



Recommendations for cheap and fast local broadband access as a tool of regional development

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1. Introduction - Importance of Broadband

A Layman's understanding of Broadband is that it is necessary or at least desirable for internet access, mainly for email and web browsing.

In reality, Broadband is a high speed digital access medium to any communications service, and will certainly be the predominant access technology for the foreseeable future.

This quite global aspect is often overlooked by private users and businesses within the discussion of a newer and faster access possibility. A direct result of this aspect is the demand to accept broadband internet access as a basic supply such as water, electricity, mobility infrastructure. This demand has evolved from a recommendation and has been formulated for some time now.

As the size of attachments to emails grows and contents of websites become more elaborate by using more resource consuming tools and services, the alternative to broadband, the slower and first access technology to the internet, dial up access, is at the point of becoming impractical. ISDN connections, an early form of digital services which provides faster yet still limited connection to customers (and thus a de facto digital performance benchmark) is in the process of becoming insufficient.

This means that where broadband is unavailable, internet access for the most basic use is likely to become essentially impossible. In effect it means cutting of existing internet users dependent on dial up access and leaving those with slow/ first generation digital connections far behind.

1.1. Definition of Broadband – what does “fast” mean?

There is not just one definition of Broadband. For one thing broadband is defined by a number of organizations using a variety of qualitative and/or quantitative descriptions and parameters.

The most understanding of broadband is that it is a “fast” internet connection, with twice to several times faster connection rates than above mentioned first generation dial up access¹. This implies data transfer rates of at least 112 Kilobit per second (Kbps) up to several Megabit per second (Mbps).

What makes a definition more difficult is that broadband technology has been evolving rather quickly over the last years and will continue to do so in the foreseeable future. This is driven by increasing demands which push new and faster offers which in turn set new standards and influence the demand. Definitions become easily outdated or obsolete due to this rapid evolution.

¹ Data transmission rate of dial up: 56.000 bit per second



Still, a common definition is necessary in order to prevent basic infrastructure bottlenecks - especially in regions which regard international and transnational cooperation as highly important, such as the European Union or the North Sea Region.

One solution is to give a general descriptive definition of broadband, such as can be found in the Cambridge dictionary:

“A system that enables many messages or large amounts of information to be sent at the same time and very quickly between computers or other electronic devices”.²

Another solution, and more appropriate when trying to define “fast”, is to define a specific speed and either rework this definition regularly or to combine the definition with a schedule. The BIRD project’s Think Tank chose the latter and gave a combined definition of quantitative parameters and a schedule in two steps³:

1.2. Recommendation for a definition of Broadband

After experience exchanges, discussions and reasonable extrapolation the BIRD projects Think Tank recommends the following common definition of broadband:

“**Step 1-** to be completed before 2010:

1. Broadband internet connection must become a basic supply.
2. The connection has to be a flat rate for time and capacity.
3. Until 2010 a connection speed of 2 Mbps (Megabit per second) up- and downstream has to be available for every end user.
4. The latency period has to be low.

The specific reason to suggest this in the first step is that everyone should be able to use applications included in the so called “triple play”, in a streamlined version. Usually, triple play means internet, telephone and IP TV. We agreed to reduce IP TV in the beginning to video phoning and video conferences. Excluding IP TV (equal to HD or SD standards), a connection of 2 Mbps appears to be sufficient for most households.

Step 2- to be completed until 2015:

In the second step, the definition of IP TV will be defined as it will be commonly used in the year 2015: High Definition Television (HD IP TV). To be able receive more than one HD IP TV channel the Think Tank members agreed to broaden the definition with a supplement:

5. Until 2015 a connection speed of at least 100 Mbps”

² <http://dictionary.cambridge.org/>

³ [BIRD project; A new definition of Broadband 2008, www.bird-project.eu]



This definition should serve as a common European standard and development goal. Its implementation would provide the benefits which are offered by fast internet connections to each EU citizen. With every citizen being capable of accessing and using the internet fast would in turn allow new quality of communication and participation.

1.3. *Broadband in the context of regional development*

The internet and information and communication technologies (ICT) are the current step in the evolution of technologies and infrastructures such as rail, road, electricity and first generation telecommunications. The adoption of each of these new technologies and infrastructures into our daily life has in turn boosted our capacity and capability development immensely.

