KNOW HOW GUIDE

INFRASTRUCTURE

1 Preface

This Know How Guide is to be read in conjunction with other material available to applicants for funding from the Broadband Investment Fund (BIF). It is not a guide to applying for funding from the BIF. Applicants for BIF funding should refer to the appropriate BIF Application Forms and Guidelines for Applicants.

The documentation prepared in conjunction with the Broadband Investment Fund includes a Broadband Friendly Protocol which provides a basis for local authorities and telecommunications service providers to work together to enhance broadband services. The Protocol has been prepared by Local Government New Zealand (LGNZ) and outlines principles and procedures which will expedite deployment of broadband services by existing and new entrant telecommunications operators. It has a wider application than for applicants for funding from the BIF and is largely complementary to the supporting documentation for BIF applicants, such as this Know How Guide. The Telecommunications Carriers Forum (TCF) is working with LGNZ and the telecommunications operators to finalise the Protocol. The Protocol is expected to be released around the end of September 2008.

2 Purpose

Communities around the world are responding to the needs of their citizens by discovering new ways of using information and communication technologies for economic, social and cultural development. Companies and governments that take advantage of these new technologies will create jobs and economic growth as well as improve the overall quality of life within the communities in which they take part.

This guide provides assistance and identifies “best practice” for the development of municipal fibre networks (MFN), including the role of local government involvement in the establishment of such networks. It forms part of the background information available to assist potential applicants for government funding towards implementation of open access networks, such as through the Broadband Investment Fund (BIF) www.digitalstrategy.govt.nz.

Best practices in this Guide have been identified with the assistance of telecommunications experts and practical experience from both local and overseas municipal projects.

The Guide is intended to be a ‘living document’. While there is a substantial body of knowledge available about MFNs within New Zealand and from overseas, there is much to be learned as the process of developing applications and implementing MFNs is undertaken. In addition, from time to time there may be regulatory changes relevant to the topics covered herein.

The Guide should be read and considered along with the case studies, which illustrate different issues in connection with project development, business planning and budgeting, on www.digitalstrategy.govt.nz.

The current version of the Guide is acknowledged to be incomplete. In particular, a chapter on rural network project development has yet to be incorporated. Some of the case studies do illustrate rural broadband project issues. It is expected that gaps will be filled in the light of experience and feedback as broadband projects are undertaken and with contributions from those taking part in the process.

Much of the material included here overlaps with, or may be complementary to, the LGNZ Broadband Friendly Protocol which is currently undergoing consultation with the telecommunications service providers and Councils. This applies particularly to readers looking at the business opportunity from a local government perspective.

3 Municipal Fibre Networks [Overview]

3.1 Why are Municipal Fibre Networks Necessary?

A municipal fibre network (MFN) is one which provides open access (i.e. fair and non-discriminatory access) to any qualified telecommunications or Internet service provider. It will usually be a community-owned network but in any case will have a strong community or local government involvement in its governance structure. Its objective will be to provide low cost very high speed network access (1 Gigabit per second [1Gb/s] or better).

The involvement of local government, communities and other groups in the deployment of open access fibre networks is being driven in part by the view that the incumbent service providers are not responding to the needs of the local community and in the absence of that commitment, new local networks will be deployed that can better respond to that need. Local bodies are of particular importance because of their links to community and economic development groups and their local and regional focus.

Another driver is an understanding that duplication of expensive infrastructure may be inefficient and that the competition that results may not provide sufficient economic justification. On the other hand, open access networks, where basic infrastructure is available on an equal and equitable basis to many service providers, can ensure service-level competition. Some form of public ownership of the passive infrastructure is one way of ensuring open access to that infrastructure.

Within developing industry sectors there is consumer frustration at the seeming lack of coverage, bandwidth (at the right price), network performance, and openness of broadband networks which will allow the full potential of that industry to develop. While larger well established commercial organisations may be able to pay for essential high bandwidth connections, the same does not hold true for smaller developing industries, nor those in the social sectors such as health and education. Operational efficiencies along with new business and teaching models are therefore not being developed to their full potential because of restricted access to technology and communications.

End users of broadband services need to be able to change service providers at will and have the ability to choose from multiple service providers so that they have the flexibility to meet their changing requirements over time, and ensure that they receive the services they need at fair and reasonable prices based on market dynamics.

The benefits of appropriate and affordable broadband networks to address the social and economic needs of the community and the business sector have been well established but these benefits are often indirect and do not provide adequate direct return for a profit driven enterprise. There is a wide difference between the longevity and security of investment in basic network infrastructure such as ducting and passive optical fibre, where a relatively long return on investment (ROI) is acceptable, and that associated with electronically active components of the network. Investment in basic, passive infrastructure with a 10 to 20 year ROI is well suited to public sector investment, as with roads, water reticulation and the like.

Central and local government must therefore step in to full the gap through direct or indirect investment in order for these benefits to be realised by the community as a whole.

There is also clear evidence that regionally driven programs are more effective (albeit with some central government support) than a national “one size fits all” program. Demographics, socioeconomics, skills, and economic base and capability vary vastly between regions. Each must decide on its own priorities and what is within the region’s capability to achieve. Targeted programmes to develop particular industry sectors through the use of broadband and information technology must therefore be undertaken now.

Councils have a responsibility to facilitate the availability of high speed broadband services to their community at a price point which ensures accelerated economic and social development through efficiency gains, business creativity and enhanced social networking.

3.2 The Role of Local Government

The role and active involvement of local government in the establishment of a MFN is an important one but can take many forms:

a) act as a catalyst, facilitator and leader to coordinate regional actions;
b) establish a supportive and complementary policy environment for suppliers to participate and form partnerships;
c) aggregate local council demand to become an anchor tenant and stimulate other government agencies to join;
d) making available at favourable rates, council assets, such as disused ducting and buildings to lower the construction costs;
e) taking the opportunity to install telecommunications ducting and create communications corridors as council opens roads and trenches for maintenance works;
f) create or stimulate the building of an “open access” MFN such that this will provide core network and backhaul connectivity to other broadband access providers for the creation and extension of wireless networks, cellular networks and broadband cable networks;
g) assist communities in exploiting opportunities for broadband deployment;
h) ensure the effective utilisation of broadband networks in public sector activities such as e-government, e-health, e-learning and e-research; and
i) act as anchor tenants to provide a degree of financial stability for start-up networks.

The options for council participation will be dealt with more fully in the Broadband Friendly Protocol**.**

3.3 Why Broadband Matters

There is evidence to support the growing realisation that the proliferation of affordable high speed broadband has the ability to stimulate economic growth, achieve higher educational standards and achieve greater efficiencies in providing social and commercial services to the community. The question for each council to answer is therefore not “if” it should be involved, but “how and when” and what will be the extent of the council’s role in this development.

The benefits of broadband have been well established and will not be repeated here. It is however important that councils understand how to extract those benefits through prudent and well planned broadband investment strategies, as there are numerous cases of major projects not achieving the outcomes anticipated. An analysis of market requirements and the size of the potential customer base being targeted with council initiated programmes remains a critical element in making a case for investment. The competitive environment is also important to understand as there is likely to be a reaction (ideally one of collaboration) from established network operators.

3.4 Key Initial Decision Points and Milestones

a) What vision does the community share and to what extent can this vision be enabled through improved broadband infrastructure and services? How, and to what extent, will the Council get involved? What projects will enable the vision and objectives for the community to be met?
b) What community-owned resources (physical and financial) are available?
c) Who are the potential partners, stakeholders, anchor tenants, and other customers? What governance structure is most appropriate to serve their needs?

d) What type of network structure is required, how extensive and what is the likely cost?
e) Are the necessary finance and/or in kind contributions available? Does this project meet the criteria for a BIF application?

3.5 Issues and Risks

With the assistance of outside plant design engineers and networking technology and telecommunications experts the risk of technology failure can virtually be eliminated. Technology choices, however, need to be balanced between large initial investments, which may increase its useful life, and, incremental investments with a shorter life span as the customer base builds.

