-term leadership in the provision of Wireless Local Loops (WLL). In 2009, 50 percent of the 1.3 million WLL fixed broadband lines installed in the whole 27 EU countries was in the CR (European Commission, 2010a), although its 10 million citizens represent only 2 percent of the EU population.

As in many other countries, the Internet in the CR has begun as an academic initiative (Kirstein, 2004). The academic Internet access has been started officially in February 1992 (CESNET, 2012). In the following few years, all major Czech universities had been connected for the purpose of providing Internet access in their campuses for their students and employees. In 1996, these academic networks were covered by a newly formed legal association called CESNET. Around that time, students could use the Internet also in some dormitories. In addition, they could use a dial-up connection to access their university networks from home. However, the latter option was very expensive if long-distance connections had to be used.

The first commercial Internet in the CR was provided by COnet in 1994. However, their services could not be offered openly because of the monopoly license of Eurotel, which controlled the provision of data services. Eurotel was a joint venture company owned by the ex-state driven company SPT Telecom and the American joint

venture Atlantic West (Smithfarm, Lemmio, Jklamo, & Voženílek, 2011).

State guaranteed monopoly has major negative impacts and the situation in CR was a typical example. This is because when COnet and CESNET had started their commercial Internet offerings, Eurotel was not providing *any* Internet access services (Peterka, 2001), only the voice tariffs on its NMT mobile network. Therefore, the Internet was mostly locked inside the academic walls until 1995. Afterward, the monopoly for data services was terminated when SPT Telecom purchased NexTel, which was the data division of Eurotel (Peterka, 2001).

Since then, commercial ISPs have started to enter the market. In 1998, there were more than 150 ISPs (Peterka, 2001). Typical small ISPs of that time used the Plain Old Telephone Service (POTS) and the Integrated Services Digital Network (ISDN) modems for both uplink and last-mile connections, as the e-carrier leased lines were very expensive. However, there were already reasonably priced P2P microwave links produced by several Czech companies. These links could be used for building larger network backbones without the burden of leasing lines.

The last-mile ISDN dial-up connection was not affordable for most households because of the high price of phone services. Phone services were suffering monopoly as well. In the 1995-1999 era, the Czech households did not have viable or affordable connectivity alternatives. In particular, the P2P microwave links were too expensive and the 10/100 Mbit/s Ethernet had short range. Cheap fiber optic technologies emerged many years later.

The situation in 1998 was such that the Internet was already perceived as a standard service in many Czech companies. Yet, households were still dependent on dial-up connections that could not be used for long periods because of the old charging schemes, which were adequate for voice calls but expensive for Internet connections.

This caused permanent frustration among Internet users, who blamed the government for

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