Broadband access is now the basic precondition to use internet infrastructure effectively and to unlock its potentials for the development of single businesses, communities and regions. The capability to access, process and transport any information in digital format around the clock and around the globe is the engine of economies that rely increasingly on the intangible assets of knowledge and information. Sharing and analyzing information in real time allows for more efficient conduct of administrations, businesses and individual affairs. It has become a critical factor for the competitiveness of most enterprises⁴.

In other words, broadband technologies offer a transformational approach to the delivery of existing and new communications services, with lower costs and a wider choice of services than can be provided with traditional technologies.

Typical emerging and further applications⁵ for broadband technology, beyond email and internet browsing are:

- Voice over Internet Protocol (VoIP) – very low cost national and international telephone calls that largely bypass the current telephone networks.
- Video and audio conferencing – very low cost compared to traditional services
- Remote medical diagnostics – video access to medical imaging, in combination with the prior two services also advanced remote medic-patient contacts
- Shared resources between Councils, software applications, Wide Area Networks
- Remote education – provision of expert teaching resources to locations that lack similar resources
- Virtual Private Networks (VPNs) - will replace costly dedicated data links with physical wires by using (virtual) resources of larger networks

⁴ [following: Broadband definition - milestone 1, January 2007; www.ebop.govt.nz/Broadband-Initiative.asp]

⁵ Definitions of the following services can be found under: www.broadband-europe.eu/Pages/GlossaryList.aspx



- Video on demand – download video content for immediate or delayed viewing
- Internet Protocol Television (IPTV) and High definition TV (HDTV) with a new level of quality– will eventually replace coaxial or satellite delivered pay TV.

Some, if not all of these applications will be an increasing part of regional development with impacts on all three dimensions of regional development: economic, social and ecological. Furthermore is important to point out the opportunities that broadband technologies yield for many rural or declining industrial regions. It is the chance to break the “vicious circle” of diminishing and ageing population, as well as declining availability and quality of commercial and public services. (As younger or still mobile generations may need or want to leave for jobs in metropolitan/growth areas, there are fewer consumers and taxpayers left to maintain the level of public and commercial services. In turn, the region loses its attractiveness and more people feel tempted to leave.)

Services which are built upon broadband infrastructure can both, keep enterprises competitive and help in providing public services for citizens at lower cost. Enterprises can optimize their management and production and reach their markets from a distance. Employees can (potentially) work efficiently from remote locations of their choice, using e-mail and mobile phones, thus having more flexibility to reconcile their family and working lives. And carefully planned userfriendly e-Services in local government, education and health care can help to maintain service levels.

2. Provision of cheap Broadband

The main difference between metropolitan and rural areas when it comes to the provision of broadband networks is that there is much more competition which results in more offers and lower prices in the first than in the latter.

On the one hand the basis of broadband networks and broadband access is dependent on technical possibilities. There already exist a number of technical solutions which can be applied to individual situations with the main distinction being between wire (e.g. DSL - Digital Subscriber Line) and wireless (e.g. WIMAX - Worldwide Interoperability for Microwave Access) solutions. New ones evolve from existing products or are being developed completely anew. A description of these technical solutions would exceed the content of this report.

Instead the interested reader is directed to the project’s website www.bird-project.eu and to more comprehensive and ongoing sites such as www.broadband-europe.eu and also www.epractice.eu .

On the other hand present and future needs (as depicted in the introduction and the broadband definition of this report) and effective as well as cost efficient solutions have to be considered. Especially in sparsely populated rural areas where it may not



pay off for private providers to establish a network there may be a need for public – private partnerships (see: recommendations - local level).

However, broadband access and connection will always be compared to other available solutions. It is quite probable that rural conditions will continuously lag behind metropolitan ones. It will be the task of planners and decision makers in these areas so keep the difference so small as not to fail the aim of 100% broadband coverage according to a current and commonly accepted definition.

2.1. Practice example: the WIMAX wireless network in the county of Värmland/ Sweden

Summary⁶:

For two years, the County of Värmland (273.511 inhabitants and 17.583 km²) has actively been working to support the development of modern and advanced broadband infrastructure to allow all citizens to have broadband access to internet. Different technologies have been used, but the traditional xDSL technology had not been possible to implement to everyone in the county due to the rural nature of large parts of the county and the high costs associated with expanding the xDSL network. In November 2006 the county of Värmland decided that *Nordisk Mobiltelefon* were to supply broadband internet access using the CDMA450 mobile network technology. The advanced CDMA450 network is based on the American 3G technology CDMA2000 and combined with the low frequency, 450 MHz, provides a superior coverage in large rural areas.