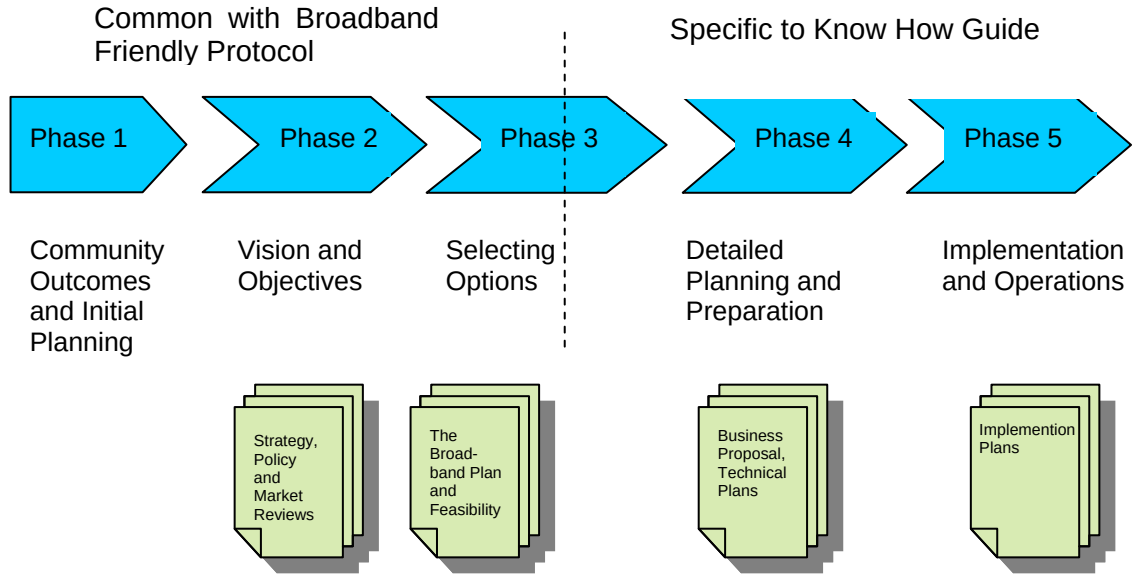
The key risk factors to be addressed will be commercial and the failure to achieve the desired result through bad project choice or insufficient market knowledge.

4 Keeping this Document Current

Access to this document and continuing updates will be managed by the Ministry of Economic Development initially through its Digital Strategy programme and more specifically the Broadband Investment Fund (BIF).

The document is also intended to be continually updated through contributions from organisations engaged in the process of creating MFNs such that lessons learned, knowledge and support can be shared, and some national “best practice” consistency will emerge in the process.

5 Process Overview



The following is a summary of the steps recommended for the establishment of a MFN:

5.1 Phase 1: Community Outcomes and Initial Planning

a) Project initiation and leadership
b) Relationship with local Council and establishment of council policy to encourage and facilitate regional broadband investment
c) Situational analysis
   - Initial identification of needs demand
   - Relevance and linkages between telecommunication infrastructure and "community outcomes" (eg, from the LTCCP)
   - Understanding of current supplier services, coverage and infrastructure development plans
   - Brief assessment of telecommunication regulatory environment and pending changes
d) Complete a gap analysis of infrastructure and services
e) Initial assessment of options for the role of council (strategic options for council).

5.2 Phase 2: Vision and Objectives

a) Engage with potential beneficiaries to determine support and direction (anchor tenants, community groups, business groups, other government agencies)
b) Create a realistic vision based on clear objectives for the region
c) Identify any potential action plan and prioritise based on an initial assessment of benefits, risks and resources required (creation of a regional broadband plan)
d) Obtain council and community buy in.

5.3 Phase 3: Selecting Options

a) Detailed analysis of priority options and programme development
b) Project initiation and governance
c) Identify costs, resources, potential revenue streams and funding for the project
d) Identify council infrastructure elements to leverage off
e) Develop a preliminary business plan and business strategy

5.4 Phase 4: Detailed Planning and Preparation

a) Identify demand
b) Service development and service standards
c) Network governance and ownership
d) Operations and support plan
e) Technology and design
f) Final business proposal and project plan
g) Gain financial approvals and formalise partnerships

5.5 Phase 5: Implementation and Operations

a) Create a business entity
b) Project Implementation
c) Commission an operational plan

6 Definitions and Terminology

Please also refer to Appendix A for a comprehensive list of terms and abbreviations.

Broadband	For the purpose of this Guide, Broadband is defined as a high-capacity, two-way link between an end user and the access network supplier capable of supporting the transportation of digital information using the Internet Protocol (IP). The access speed and quality of service required by an end user is dependent on the applications and volume of digital information needing to be transported and will vary from one application to another. Broadband is often referred to in terms of network access speed (eg 5 million bits per second [5 Mbps]) since this a relatively easy concept to understand, but this parameter is only one of the network performance factors determining the end user experience. Access speed alone should not set the definition of broadband as network loading and service provider (ISP, ASP) performance are also key factors. These factors influence key performance issues such as throughput, delay (latency), delay variation (jitter) and packet loss on the end user experience. A future-proofed broadband access infrastructure should enable service providers to deliver their services over the infrastructure with minimal impairment in terms of all of these attributes Based on today's technology, typical access speeds for Telecom's standard DSL service would range from between 1 and 5 Mbps. Wireless networks such as Woosh and Extend are generally below this at between 256 and 500 Kbps. Because of costs, satellite services currently range between 128 and 256 Kbps. The generally agreed standard for Municipal Fibre Networks is currently 10 Mbps to 1Gbps.
Broadband Service	The definitions of "broadband services," "broadband networks" and related concepts should be dynamic and should encompass and reflect changes in technology, applications, the needs of individuals, and the potential of broadband to yield great economic and social benefits for New Zealanders. Typical services include web browsing, e-mail, video conferencing, file transfer, audio and video streaming, and interactive voice (VoIP).
Symmetric/ asymmetric broadband service	A "symmetric" broadband access connection has identical bandwidth allocated in both the "upstream" and the "downstream" directions. In an "asymmetric" connection, the bandwidth allocation in the "downstream" direction is greater that the "upstream" direction. Traditionally the asymmetric technique has been used for more efficient use of finite capacity DSL modems over copper cables, however it is also applicable to co-axial cable and most forms of broadband wireless technology.
Upstream/down-stream	Upstream = traffic from user to network or ISP etc. Downstream = traffic from network/ISP to user.

