

Business Models for Broadband Municipal Optical Networks: A Proposed Model for the Greek Case

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Abstract

This paper proposes a business model for the successful operation of the currently developing broadband metropolitan area networks in Greece. Having recorded and examined relevant international practices, we describe in detail the way that these networks should be managed, operated, maintained and expanded. Taking into consideration that these infrastructures will alter the broadband map of Greece widely, that Greece currently has one of the lowest broadband penetration percentages in Europe and that the proper exploitation of the networks to be deployed could boost the demand for broadband connections and applications, the proposition of the business model appears to be of vital importance. We present the proposed business model in detail including information regarding network management and network expansion of the broadband metropolitan networks and viability issues regarding the authority which will manage the broadband metropolitan networks.

1. Introduction

On 1st June 2005, the European Commission (EC) adopted the “i2010: European Information Society 2010” initiative, in order to foster growth and jobs in the information society and media industries [3]. i2010 is a comprehensive strategy for modernizing and deploying European Union’s policy instruments in order to encourage the development of digital economy.

Greece will attain the targets of the aforementioned initiative through the implementation of the Operational Program “Information Society” (<http://www.infosoc.gr>). Following the relevant Action Line of this program, granted actions have been approved for the development of local access network infrastructures and advanced telecommunications services for the citizens (Call 93). The aim of the proposed broadband infrastructures is to develop local access networks in small towns and non-urban or remote areas, in order to provide a broad range of basic telecommunication services. The development strategy will be applied on regional level and take into account the physical particulars, the foreseeable social, economic and population developments, as well as the existing telecommunication infrastructure.

Similar broadband metropolitan networks have been developed in various parts of the globe; indicatively, we mention Ireland, Sweden, USA, New Zealand, Canada, France and the Netherlands. Pioneer countries like Ireland and Sweden present successful examples on how broadband infrastructure can reinforce the local economy and boost development.

However, several questions, regarding the proper business model that should be applied in the case of the currently developing, Greek broadband metropolitan area networks are raised; what will be the role of each Municipality, what will be the degree of government interventionism, how is healthy competition going to be promoted, how is the network’s viability going to be ensured, etc..

In order to provide realistic answers to the aforementioned questions, our paper:

- Presents the status of broadband infrastructure in Greece and examines a general business model for the operation of this infrastructure.
- Records international experience on business models concerning exploitation of broadband infrastructure.
- Propose several competing business models and designate, through comparative analysis, the most appropriate one for application in the Greek case.

2. Status of Broadband Infrastructure in Greece

The development of broadband access in Greece has not followed the same growth rate as in the most European countries [6]. This is due to several reasons.

Firstly, the potential market of broadband services in Greece is small. Recent studies [4], [8], [2] which concern either small and medium-sized enterprises (SME) in Greece or Greek households have shown low percentages in personal computers (PC) and Internet possession. The only encouraging outcome of such studies is the increase rates in both PC and Internet users' penetration; thus, an improvement of the current situation is hopefully going to be anticipated soon.

Secondly, the country's remote areas are the least developed ones, and the ones facing the most intense technological exclusion. Long local loops are needed for many Greek areas, mainly rural ones, due to the country's geography (as compared to much shorter distances required in urban areas). This fact leads to a dramatic increase in the broadband networks development costs and that, in combination with the low anticipated demand in these areas, results in limited, relevant new investments [1].

Taking the above into consideration, granted actions have been announced by the Operational Program "Information Society" for the development of local access network infrastructure and advanced telecommunications services for the citizen. Part of these actions concerns the development of broadband (fiber optics based) municipal metropolitan area networks (MAN) in small towns and non-urban or remote areas, through a relevant program known as "Call 93". The aim of this Call, apart from the infrastructures deployment, is to grant the ability of providing a broad range of basic telecommunication services, as well as to propose a relevant business model for the successful MANs' operation. This business model will take into account the possibility of providing bandwidth to the telecommunication providers in cost-based prices, so as to cover operational and maintenance costs of the infrastructures. 69 local networks will be implemented

throughout Greece, exhibiting 58 M€ total cost and 740 Km total length.

Several cases regarding the development of broadband access networks from different parts of the world with emphasis to the broadband business models that have been implemented and are now followed can be found. The selection of the appropriate business model is not an easy issue and the various particularities of the case under study have to be taken into consideration. Indicative case are the following: The Irish development model, the case of Stockholm in Sweden, the case of Amsterdam in the Netherlands, the case of Vienna in Austria, the case of Catalonia in Spain, the case of Canada and the case of the city of Wellington (New Zealand).