The County of Värmland offer today broadband access to the internet everywhere and to all citizens in the whole County of Värmland (geographical area). This is unique in Sweden and probably in Europe since it is the first region ever to actually achieve the vision that all people shall have broadband access to the internet, allowing all people to take an active part in the new IT society.

Details of roll-out

The roll-out in Värmland started in December 2006 and after six months the whole geographical area was covered.

By using existing infrastructure and without building a single new site the deployment was very fast and since mid- 2007 broadband access is available in the whole of the County of Värmland. It was the first time this was achieved in Sweden. One of the key challenges of building a cost-effective and reliable network was the construction of an access and backbone transmission for connecting the base stations. This was done on a rental basis using mainly *Teracom's* access and

⁶ (taken from/ full text available under: [CDMA450 - a low frequency radio based broadband solution in Värmland](http://www.bird-project.eu/best_practices) ; www.bird-project.eu/best_practices)

backbone network which provides a stable and secure connection back to the switch site located in Stockholm.

It is important to point out that the bandwidth in the CDMA 450 network is dependent on the distance to the base station, but it is the only solution that delivers bandwidth of more than 0.5 Mbps in combination with coverage throughout the whole region.

Coverage

Nordisk Mobiltelefon had chosen to offer all municipalities in Värmland coverage because it was more cost-effective than covering single municipalities. A great advantage of the CDMA 450 frequency is the possibility to provide a good service where people live and work. In many cases it is very difficult to justify fixed line cables from the telephone exchange to the customer both economical and technical since the distance might give the DSL service poor performance. In these cases, the CDMA 450 is a superior solution which offers coverage everywhere and also allows people to bring their data modems both to summer houses, on their travels and in Norway and still have good broadband access.

3. Recommendations

Following the recommendations collected during BIRD's project lifetime and deducted from project outputs shall be listed. It is important to bring to mind that there are different levels which have different means of influence.

These are the local level (ranging from municipalities up to about county size), the regional level (from [several] counties to federal state level) and the level of the North Sea Region. The last is the BIRD specific example of a transnational level or a macro-region which is composed of several cooperating countries.

BIRD has also produced recommendations leaflets for these three levels on

- how to implement broadband infrastructure and access
- how to increase broadband use on the respective level

The recommendation flyers can be downloaded from the project website in English and in locally translated versions (North Sea Region only) at: www.bird-project.eu⁷ Naturally the recommendations given in this document can partly be found in said leaflets as well.

It is also important to distinguish between rural and metropolitan areas. Both types have uses for broadband as tool of regional development.

More densely populated areas benefit from more human resources, diversity and critical mass which more or less automatically provide new services, applications and demands. The focus here is to choose intelligently with respect to usefulness.

⁷ <http://www.bird-project.eu/index.php?id=56&L=1> (project outputs)



Generally there is competition between providers which results in competitive pricing to the benefit of customers.

Rural areas suffer from low population density. Fewer people means less human capital in the fields of development demand and application and it also means fewer customers to providers. Longer distances between customers push prices for connection while average incomes in rural areas are lower than those in metropolitan areas. These factors result in little or no provider competition and higher supply prices. In some regions these factors mount up to no broadband coverage at all.

3.1. The local level

Local and regional authorities and administration are key players when it comes to reaching the aim of 100% broadband coverage. That's because they are part of the local demand and have the resources to analyze the requirements of infrastructure and to understand the local needs. Furthermore, as broadband is a basic infrastructure such as electricity, water, etc. it is a task of the public sector to ensure its availability to each citizen. This can be the encouragement of the private sector to invest in under-served areas. But if necessary, local authorities should make their own infrastructural investments.

In the face of limited resources it is important to make efficient use of planning as well as internet implementation. Therefore and because underdeveloped regions cannot be competitive without (access to) Internet-Communication-Technologies (ICT) not only obviously disadvantaged regions need to adopt an active (ICT) policy. For setting up a strategy it is strongly recommended to look at least 5 years ahead and to not only react to current trends and options. A strategy must include a down-to-earth analysis of current conditions and developments (SWOT) and should be completed by a vision and realistic goals.