Figure 1: Network Structures

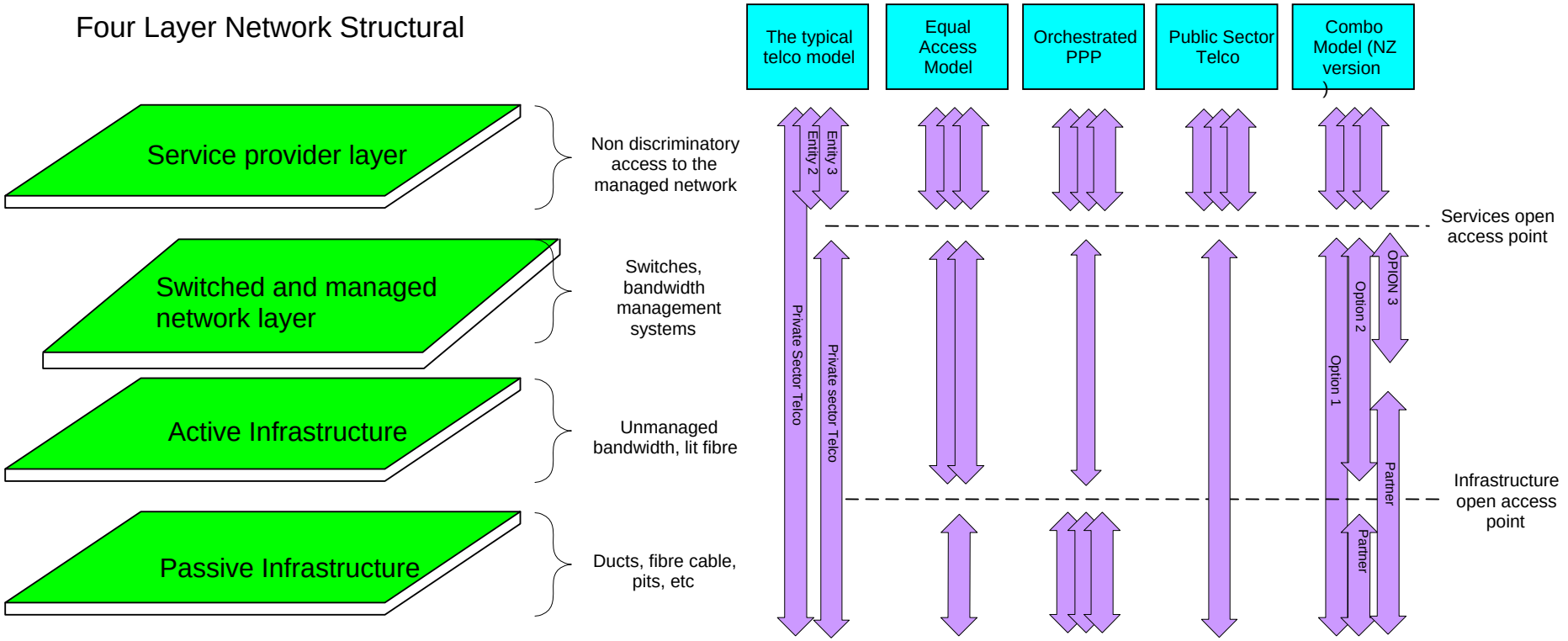
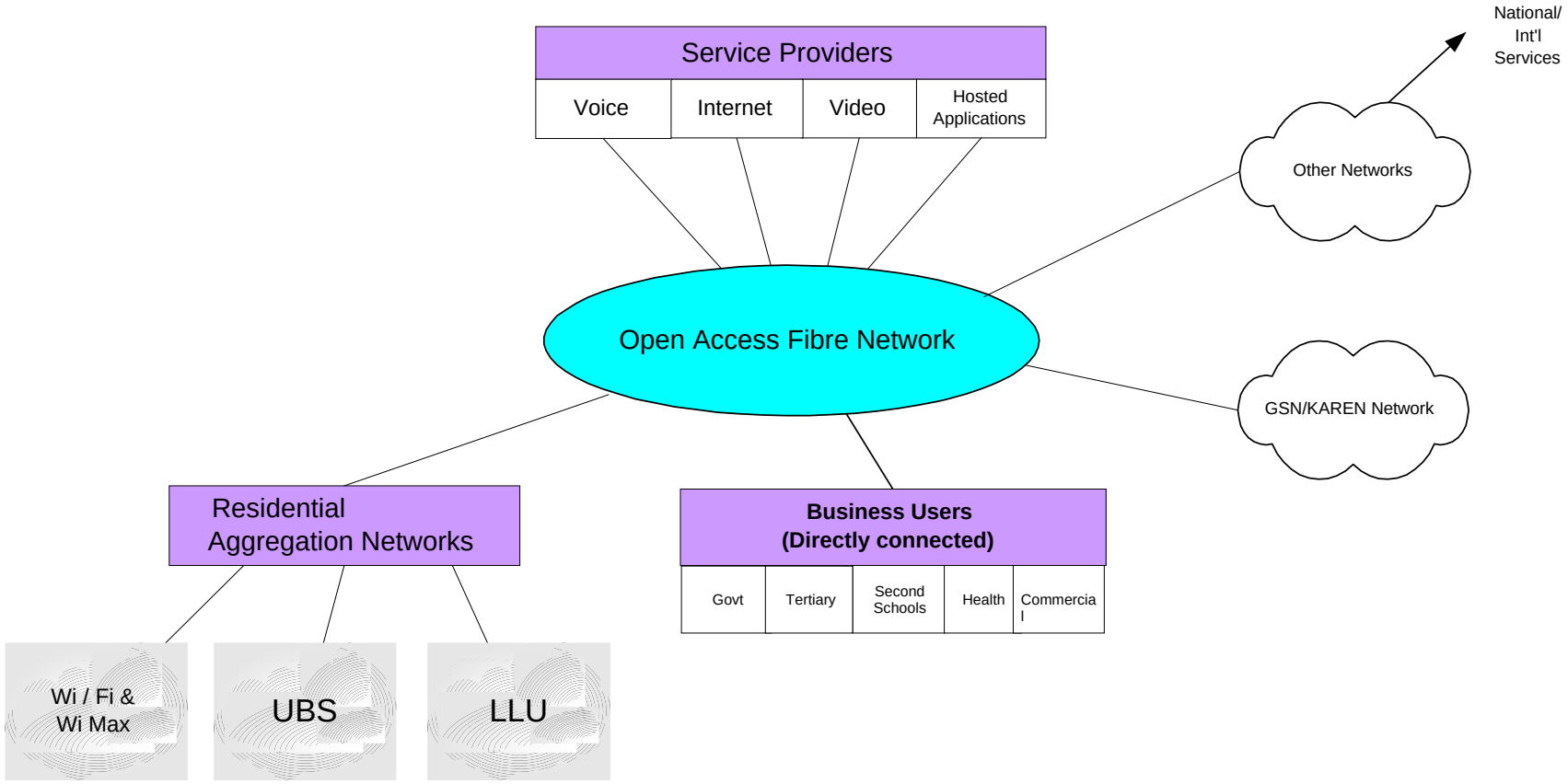


Figure 2: High Level Network Architecture: Service Delivery Model



6.1 Basic Elements of a Municipal Fibre Network

A basic broadband network (MFN) can be represented by describing the various major components which make up the network. These are as follows (also refer Figure 1):

The **Passive Infrastructure** (also referred to as Physical Infrastructure). This refers to trenching, manholes, pits and joint enclosures, ducts, fibre cables, poles, masts and buildings etc, which are the civil infrastructure elements used in the provision of the network. The **Active Infrastructure** provides unmanaged point-to-point bandwidth which, in the case of a MFN, constitutes lit fibre with active media converters at each end, along with optical network units, Ethernet switches, routers, and optical modems. This is often referred to as layer 2 service but in fact incorporates both layer 1 (Physical) and layer 2 (Data Link) functions of the OSI model.

The **Switched and Managed Network** provides for the intelligent routing of traffic between switch points in the network such that individual traffic streams can be channelled to various destinations depending on the functions and services required; e.g. traffic from end-users routed to the nearest ISP or internet gateway.

(Note: Together the "Active Infrastructure" and the "Switched and Managed Network" are commonly referred to as the "**Network Service Provider"** layer. For example, distinction has been made here to accommodate point-to-point bit streams sometimes provided by other parties to create components of a switched network or direct links between council sites).

The **Application Service Provider Layer** provides services and content to end users (eg, e-mail, video conferencing, web browsing etc).

The **Cable and/or Network Interconnection Point.** This is an essential element of any network design in that it provides at least one common aggregation point for (cable ends) customer traffic and interconnection to other networks and services. Some care and engineering advice should be sought in choosing the location and the physical cross-connect technology and duplication may be required to ensure network robustness as well as acceptable service outcomes.

6.2 Defining an Open Access Network

There are a number of interpretations of an Open Access Network and these usually stem from the various business models employed by the infrastructure provider. The Broadband Investment Fund definition is fair and non-discriminatory wholesale access allowing third party service providers to provide competitive offerings across the network. Access to various parts of the infrastructure may be provided to a "customer" dependent on the business model option chosen and could range over the following options.

a) Access to duct space (for the "customer" to install its own cable). This has some limitations in terms of scalability and shared ducting can result in operational difficulties.

b) Access to fibre optic cores within a cable. This requires a higher level of operational commitment than Option (a) but it is more readily implemented by an entity with relatively little skill enhancement and commitment to the business.

c) Access to point to point bandwidth (Layer 2 connections). This allows for the delivery of services to end users but introduces operational complexities and the requirement for quite different skill-sets, and hence should only be contemplated in conjunction with suitable partners. It also opens the opportunity for the public entity to be a competitor to its desired customers – the other service providers, so introduces another level of commercial risk.

d) Access to network interconnection points (Layer 3 network i.e. neutral peering points). Option (d) has many of the issues associated with Option (c).

The two most common points of open access are at the physical level (Option b) and at the switched network level (Option d). These are referred to in Figure 1 as the "Infrastructure Open Access Point" and the "Services Open Access Point".

Option (b) provides direct access to fibre cable cores with which the customer (usually a network operator) would attach its own active elements to create a network or point-to-point connections.

Option (c) may be used for point-to-point capacity between buildings or as part of an access link (e.g. Ethernet link) to another network interconnection point.

Option (d) is where a switched network has been created and access points provided to users such as ISPs and application service providers (ASP) to enable them to sell services to the connected community.

6.2.1 What is "Open Access"?

Open Access, as it applies in this context, must ensure fair and non-discriminatory access to the underlying infrastructure for all service providers. This is best achieved where ownership and provision of the network infrastructure can be separated from the services (content) carried by the network. In this regard, it will always be better if the service providers involved in contracting with one another are NOT also competing with one another at the same time. Directly competing service providers will always have some distrust when they are contracting services from each other. This can lead to the suspicion of at least some form of discrimination. In the extreme, this can mean that the competitive imperative can outweigh the benefits of a collaborative relationship.

Access to "raw" bandwidth and dark fibre should not be restricted on commercial competitive grounds but should be actively encouraged.

In its most abstract form, open access allows multiple downstream competitors to share a bottleneck facility (ducts or fibre cables) that is a critical input for the services that are provided. In most cases, the bottleneck facility is owned by one of the firms that also competes in the downstream market (eg a vertically integrated private telecommunications service provider). The access is open if it is sufficiently non-discriminatory that all competitors can access the bottleneck facility under equivalent cost and quality terms. This ensures that if the bottleneck provider competes downstream, it does not realize a significant competitive advantage by virtue of its ownership of the facility. The separation of Telecom's infrastructure and networking functions under Chorus is an attempt to create this neutrality and non-discriminatory access environment.