3. Broadband Business Models

In our case, a business model determines the way in which the exploitation of a metropolitan, community-owned, optical network will be effectuated. Additionally, it determines the role of the municipality and the region, the way healthy competition is going to be promoted, the degree of involvement of the private sector etc. The business model aims to ensure the viability of the metropolitan community-owned optical network and to secure the resources for its conservation and expansion, while, in the same time, it aims to promote competition for offering better and cheaper services to the citizen [5].

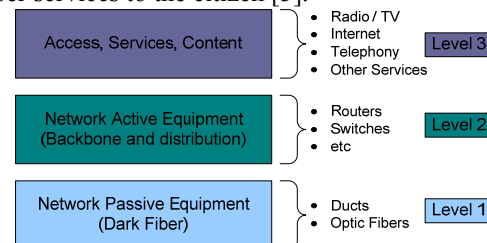


Table 1: The basic levels of a business model

Table 1 presents the three basic levels of a relevant business model:

- The first level determines who (a private or public enterprise, etc.) exploits the network's passive equipment (channels, optical fibers etc.).
- The second level determines who provides and exploits the active equipment of the network (routers etc.).
- The third level determines who offers access to the network, the services and the content.

Broadband metropolitan networks have been developed in municipalities along different parts of the globe. Pioneer countries, such as Ireland and Sweden, present successful examples of how broadband

infrastructures can reinforce the local economy and contribute in further development. International experience records various business models [7] on broadband infrastructures exploitation, and a few indicative ones are mentioned in the following paragraphs:

- Demand aggregation model: This model regards coordinate efforts, exerted by regional carriers, and aiming at aggregating broadband services' demand. The regional carrier presents the aggregated demand as an attractive clientele basis to the service suppliers, with whom it negotiates the overall purchase of broadband services and the percentage ownership upon the infrastructure.
- Open access/wholesale provider model: According to this model, regional carriers and local communities, usually co-operating with an independent infrastructure provider who offers wholesale prices (as a public utility service, in principle), develop the fundamental broadband infrastructures (trenches, conduits, subterranean or aerial cables), based on the foreseen general needs (similar to the case of roads and sewerage works).
- Community-owned network with service provision model: Regional carriers and local communities, usually co-operating with a local service supplier, or acting as broadband network service suppliers themselves, develop the fundamental broadband infrastructures and provide network wholesale or retail services, investing the relevant profits on expanding the infrastructures.

4. Rationale for the selection of a suitable business model for Greek MANs

In the case of Greece, the network's passive equipment (Level 1 - Table 1) will be public. It is appealing to let the competition act (more than one player) in the two upper levels of Table 1 (active equipment and services). There are three alternatives concerning who will manage, maintain, exploit and expand the passive infrastructures:

1. Municipal enterprises (where the business model will be applied to Municipality/Community level)
2. Enterprises per Region (where the business model will be applied to Region level)
3. Nationwide enterprise (where the business model will be applied to the whole country)

Concerning the second level (Table 1), anyone will be able to lease the network's passive part, install its active equipment and sell bandwidth. Finally, on the third level, action will be taken by multiple service

suppliers, competing to offer broadband services to the users.

The three alternatives are depicted schematically in Table 2.

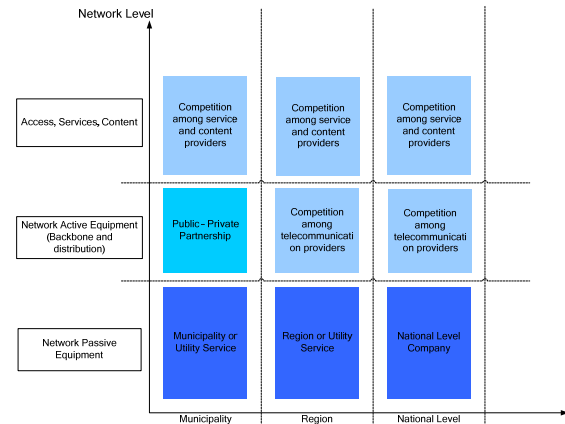


Table 2 Business model scenarios for Greece

4.1. Municipality level

An obvious disadvantage of this alternative is the foreseen difficulty in interconnecting the optical MANs to each other. Each Municipality will be responsible for its own passive network, so (a) different policies will be adopted for each MAN, (b) there will be no planning for interconnecting these MANs to each other and (c) there will be no provisioning for connecting the MANs to other broadband networks, currently being developed throughout Greece.