There are a number of possibilities for the public to provide broadband locally which should also be included in an ICT policy. The different broadband deployment models that can serve as a framework for public sector involvement in broadband projects need to be carefully evaluated in the context of the specific regional characteristics. Following models are possible⁸:

- **Community network model**, where the local community builds, owns and operates everything from the passive infrastructure (trenches, ducts, etc) to the broadband network and the services provided to end-users.

⁸ [Guide to Regional Broadband Development, 1st edition; eris@ the European Regional Information Society Association; www.broadband-europe.eu]

- **Carriers' carrier model**, where the local community builds and operates the infrastructure and equips it with a broadband network to sell wholesale capacity to commercial service providers who serve the end-user.
- **Passive infrastructure model**, where the local community builds the passive infrastructure (trenches, ducts, etc), which is then transferred as a concession to an independent third party in charge of leasing all or parts of the infrastructure to commercial service providers who install and operate their own network and services.
- Different forms and degrees of “**demand aggregation**” to reach the critical mass of users and traffic required to guarantee revenue streams, justify investment in broadband, and secure viable project business plans,
- Establishment and promotion of “**fibre condominiums**” to help in the financing of drop links from optical fibre networks to the end-user.

Further recommendations for the local level include:

- e-Education/ e-Learning:
ICT technologies unfold their capacities only with capable users. Therefore it should be a policy goal that virtually every individual in a county acquires good IT skills. This includes the education of beginners in the use of ICT by offering educational courses and cooperation with schools, colleges, etc. Special target groups are elderly people, people with low education background and underprivileged in terms of income. It also includes training or educating system administrators because there is a need for additional knowledge or even specialists for the installation and improvement of services without high costs. With the help of broadband and new technology it is possible to design flexible education in the form of co-ordinated distance education.
- e-Collaboration:
There should be cooperation between all municipalities in a county on the topic of IT services. E.g. cooperation on joint purchases, system administration and resource centre's for various shared systems.
- e-Government:
Make use of the gains in efficiency that ICT offers and strive towards co-operation. Work towards making it possible for local citizens and businesses to obtain clear insight into the handling of cases and to give everyone the same high level of quality as regards to the handling of cases, regardless of conditions and where in the country one may live. Work towards making the inhabitants of the municipality/ region to use IT and the e-Services on offer in the county to a greater degree.

3.2. Regional to international level

During the BIRD project it has become clear that there are clear differences between national broadband definitions and standards and approaches to broadband implementation. Overcoming these differences or closing the gaps is an essential part of the European Union process.

There are two main fields of action on the regional and the international level:

- (1) The adoption of a common definition of broadband and respective implementation goals or a harmonization with the European level.
- (2) The setting of favourable frame conditions for both effective and efficient local implementations. There are a number of actions and technical possibilities to meet individual situations.

In accordance with the recommendations to the local level this includes:

- To follow the aim of 100% broadband coverage according to the common definition of Broadband
- To form an environment for the education of beginners in the use of ICT such as elderly people, people with low education background, underprivileged in terms of income
- To form an environment for the training/ the education of system administrators

3.3. Concluding recommendations

Despite an optimistic view on technology development – a comparison in terms of broadband coverage and available transfer rates between today's situation and that of the turn of the millennium automatically leads to quite a vision of the situation in 2015 - it may be important to recommend an emphasis on efficiency especially for the rural areas.

On the one hand do server parks and broadband use in general tend to be very energy consuming. This affects both global climate and local financial budgets. Therefore the necessity to deal with comparatively lower bandwidth rates can prove a virtue in terms of local cost saving and CO₂ savings in rural areas. On the other hand an uncritical focus on bandwidth use as success criteria could possibly broaden the broadband gap between metropolitan and rural areas instead of narrowing it. It would lead to the development of quick and not efficiency optimized applications coming from already high speed environments. This would leave the part of the population in areas with insufficient bandwidth marginalised.

A last recommendation is to stress another qualitative rather than a quantitative aspect. The main objective for ICT-development policies as well as for the introduction and use of e-services should be "Towards a sustainable information society for all."

This implies an accessible information society with a modern infrastructure and IT services of public benefit. So as to simplify everyday life and give women and men, young and old people, disadvantaged and disabled in every part of the country a better quality of life.