6.2.2 Principles of an "Open Access" network

These can be stated as follows:

a) The network will have a disaggregated structure whereby the delivery of the core networking infrastructure will be commercially independent of, and be able to support numerous value added services from, various suppliers in a fair and non-discriminatory way.

b) The broadband network will include at least one interconnection point that supports the interconnection to other networks and service providers on an equal basis.

c) The connectivity components may be purchased from various suppliers and meet at a common aggregation point where the appointed network operator will provide the

interconnection, networking and operational capability. These connectivity components may include public networks or high capacity wireless connections.

d) Core services such as Internet access, domain name services, directory services, IP address management, mail servers, firewall management etc, will be provided to those on the network through separate commercial and technical agreements with suppliers.

See also the International Network of E-Communities (INEC) Declaration on Open Networks at http://www.i-nec.com/activities/the_declaration

6.2.3 A typical implementation of an "Open Access" Municipal Fibre Network:

a) Provides symmetric bandwidth. Anyone connected to an open access network may, as time progresses, equally well be 'providing' content/services as 'consuming' them. It is for this reason that this capability is important.

b) Provides abundant (adequate bandwidth fit for purpose), low cost end-to-end connectivity throughout that community. The cost of bandwidth is generally expected to be well below that of the private telcos.

c) Does not differentiate between 'content creators' and 'content consumers' and their data bits (although there may well be a commercial differentiation for application and service providers).

d) Is financially and legally structured and configured with management and governance measures and locks which serve the 'common good' and assures that the primary value and benefit rests locally with users connected to it.

e) The level of end-user periodic 'access charges' is broadly based on servicing the capital and recovering maintenance and upgrade costs over time.

f) Access outside of the local network (eg Internet access) is a service which is provided by a partner on top of the access network. The open network itself provides no services whatsoever beyond local transmission.

7 Establishment of a Municipal Fibre Network

7.1 Background

The first round of the Broadband Challenge funding provided the impetus for a number of MFN projects. Five major projects resulted: Smartlinx3 , Christchurch City Networks Ltd., Hamilton Urban Fibre Network, and the Nelson Marlborough Inforegion.

In addition, central government initiated with separate funding the creation of KAREN (Kiwi Advanced Research and Education Network) and the GSN (Government Shared Network).

An important factor in the establishment of a MFN is that municipalities not only support the project but become anchor tenants.

The MFN should be based on the principles for an "open access" network and provide significant community benefits other than a direct return on investments.

The key defining feature of an Open Access Network is the legal and financial set-up of the network which, whatever the corporate structure, prevents the MFN owner from acting like a traditional vertically integrated telecommunications service provider.

7.2 Establishment Process

A MFN project would typically be broken up into several work streams. Each of the work streams, while interrelated, can be treated as separate parts of the project but in some instances be executed in parallel.

Work streams can be broken down as follows:

a) project management;
b) business structure and business case development (the Business Plan);
c) product and service development (the Product Plan);
d) demand, customer and service providers aggregation (Demand Aggregation Plan);
e) funding and operational details;
f) network architecture and technical design (the Technical Plan);
g) network implementation planning (the Project Implementation Plan); and
h) network implementation and operations. (Operations and Marketing Plan).

8 Project Initiation and Leadership

8.1 Overview

All broadband projects require a champion and a mandate from council in order to get started. Many initiatives being championed by council staff have failed to eventuate because of lack of higher management support and councils being unclear as to their roles and objectives.

The Broadband Friendly Protocol recommends the creation of a regional structure to support the planning and implementation of broadband projects to the point where detailed design and implementation should be passed on to experts in the field.

The following process is provided as a guide:

a) establish leadership role and get council's support for this role;
b) set up project governance structures – roles, responsibilities and funding;
c) establish a team of advisors and interested parties which could be useful for technical, financial and operational support (project structure); and
d) identify key stakeholders from the community which could potentially benefit.

8.2 Local reference material

Author	Title	Date
Wellington City Council – Strategy and Policy Committee	ICT Policy – Enabling Economic Transformation through Broadband	1 March 2007

9 Initial Planning Stages

The following provides an overview of the process which can be followed to determine what intervention is required and what role a council wants to play.

9.1 Overview

a) identifying the needs of the regional community (commercial, state sector and residential) (possibly through a regional broadband status/capability review);
b) identifying potential stakeholders, partners and anchor tenants;
c) developing an understanding of current supplier services and their plans for the region;
d) creating a clear vision of what needs to be done and clear objectives to support that vision (with council and community buy in);
e) developing key objectives and potential projects;
f) prioritising projects (based on needs and resources required/available, and identifying strategic quick wins);
g) identify skills and resources required;
h) costs and feasibility of priority projects;
i) reprioritisation based on feasibility studies;
j) potential roles for council; and
k) getting beyond the planning stage (get a clear direction and support from council on moving forward to the next phase).

9.2 Stakeholders and Partners

Experience suggests that successful projects have a champion who may be associated with a local council, a community group or economic development agency, or a potential service provider. One of the first tasks for the champion is to marshal the resources of the potential stakeholders, business partners and anchor tenants. These are the source of local enthusiasm, possible finance, business skills and around whom demand aggregation can be developed. They are likely to include:

a) local and regional councils;
b) regional economic development agencies;
c) tertiary institutions (universities, polytechnics);
d) primary and secondary schools;
e) health authorities (DHBs, hospitals);
f) community representatives;
g) local marae; and
h) business groups and leaders (eg local Chamber of Commerce).

9.3 Skills and Resources

It is unlikely that councils will have all the skills required to create and operate a MFN in-house. Generally a number of independent external experts and business partners will need to be engaged. External business partners will have a commercial goal, and it is important to realise this aspect in terms of establishing a sustainable enterprise.

In terms of the roles to be performed, note that different network projects and governance models will require different accountabilities for those roles; it is essential that accountabilities are clearly defined. Essential elements of any partnership should include:

Partner	Role
Catalyst and government agent	Local Government or EDA. Acts as head of the consortium in a coordinating role. Establishes partners and contracts when required.
Systems integrator	Constructs tests and commissions the equipment of the network. Sets up interconnections with other networks, ISPs, and content providers.
Network construction	The creator of the network. Cable layers, equipment installers.
Technology partner	Provides the standards, design, equipment and expertise required to create a commercial network.
Network operator	Has the resources, people, spare holdings, help desk functions, network monitoring capability, cable maintenance contracts, etc to maintain the network.
Sales and marketing	These are required to achieve growth and ongoing cash flow and to extend the customer base.

A consortium of partners needs to be established. Partners would include those who can deliver the expertise and physical assets to successfully create and operate a broadband network. It is possible that partners could also be stakeholders.

For example, the Nelson "Loop" project for Schools has the following parties carrying out these functions. This table is not complete and assumptions have been made as to who the main players are.

Partner	Example
Network Construction	Network Tasman, Transfield
Systems Integrator	Connector Systems, United Gooder, Computer Concepts Ltd
Technology Partner	Allied Telesyn, Cisco
Network Operator	Potentially CityLink, SNAP, Gen-i
Sales and Marketing	ISP, Network Operator, Network Owner

9.4 Local Government Initiatives

A number of examples may be found at:

http://www.lgnz.co.nz/library/files/store_020/DigitalCommunitiesReport.pdf

Northland Regional Council proposes to invest in core regional infrastructure, specifically, a world class regional fibre network to provide regional backhaul capacity and fast (1Gbps) connections for all public institutions. It will provide an open access network – with pricing designed to encourage market entry for service providers in offering Local Loop Upbundling (LLU) and wireless services.

http://www.nrc.govt.nz/Your-Council/Council-Projects/Broadband-for-Northland/

North Shore City Council, working with Vector Communications Ltd (VCL), received $4.125 million from the Government's Broadband Challenge to further develop VCL's existing North Shore network. This project allowed approximately 50 km of new fibre to be laid (90% underground and 10% overhead) to service schools, libraries and community facilities. The construction work is complete with 40 schools, all of the public libraries and most of the council owned community facilities connected.

http://www.beehive.govt.nz/node/29094

Hamilton City Council in 1997 installed an extensive ducting and fibre network in the central business district to support a closed circuit television surveillance system. This venture has now evolved, with the assistance of $2.875 million from the Broadband Challenge Fund, into Hamilton Urban Fibre Networks Limited, which is the owner of assets transferred by the shareholding partners. These partners are Hamilton City Council, Wintec, Waikato University and Environment Waikato, together with a private investment partner, Telecommunications Infrastructure Investments Ltd.