These three points will make these networks less attractive to the telecommunication providers, since they will offer the capability of exploiting them only to a municipal level. Additionally, it should be stressed that the creation of municipal networks may lead to financial failure, as it is not always possible to ensure direct profits from their usage in the municipality level. Research reports state that a large investment in passive equipment may need 5-7 years, after the completion of the implementation of the whole network, before achieving ROI (Return On Investment)

4.2. Regional level

This alternative presents also the interconnection/connection problems, as in the Municipality case, but instead in the regional level. It is however more advantageous than the previous one, since a number of networks will be managed by a single authority, while the networks in less competitive areas (always within the same Region) will be

supported by the operation of the most competitive ones (in the same Region).

4.3. Nationwide level

According to this alternative, a single national authority (namely Greek Broadband Company SA - GBC SA) will be established, being responsible for managing, maintaining, exploiting and expanding the passive infrastructures throughout the whole country.

Compared to the two previous business models (municipality and regional level), this one presents obvious advantages:

GBC will be able to design (a) networks expansion within the Municipalities, (b) connection of MANs to each other, and (c) connection of MANs to other broadband networks.

Less competitive Municipalities will be able to expand their networks as well, since management will be central and part of the resources from other, competitive Municipalities may be used.

The telecommunication providers (Table 1-Level 2) will lease the passive infrastructures from GBC, offered a common pricing policy (cost based) for every Municipal network. In this way, pricing, as well as all relevant procedures will be simpler for all parts.

The service providers (Table 1- Level 3) may offer their services, potentially, in national level, having the ability to reduce their prices.

Everybody will benefit from other participants' success; therefore everybody will turn the wheel towards the same direction.

5. Proposed Business Model

As result of the above comparison the most appealing business model for Greece is the national level company (for the remaining of this paper, this company will be referred as GBC – Greek Broadband Company). The financial and operational aspects of this business model are analyzed in more detail in the following paragraphs.

As depicted in Table 3, competition exists among private companies in the two upper levels (services and active equipment), while the GBC is responsible only for the first level (passive equipment).

Table 4 presents briefly the proposed business model, showing the relevant stakeholders, roles, costs (Capital Expense - CAPEX and Operation Expense - OPEX) and the revenues in each layer (services, active network equipment and passive network equipment).

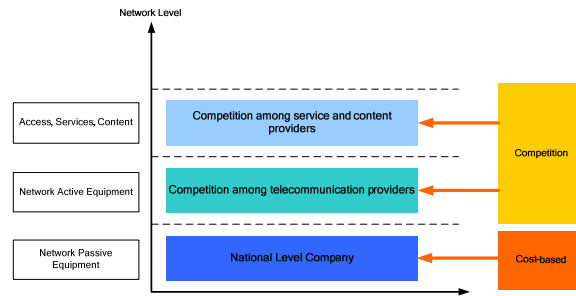


Table 3: The proposed business model

Charact eristics/ Layers	Level 1 (Passive network equipment)	Level 2 (Active network equipment)	Level 3 (Services)
Player	GBC	Private companies	Private companies
Roles	Core network operator/provider (only for passive network equipment)	Access network provider/operator or Core network operator/provider (only for active network equipment)	Service provider Service Integrator Value-added service provider Content aggregator Content provider Content producer/owner
CAPEX	Passive network equipment Excavation costs	Active network equipment	(n/a)
OPEX	Maintenance of equipment and components Network management Charging and billing Customer provisioning and care Regulation	Maintenance of equipment and components Regulation Customer provisioning and care Network management Marketing, charging and billing Equipment and software licenses, maintenance outsourcing	Sales and marketing, charging and billing Customer provisioning and care Services management Product/platform development Content Rental of physical network resources Regulation
Revenue	Revenues from leasing the physical network resources	Revenues from the rental of telecommunication services subscribers	Content usage revenue Services usages revenue Internet access revenue

Table 4: Stakeholders, roles and costs in the proposed business model

The GBC will have two roles: (1) Monitoring of networks operation and maintenance and (2) Monitoring and design the networks expansions.

5.1. Network Management

Regarding the network management sector, GBC will be responsible for the infrastructure management and policy making activities.

GBC infrastructure management activities include:

- Adding new users (telecom providers) to the GBC broadband network infrastructure.
- Operating the network's passive and elementary active equipment (e.g. switches).
- Resolving collocation issues of the customers (i.e. telecom providers).

GBC policy making activities include pricing of GBC services, marketing and customer support. It is important to mention that the pricing policy of GBC must be cost-based, in order to provide its services to the telecom providers in attractive prices. Following this approach, the GBC will ensure that the end user will receive broadband service in low prices as well.

5.2. Network expansion

Long term target of GBC is the expansion of broadband networks in several (parallel or not) phases, in order to finally offer Fiber-To-The-Home (FTTH) to each household. The network expansion includes the following phases:

- First Phase: Initial implementation of the broadband municipal networks in Greece (public funding under the Operational Program "Information Society", "Call 93")
- Second Phase: Expansion of the broadband municipal networks, so as to cover more points within the municipalities they are implemented in
- Third Phase: Interconnection of the broadband municipal networks, implemented in the two previous phases
- Fourth Phase: FTTH for each household

5.3. Viability of GBC

This paragraph discusses the viability issues of GBC.