http://209.85.141.104/search?q=cache:GpyT2tMWBl8J:www.ew.govt.nz/newsandevents/agendas/documents/1112052.pdf+HUFN&hl=en&ct=clnk&cd=2&gl=nz

Environment Bay of Plenty has carried out a business case study that looks at how councils can improve capability and accessibility to broadband services in the Bay of Plenty. The study was carried out in association with the region's city and district councils, economic development agencies and industry representatives. The business case for the Bay of Plenty is based on the region recognising that wider geographic availability of broadband services is an economic enabler. In many instances the lack of these services is increasingly being viewed as an economic disabler.

www.envbop.govt.nz/publications/media/070322broadband-ac2.doc

Wellington City Council has developed a broadband vision for high speed broadband connectivity and resolved that the council will have a facilitation role in advancing it. This flows from the Council's Information and Communications Technology policy, adopted in June 2006. The policy is designed to enable economic development, e-democracy, and environmental and social benefits. The Wellington Regional Strategy has also identified broadband as a key enabler of economic growth and one of seven priorities.

http://www.wellington.govt.nz/haveyoursay/meetings/committee/Strategy_and_Policy/2007/01Mar0915/pdf/

Christchurch City Council recognises broadband as a basic infrastructure that all modern knowledge-based cities require and is as important as other traditional infrastructure such as water, roading and transport. Through the Canterbury Development Corporation, the Council applied for and received funding from the Broadband Challenge Fund. This funding was received by the city through a newly-formed subsidiary of Christchurch City Holdings and Christchurch City Networks Ltd (CCNL). CCNL is in the middle of its dark fibre deployment, which includes a MUSH dark fibre network in Christchurch.

http://www.ccnl.co.nz/

West Coast Councils (Buller, Grey and Westland District Councils and the West Coast Regional Council) have coordinated broadband and ICT uptake initiatives through the regional development agency, West Coast Development Trust. Following Project PROBE, and working with Telecom New Zealand, the West Coast Broadband Taskforce prepared a

business case to enable a further 38 communities to receive broadband, the coverage now being available on 96% of existing telephone lines.

http://www.dwc.org.nz/index.cfm/3,78,229/ictstrategy.pdf

Southland Regional Council and community groups are committed to the development of a "whole of community" approach to the delivery of broadband. To date, following Project PROBE, Southland has achieved 96% coverage. Venture Southland has been responsible for the development of the "Southland Whole of Community Broadband Project" and is actively involved in expanding the coverage into the remote fringes of the network. The former chief executive of Telecom NZ described Southland "as the most connected region in New Zealand".

http://www.southlandnz.com/BusinessinSouthland/RegionalInitiatives/DigitalSouthland/SouthlandDigitalStrategy.aspx

10 Identifying the Demand

10.1 Overview

Identified demand for a MFN will enable interested parties to assess whether they either want to go down the path at all, or if they have the skills and capabilities to successfully execute such a proposition. It is essential that all parties understand that they are entering a commercial proposition, and how to manipulate the factors affecting financial performance to achieve the best possible outcome.

The process can be summarised as follows:

a) identify municipal agencies, universities, schools, hospitals (MUSH) and their locations;
b) identify significant commercial entities and locations;
c) undertake a brief feasibility and density analysis (eg number of potential customers for each kilometre of fibre);
d) identify key anchor tenants;
e) decide on the services these customers require (and at what market price) and what could be provided by an elementary network;
f) engage with potential anchor tenants, other government agencies and supporters;
g) decide on the reach of the network (customer density is a factor);
h) obtain commitments; and
i) establish contracts with anchor tenants and general customers.

10.2 Evaluation of Demand

The potential market demand for the proposed services should be assessed. It is important to ensure that all municipal facilities, where practical, become users of the network. In addition, universities, schools, and hospitals and other major community groups should be targeted, although this has not always proven to be easy. This group will generally be looking for substantially reduced pricing and higher capacity than is available through existing service providers. The demand from the commercial sector should also not be ignored as this sector is also likely to provide much needed initial injections of capital funds.

The demand assessment process should build on the opportunity to meet with customers and identify their further needs. It may involve the use of "dark fibre", access to specific content, or direct connection to other key sites. These needs could be evaluated and be part of the future plan for the network.

A substantive commitment should be obtained from all potential MFN customers for the purchasing of the offered services on a medium to long term basis. A three to four year or longer commitment would be ideal from anchor tenants. This must be done in order to justify any investment in the network.

Business customers could also be canvassed in order to assess their demand and commitment.

Experience suggests that issues to be faced in gaining commitment will be existing (possibly multi-year) service contracts and problems for potential customers in the early stages when timeframes are vague and costs uncertain. Where head offices are located elsewhere in the country, local offices seldom have flexibility of choice in selecting a telecommunications provider.

10.3 What Services?

The services or facilities being offered by an open network will be dependent on the business plan chosen as a number of options exist. The key differentiator to a vertically integrated telecommunications provider is that as an open access network provider, you will have no interest in the provision of value added services directly to end users other than the additional use of the network this will stimulate. Common services being provided by open access networks are:

a) access to duct space for fibre cable installation;
b) access to dark fibre cores within a shared cable;
c) point-to-point dark fibre connections;
d) point-to-point Ethernet connections (at 10Mbps, 100Mbps, 1Gbps and 10Gbps);
e) virtual private networks (VPN); and
f) Wireless access (1Mbps to 10Mbps although some higher speeds are becoming available).

10.4 What Pricing?

In general, it is desirable to keep the pricing structure as simple as possible, especially for the provision of passive infrastructure based services (eg ducts and dark fibre). There are a number of factors which impact on the price of the services offered. In the end, price is function of market forces, return on investment and end user affordability. These factors will need to be traded off against one another for each market segment to be addressed – for example, it will be different for anchor tenants, MUSH entities and commercial customers.

The pricing also needs to reflect the basic underlying economic principles of a fibre infrastructure; a fundamentally large fixed asset which has considerable economies of scale. The volume of customers connected and how quickly they are connected and stay connected are critical factors in the economic success of the business.

While market guidelines should be taken into account, the final pricing of services should not be established until all costs have been identified and the business model prepared. One of the prime objectives is to make high-speed broadband services available at a lower cost to end-users such that economic transformation can take place through the development of new and existing businesses and services. A significant reduction in the general market price should be aimed for to achieve the desired outcomes.

If the business case suggests that significant reductions in prices below those currently on offer in the particular market being addressed cannot be achieved, then this should be a clear signal to review the viability of the proposition.

10.5 What Resources are Available?

It is likely that a significant portion of project resources (upwards of 20% of the project management costs) will be required to establish an initial solid customer base.

Any group embarking on this type of initiative should focus on getting customers connected to deployed infrastructure. A MFN will have large economies of scale and hence the volume of customers connected is a critical factor for business success. Ensuring the resources are available to market the capability and work with customers to sell the benefits is essential. These resources can be provided directly within the proposed business entity, or can be outsourced through indirect sales channels. Both models are valid and both require focus within the entity to develop the volume of connected customers.

The State Services Commission's National Broadband Map can provide very useful guidance about what elements of the market to target and assist with demand aggregation, see http://www.broadbandmap.govt.nz/map/

10.6 Anchor Tenants

The identification of a number of anchor tenants is essential for the initial justification of a MFN. Identification of one or two anchor tenants who can be contracted to long term commitments (greater than five years) for substantial volumes of capacity (duct and/or dark fibre) will greatly enhance the cash flow in the early years of the project and hence greatly enhance the potential success of the project. (Note that contract commitments beyond one to three years are unlikely to be achieved with commercial customers.)

It is important that councils and other public entities become significant users in order to create the initial user base. It is also likely that network operators will be keen to utilise the MFN to either start a new network service or expand existing ones. In many instances these network operators have been the major national telecommunication service providers.

11 Resources and infrastructure

11.1 Overview

This section will cover the following topics:

a) resourcing the project;
b) what resources are available? (Where to get help, templates, tools etc);
c) engaging with suppliers;
d) leveraging of existing council assets for key network building blocks (ducts, accommodation, real estate etc); and
e) relationship with other government initiatives such as the GSN and KAREN, and the National Education Network.

11.2 Resourcing the project

As indicated above, resourcing the project is a critical issue for success. The minimum requirements are as follows:

- Well defined and implemented business governance, encompassing the right set of skills to govern the business, and ensure that the strategic goals of the business are delivered with minimum risk to stakeholders.
- General management with excellent commercial skills and a good understanding of the economics of the infrastructure based business,
- Sales and marketing skills with a clear understanding of the customer needs by segment and ability to relate these to the underlying economics of the business,
- Network operations and contract management skills to deliver the lowest cost, highest quality infrastructure possible largely through the use of outsourced resources and can deliver customer expectations in terms of the provisioning of connections and the repair of faults as they arise.

11.3 Engaging with suppliers

This section is a critical component of a successful business. Issues include:

a) The need for well defined arms-length contractual relationships, including well defined performance objectives which are related to financial outcomes;
b) The need for the contractual relationships to drive the underlying unit costs of the business and hence the need to be clearly defined in terms of unit cost based objectives; and
c) The types of contract that will be required to achieve these outcomes.

Properly-developed contractual relationships will provide cost data which can be directly linked in to the underlying economics of the business and hence drive the business plan.

11.4 Leveraging of existing assets

The first step to the creation of a network should be to leverage off existing infrastructure where possible. After having identified key customers and their location, an audit of suitable infrastructure available to reach those locations should be undertaken. This audit could consider:

a) Existing broadband networks and fibre optic cable.
b) Availability of access, i.e. use of aerial fibre on existing poles.
c) Low cost trenching, established telecommunication corridors, and road crossings.
d) Access to existing underground ducts i.e. disused gas mains and water pipes, etc.
e) The prospect of future street trenching activity in the area. Coordination with other utilities, Transit NZ, and other council projects.
f) The geographic options for customer access, i.e. what is the most effective route to access the potential customers.
g) The access or “break in” costs to buildings is usually significant and often difficult to get approval for. Options on how this can be achieved need to be considered carefully and included as a cost.
h) Compliance costs. This activity will be subject to the Resource Management Act and local body processes.

For further details, the Broadband Friendly Protocol will deal with the council policies and best practice in the use of council assets for enabling the creation of broadband infrastructure.

11.5 Relationship with other government networks and initiatives

MFN projects must be seen not as stand-alone entities but as part of a national fibre infrastructure linked to a national backbone. MFNs need to operate in relation to the industry as a whole. The various government initiatives are part of this wider picture. These include:

a) KAREN, the national education and research network;
b) the Government Shared Network (GSN);
c) the National Education Network; and
d) Connected Health.

Of these the education and health initiatives are not separate physical networks but are national policy initiatives intended to make use of locally-available network connectivity.

The common element across these government initiatives is the need for government agencies including tertiary educational institutions, schools, primary health providers and hospitals to be linked to cost effective very high speed open access networks.

There is clearly a synergy between the needs of MFNs for customers and anchor tenants and the needs of these government agencies. Gaining a clear understanding of the needs of these institutions for connectivity should be part of MFN project planning.

12 Technology and Design

12.1 Overview

This section will cover the following topics:

a) The technology plan;
b) The technology decision (what technology is required to support the required services);
c) Obtaining technical support;
d) Network architectural principles and design;
e) Network features, standards and quality (designing for the long term objectives);
f) Interconnection with other networks and services; and
g) Cable network design and accommodation.

12.2 The Technical Plan

A standard structure for a Technical Plan is as follows:

12.2.1 Physical network topology and design:

- map showing geographical coverage;
- network topology diagrams with physical cable, switch-points, peering points and customer locations;
- diagram of cable routes, manhole construction, breakout pit and turning chambers etc;
- specifications for cable ducting standards and design; and
- specifications and location for suitable accommodation to house switching equipment and cable terminations.

12.2.2 *Network architectural plan:*

- diagrammatic representation of the key network elements and their interconnection;
- specifications and functionality for all switching equipment – to align with customer service requirements;
- standards and protocols used by the network;
- a list of required operational support objectives;
- network addressing (if any); and
- network services (such VPN, QoS support etc).

12.2.3 Network Equipment:

- Proposed network equipment and customer access equipment.

12.2.4 Network Management Systems Design:

- specifications for a network management system which will provide all FCAP functions at the required service level;
- service quality and reliability objectives and enablement; and
- specification of all network cabling.

12.2.5 Definition of critical success factors related to time:

Example	Key performance indicator (KPI) or milestones
Rollout of duct and/or fibre	Kilometres deployed against dates
Achievement of unit cost metrics	Unit cost against dates
Delivery of customer connections	Number of connections against dates Unit cost of connections
Utilization of deployed assets	Customer connections per kilometre against dates

12.2.6 Interconnection standards and service level agreements with other networks.

12.2.7 Service agreements with any third party supplier (such as a network operator).

12.3 Design Considerations

The following section discusses options, issues, and standards for the civil works associated with MFN establishment. These will include ducts, cables, pits, manholes, network aggregation nodes (accommodation guidelines) and interconnect points.

An important aspect to consider is the environmental and consent issues associated with the different deployment technologies. This can have a significant impact on the overall project cost and so needs to be considered as part of the design.

One important consideration is the long term aims of the project. Planning for a network only intended to cover the CBD may preclude options for a much more extensive network associated with provision of fibre to the home if not thought through carefully.

12.4 Cable and Duct Network Design

Once the location of target customers has been mapped and interest and commitment have been obtained, a network can be designed to connect to a switching and traffic aggregation point.

The standards for the proposed network should be considered at the initial stages but as a general rule trade-off is made between a high capital cost network with low ongoing maintenance costs or a lower capital cost network with higher maintenance costs, as in the case of aerial cables or shallow trenching. Generally, performance from the customer perspective is enhanced with the higher capital cost scenario. It is important to engage construction experts and network planners at this stage as a number of options exist in cabling reticulation technology.

It is important to leverage off lower cost construction methods which councils can offer through trench sharing and access to disused ducting, etc. as the “outside plant” installation constitutes the major cost for network establishment.

An audit of suitable infrastructure should be undertaken and should consider the elements discussed in Section 11.4 above.

The detailed network design should be costed and include such items as cable joint locations, turning pits, access pits and the equipment required to terminate the cable network to the termination frames. The “backhaul” for connecting the network to the outside world should also be included.

From this information a financial model should be created and it is suggested that comparisons between investment options be made on a net present value calculation.

Note that it may not be viable to access all customers in the first phase of the project.

12.5 Consistency of Standards

In creating a MFN, a long term view should be taken so as to not only enhance its future worth, but also satisfy customer expectations and to allow for interconnectivity with other regional and national networks. Local and regional capability will need to be part of a larger national network system and so needs to be designed and built with the wider picture in mind. It is of no value to build a local or regional network capability that cannot be successfully used as part of a national infrastructure.

It is therefore important to adopt up to date best practices in the design and build to ensure that customers, partners and service providers will continue to be attracted. It is useful therefore to engage a partner which is capable of drawing on its national and/or international experience in the technology.

12.6 Network node accommodation guidelines

The choice of location for a major network interconnection and cable termination point should take into account the following:

a) proximity to other points of interconnect (eg other pubic and private networks such as KAREN, GSN and a Telecom or TelstraClear network access point);
b) be on the proposed fibre network so as to minimise access costs;

c) amount of floor space available (for later expansion also);
d) site's vulnerability to natural or manmade disasters;
e) ease of access for underground cables and ability to provide diverse access points;
f) security of tenancy; and
g) ground floor accommodation is preferable.

Basic requirements of the accommodation facility would include:

a) cable distribution panels and test access points;
b) racks, cable trays and trunking;
c) sealed cable entry points;
d) external and intra-building cable ducts from the external duct system to the POP room with sub-ducts to maintain physical separation between different users;
e) copper and fibre patch panels;
f) power distribution panel;
g) power supplies (standard and mains fail backup and alternative supply switchover);
h) security and access systems plus entry logging;
i) equipment alarm monitoring panel/router;
j) fire protection;
k) emergency event documentation; and
l) test equipment.

12.7 Technology Considerations

The technology needs to be described to a level of detail necessary for the reader to assess that the capital and operational costs included in the business case are reasonable to achieve the desired business outcomes. For a passive network it will be necessary to choose between a number of options:

a) **Aerial or buried fibre:** Aerial fibre involves a lower initial capital cost (50%), is relatively easy to reconfigure over time and has low cost for building lead-ins. On the other hand, it requires access to street poles (ongoing rental costs) and is vulnerable to pole replacement, wind damage and can be visually polluting. Buried cable has lower maintenance costs, long service life and minimal longer term environmental costs but has higher initial deployment costs, deployment and new customer connection is environmentally disruptive, and cable damage (eg due to the backhoe effect) is very disruptive to services.

b) **Kilometres of buried duct by method of deployment:** Typically a combination of main and sub-ducts is used. Main duct diameters range from 32 to 63 mm and can hold up to 20 7 mm or 10 10mm sub ducts. 10 mm ducting can hold up to 72 fibre cable, 7 mm 25 fibre cable.

c) **Type of duct deployed** (straight or managed): Managed duct costs about five times straight duct ($10 versus $2 per meter) but savings on operation management over the lifetime of the infrastructure more than compensate.

d) **Building lead-ins:** Used for access to cell sites (e.g. for wireless backhaul), exchange buildings (eg for LLU backhaul), customer premises, etc. Options include single lead-in tube per building with multiple fibres supporting multiple customers or multiple lead-in tubes per building with each tube supporting a different customer.