5.3.1. Cost Estimations and financial planning. The financial cost of a broadband network is divided in two parts; the network implementation cost (known as CAPEX - Capital Expense) and the operation and maintenance cost (known as OPEX - Operation Expense).

Concerning the initial implementation of the broadband municipal networks in Greece, CAPEX will be covered by public funding. An open issue is how

the CAPEX for future network extensions will be funded, since GBC will operate in a cost-basis fashion. Having in mind that broadband access is a public commodity and should be treated like that, we propose the specific CAPEX to be covered by public funding and by the network users. Additionally, it is proposed that the network users should pay an one-time-fee for the connection to the network. One part of this fee will cover the required operations for the connection of the user to the network, while the other part will be used for future extensions of the network. It should be pointed out that this connection fee must be determined so as to be low enough, in order not to hold back broadband penetration to the end users.

In order to keep the CAPEX low the following guidelines must be followed:

- Detail planning of the network
- Detail planning of required equipment (logistics)
- Usage of flexible techniques (e.g. usage of micro-ducts, etc)
- High penetration to the end users (resulting in low CAPEX/user)

The OPEX funding must be covered by the passive infrastructure users (telecommunication providers) in a cost-based approach. With this approach, we ensure competition among the telecommunication providers, due to the fact that they will rent cost-effectively passive infrastructure from the GBC, avoiding thus the need for high investments from their part. In addition, strong competition among service and content providers will be ensured, due to the fact that they will have the capability to select among several telecommunication providers.

The CAPEX in the case of the broadband Metropolitan Area Networks in Greece includes the following costs:

- Optical fibers
- Network nodes construction
- Network passive equipment
- Elementary network active equipment (e.g. switches)
- Installation of wireless equipment (where needed)

One approach to estimate the CAPEX per network kilometer for the case of GBC is to divide the total founding of the "Call 93" program with the total kilometers of the broadband networks deployed under that call (the prices stand on summer 2006):

$$\text{CAPEX/km} = \text{total founding} / \text{total kilometers} = \\ 58.217.805,78 \text{ Euro} / 740,63 \text{ Km} = 78.605,79 \text{ Euro} / \text{Km}$$

The cost for network expansion can be divided in two general categories; (a) cost for network expansion in areas with no broadband access (e.g. adding new areas to city plan) at all, and (b) cost for network

expansion in areas where initial network infrastructure exists (e.g. expansion of access network).

Concerning (a), network expansion cost estimation can be based on the aforementioned cost analysis for the initial network deployment.

Concerning (b), the cost of the network expansion is varying, depending on the penetration of the existing network to the area where the network expansion is being planned. E.g. expansion of the distribution and access networks have higher cost than connecting new users to an existing access network.

OPEX includes the following: Network maintenance, Billing and pricing and Customer support

OPEX can be estimated as a percentage of the CAPEX and a general assumption for GBC is that the OPEX is estimated to be the 2% of the CAPEX.

5.3.2. Risk analysis. According to the proposed business model, the network providers (operating in Level 2) shall make significant investments in active equipment, even though the passive equipment will be leased to them in a cost basis fashion. Having in mind that investing in broadband network active equipment is costly and highly risky, several telecommunication providers may not decide to invest on municipal broadband networks that might not show the anticipated demand. This will have as a result that some municipal broadband networks (especial in small cities or remote areas) will attract either very few network and service providers (with negative effect to the competition) or, in the worst case, no providers at all. In order to overcome this risk, promotion campaigns will be used for informing citizens about the benefit of broadband networks and increase the demand for broadband services. Additionally, the cost-based pricing of GBC will ensure small fees for the end users.

6. Conclusions and Future Work

The proposed business model for managing, maintaining, exploiting and expanding the optical MANs under "Call 93" concerns application of the business model in nationwide level, since:

- The infrastructure will be used by many ISPs
- The users will have the choice of selecting among several ISPs
- Administration of the infrastructure will be performed by a single, neutral operator
- Low operational expenditure (OPEX) and capital expenditure (CAPEX) exist
- Financial viability in all parts of the infrastructure is envisaged

All involved parts should bear in mind that once the broadband business model is applied and broadband

infrastructures are deployed, quality of service and specific service level agreements for the provided services should be ensured. Although today's broadband service suppliers and network providers are mainly interested in providing easy internet access and connectivity, in the future, value will certainly weigh on the service level.

7. References

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