13 Creating a Business Proposal

13.1 Overview

The following topics will be discussed in this section:

a) developing a business plan;
b) determination of costs (developing a cost model and cost assumptions);
c) quantifying social and economic benefits (who will benefit - quantify where possible);
d) identifying potential sources of funding and revenue generated; and
e) cost/benefit and financial analysis.

13.2 The Business Plan

The business plan should provide an overview of what the business does, what it may want it to do in the future and the ways it will be able to do this. Even though the business plan is most often used to initiate a business and raise finances, it should also take a long term view and be updated at regular intervals. It should provide the following information:

a) **The Business Proposal:**

This provides a brief summary of what the intent of the business is; what services are being provided to the market and how the revenue will be generated. The business vision and objectives should be clearly stated and measurable.

b) **Background:**

Describe why these services are required and what competitive advantage this MFN will have over the services from existing suppliers. Outline any feasibility studies, market analyses carried out and the decision making process to reach this point. What are the key benefits for the market and the region as a whole?

c) **Business Structure:**

- Description of the legal entities to be established which will provide business ownership, governance and financial accountability.
- A key element of any business is the quality and credibility of the people involved. Identify partners and provide a description of the skills that partnership brings to the business, the level of contributions being provided through their financial investment, infrastructure contributions and other “in kind” contributions from each partner.
- Signed agreements relating to partner contributions.

d) **Business Governance Model:**

Provides business management structures. Aim for a simple, clean structure with clear lines of accountability to individuals and/or the Board.

e) **The Business Case and Financial Plan should include**:

- a breakdown of costs and funding requirements for each phase of the project;
- the identification of all funding sources for the business over the first seven years;
- a definition of the Weighted Average Cost of Capital (WACC) for the business. If the business entity has significant local council ownership, then the council

WACC might be appropriate. Otherwise this will need to be determined, based on the cost of money and the expected business risk;
- a financial business model (cash flow analysis) for the proposed network construction and operation over at least a seven year term;
- a break even analysis;
- an estimated rate of return; and
- a sensitivity analysis to the market assumptions being made.

Note that the business has a potential return on investment over up to 15 years, and even then there will be a terminal value associated with the remaining non-depreciated assets. Ideally, the revenue model will span this period and so will almost certainly include some impact from customer churn.

13.3 Marketing

This section needs to include the following:

a) market approach, including segmentation;
b) overall market being addressed;
c) forecast of customer connections broken down by customer segment:
    - MUSH,
    - Anchor tenants,
    - Public utilities,
    - Commercial entities.
d) pricing model broken down by customer segment, as appropriate.

13.4 Technology

The technology needs to be described to a level of detail which allows the reader to assess whether the capital and operational costs included in the business case are reasonable to achieve the desired business outcomes. It will be necessary to identify:

a) aerial or buried fibre;
b) kilometres of buried duct by method of deployment (typically a combination of main and subducts is used);
c) kilometres of aerial fibre;
d) manhole spacing and numbers;
e) type of duct deployed (straight or managed); and
f) number, average length and type of customer connections.

13.5 Risks and contingency plans

This is a critical section within any business case and demonstrates the quality of the business plan to the reader. This section should identify as minimum:

a) potential for customer take-up;
b) competitive risk;
c) potential for customer churn;
d) impact of revenue targets not being reached or being exceeded; and
e) impact of cost structures not being achieved or being exceeded.

13.6 Operational Model

Describe how the network is going to be built and operated. This should include:

a) the build contract process and management;
b) the network maintenance process;
c) the fault restoration process; and
d) the customer connection and relinquishment process, etc.

13.7 Key Performance Indicators (KPI)

This section should, as a minimum, include a list of key performance indicators which demonstrate what outcomes are to be achieved by when, including:

a) kilometres deployed by when;
b) customer connections by when;
c) unit cost of build by when;
d) unit costs of connections by when; and
e) customer connections per kilometre of network by when

13.8 Partnerships

The identification of potential partners is helpful at an early stage of development. Initial work will probably require external business planning and technical advice to councils to a point where the requirements of a potential project are fully understood and a feasibility study is undertaken.

Potential partners could include; those with business interests, equipment suppliers, network integrators, network operators, content providers or current infrastructure owners. The key criteria being the value they can offer. Business partnerships could typically include: power lines companies, network operators, community trusts and other state owned organisations.

It will be necessary to identify the types of contracts that are expected to be executed, including any aspects of exclusivity, and their duration. A copy of MED's conflict of interest policy has been placed on the website as an additional resource for Applicants to use.

13.9 Creating a Business Model

The business model requires very careful consideration by the parties intending to implement the business entity. An analysis of business models created so far within New Zealand indicates that there is no one answer to this, rather different models tend to work in different situations.

Increasingly, the standard business model for municipal local access networks being adopted around the world is one based on local governments supporting the deployment of a common infrastructure through public private partnerships, allowing for wholesale, if not full open access, to all service providers.

This common infrastructure may provide a network operator with:

a) duct space for fibre cable;
b) fibres within a shared cable;
c) point to point high-capacity bit streams; or
d) a managed network bearer service (partitioned capacity on a high-capacity common network platform).

Note that the business complexity and hence the risk increases as one goes down the list of options.

13.10 Understanding the Issues and Risks

Some of the risks commonly encountered in urban fibre projects are:

a) expected service uptake not achieved (and hence reduced revenues);
b) availability of skills and capability in completing the project;
c) escalating project costs;
d) poor execution of supplier contracts is a major risk and will lead to endless problems; both with build and on-going maintenance;
e) inability to secure adequate funding;
f) inability to secure partnerships or partnerships failing;
g) confused accountabilities within the entity will eventually destroy the business and so clarity of accountabilities is essential;
h) inability to maintain/achieve required operational standards; and
i) technology obsolescence.

Each of these risks requires evaluation for likelihood and potential impact. A mitigation plan should be created where required.

Finally, a major source of risk lies in competing with customers – this will always lead to a less trusting relationship and make market penetration more difficult.

13.11 Building a Network Cost Model

This section provides the key cost elements required for network construction and consideration in the financial analysis of the business proposal. It includes:

a) key expense items to take into consideration (capital, fixed and variable cost items);
b) typical network element costs; and
c) what assistance is available.

13.12 Economic and Social Benefits

While often difficult to quantify, it is important to identify the key benefits and beneficiaries for any MFN project. These benefits may be direct or indirect.

Potential direct benefits to councils and communities include:

a) sharing the “corporate” LAN across councils and various sites;
b) bulk purchasing of telecommunication and ISP services;
c) creating a tele-presence between councils in the region (and other community groups);
d) sharing of resources and business systems through a common “LAN” infrastructure; and
e) transfer and sharing of graphic information such as maps and GIS system.

Potential indirect benefits to the community:

a) reducing the cost of high capacity broadband to users in the community;
b) health benefits through more efficient transportation of health information and patient access to information;
c) safety benefits through increased surveillance of trouble areas and traffic monitoring etc;

d) higher quality of education being provided to the region's schools and tertiary institutions through enhanced on-line learning;
e) a reduction in road usage through telecommuting and on-line shopping, etc;
f) the ability to attract new businesses into an area.

14 Project Implementation

14.1 Overview

This section discusses the following aspects of implementing an MFN:

a) the Project Implementation Plan;
b) resource consents;
c) running a pilot;
d) establishing supply contracts;
e) contract administration and execution;
f) testing and commissioning; and
g) handover.

14.2 Project Implementation Plan

The Project Implementation Plan should provide details of:

a) project objectives;
b) measurable milestones;
c) project resources (including personnel and funding);
d) project timeline;
e) risk analysis and contingency plans;
f) agreements for use of third party fibre or other network infrastructure;
g) agreements in place for housing of equipment;
h) signed quotes for any construction work proposed (where construction required).

15 Operational Management and Support

15.1 Overview

This section (yet to be developed) will discuss the operational management and support functions of a MFN under the following topics:

a) operating model for the business;
b) in-house functions vs outsourced functions;
c) customer sales and support;
d) service Level Agreements with customers;
e) service assurance methodology;
f) customer connection methodology;
g) network management and operational support requirements (the operating company);
h) operational support contracts; and
i) sales and marketing.

16 Network Governance and Ownership

16.1 Legal Structure (Key Principles)

In its legal structure and governance, whether publicly or privately funded and controlled, there are legal instruments and mechanisms required to ensure that nobody within the community being served can be denied access to them.

Any governance model must have a clear distinction between the commercial day-to-day operation of the business involved in the deployment, operation and marketing of the broadband infrastructure, as compared with implementation of public good outcomes. The public good outcomes may be expressed as specific business objectives for the commercial side of the business to execute but it is essential the trade-off between commercial objectives and public good objectives is not made as a day-to-day part of running the business.

All public-good outcomes should be treated as strategic initiatives and overlaid onto the operating business as strategic objectives, which are then executed in an objective manner with appropriate reflection into the financial targets of management on a considered basis.

Where they are involved, the objectives of councils must be enshrined into a legal structure such that these objectives are not subverted over time.

16.2 Governance Models

A number of guiding principles and structures should be considered with the establishment of a MFN Governance model:

a) They have a *corporate governance culture and structure* that gives importance to serving the 'common good'. Put another way, these networks are structured and managed to ensure that the 'benefit and value' of broadband digital technologies devolve to end users to a far greater extent than is the case under the conventional business models of the current commercial telcos and Internet service providers (ISP's).
b) It should be recognised that the incentives for government investment will not necessarily be aligned with those of other commercial partners. The distribution of shares should be carefully considered as this will affect ongoing control of the business and its objectives.
c) Each regional broadband initiative is created as a legal entity, with a constitution, directors and shareholders. This allows it to be financially independent of normal council operations.

16.3 Company Constitution

A legal MFN entity is required with a constitution that:

a) offers a consistency of purpose in the drive to achieve, stimulate and sell the benefits of regional broadband "open access";
b) can apply for, spend, and account for Government, local Body and other shareholder contributions;
c) has the interests and wellbeing of the region at heart;
d) has involved key stakeholders and partners in its creation;
e) can originate and manage outsourced contracts;
f) can own, hold, lease and rent infrastructure for the use in a MFN;
g) is ultimately responsible for the creation and operation of a broadband network in the public and private domain;

h) has the concept of open access enshrined into its constitution as a key differentiator and that will be upheld as a non-negotiable feature into the future; and
i) can adopt a wholesale position and source the required expertise.

16.4 Business Models

Business models vary according to who owns/controls what assets and services, how revenue is generated, and what returns are made and over what period.

In general, passive infrastructure (ducting and dark fibre) will have a longer lifetime (15-20 years) than active components which require a power supply (routers, transceivers, etc) (five years). Either of these can provide an open access network. Under the BIF open access requirement, preference will be given to business models offering open access at the deepest layer.

16.4.1 Infrastructure Service Provider

a) this model is most favoured under the BIF;
b) metropolitan fibre deployment;
c) wholesale “Open Ducts” and/or “Open Tubes”;
d) wholesale dark fibre; and
e) no active components.

16.4.2 Network Service Provider

a) this model is supported by the BIF;
b) could be executed in conjunction with other utilities (eg Electricity);
c) open access network is essential (multiple network service providers encouraged); and
d) wholesale raw Ethernet bitstreams (typically Ethernet based)

16.4.3 Application Service Provider

This model is unlikely to be funded under the BIF.

16.5 Dividends and Return on Investment

Most MFNs will be established as niche market companies and operate on a relatively small scale by comparison to a well-funded tier 1 telecommunications service provider. Traditionally, the return on MFNs to shareholders has been minimal with many opting to direct any positive cash-flow back into network expansion. The return on investment will largely be indirect and be “banked” in terms of regional development.

Investment in MFN passive infrastructure must be seen as a long term investment with a 15 to 20 year horizon and modest returns. Shareholders expectations should be addressed up front and any shareholder returns should be set and defined in a Shareholder Agreement.

16.6 Exit Strategy

Overseas experience with MFN networks documents the fact that difficulties are often encountered in operating a broadband network once it has been established. By comparison to overseas, the New Zealand MFN networks will be on a small scale, work in lower customer

population densities, but still be subject to high construction costs. This will not be a “cash cow” as a business and the future value and viability of these networks may, in the future, have a greater probability of success in the hands of a content provider or a party that can add value. Consideration should be given to this when setting up a MFN entity and this flexibility should be inherent in the company structure. However, the constitution should always uphold the ideals of “open access” irrespective of ownership.

However, there are many examples where councils do take a long term strategic view of owning and operating strategic regional assets for the benefit of the community. The extent to which councils wish to be involved in the operation of the MFN will be a key decision.

17 Bibliography and Further Reading

International reference material

Connect Kentucky www.connectkentucky.org.
“2010 Broadband City A Roadmap for Local Government Executives” Cisco Systems Ltd.
“Municipal advance Telecommunications Infrastructure (MiniTIP)” Georgia Centre for Advanced Telecommunications Technology (GCATT), April 2003.

Canadian Examples

http://largebande.gc.ca/pub/appcentre/index.html

Technical info

http://www.supernetportal.com

Role of GIS mapping

http://www.connectkentucky.org/statebb_phase1.asp

Community planning toolkit

http://www.connectkentucky.org/pdf/CBT.pdf

Australia dark fibre examples

http://www.dest.gov.au/sectors/school_education/publications_resources/innovative_bandwidth_arrangements/executive_summary.htm

Good links on using other utilities -

http://www.dest.gov.au/sectors/school_education/publications_resources/innovative_bandwidth_arrangements/appendix_6.htm

18 Appendix A: Glossary of terms and Abbreviations

ADSL:	Asymmetric Digital Subscriber Line: a technology which enables broadband service over the copper loop. Related terms include DSL, ADSL 2 plus.
ASP:	Application service provider.
Bandwidth:	The range of frequencies passing through a circuit. The greater the bandwidth, the more information that can be sent over the circuit in a given time.
BBFP:	Broadband Friendly Protocol.
BIF:	Broadband Investment Fund.
Broadband:	Wideband technology capable of supporting voice, video, and data.
Dark fibre:	See also Fibre and Unlit fibre. Dark fibre has no active optical components attached and is available as a transmission medium for any entity providing its own means of 'lighting' the fibre.
DHB:	District Health Board.
EDA:	Economic Development Agency.
Ethernet:	The most common local area network (LAN) technology in use today. All stations on the LAN share the total bandwidth. These speeds range from 10 Mbps (Ethernet), 100 Mbps (fast Ethernet), or 1000 Mbps (Gigabit Ethernet)
FCAP:	Fault, configuration, accounting and performance monitoring and services required for maintaining service levels over a network.
Fibre (optics):	A transmission medium consisting of glass filaments. Light beams generated by a laser to carry data over the fibre.
Gbps:	Gigabits per second (billions of bits per second). See also Kbps, Mbps.
GB:	Gigabyte (one byte equals eight bits)
GIS:	Geographical information system.
GSN:	Government Shared Network.
Interface:	A shared boundary with common physical interconnection characteristics.
IP Address:	Known as an Internet address. This is a unique stream of numbers that identifies a computer or TCP/IP network. The format is a 32 bit numeric address written as four numbers from 0-255 separated by full stops.
ISP:	Internet service provider.

KAREN:	Kiwi Advanced Research and Education Network, a very high speed fibre network linking universities and research institutes.
Kbps:	Kilobits per second (thousands of bits per second). See also Gbps and Mbps.
KPI:	Key performance indicators.
LAN:	Local area network (see also Ethernet).
Laser:	A device that transmits an extremely narrow and coherent beam of energy in the light wave spectrum.
LGNZ:	Local Government New Zealand.
LLU:	Local loop unbundling: allows competitors access to incumbent telecommunication service provider's copper loop.
LTCCP:	Long Term Council Community Plan.
Mbps:	Megabits per second (millions of bits per second). See also Gbps and Kbps.
MFN:	Municipal fibre network.
MUSH:	Municipalities, universities, schools and hospitals: the entities considered to be the key customers for a Municipal fibre network.
Narrowband:	(As opposed to Broadband) Digital communication at less than 64 kilo bits per second (kbps).
Network:	A series of nodes or stations connected by a communication channel, in this case a fibre optic cable.
OAN:	Open access network.
OSI:	Open Systems Interconnection: a set of standards developed by the International Standards organisation for digital networking.
Physical Layer:	The OSI layer describing the electrical, mechanical and handshaking procedures over the interface connecting a device to a transmission medium. Typical examples are X.21, G703 and RS232 protocols.
POP:	Point of presence: a location where entities (including other networks) can connect to a particular network.
Protocol:	A set of rules governing the exchange of data bits over a transmission network.
QoS:	Quality of service, a measure of the characteristics of a digital network ultimately affecting the customer service levels.
ROI:	Return on investment.

Unlit fibre:	A fibre in its raw state, i.e. not transmitting information in the form of data. See also Dark fibre.
VoIP:	Voice over Internet protocol: a technology for transmission of voice service over an IP network, including the Internet.
WACC:	Weighted average cost of capital.