Jersey Competition Regulatory Authority

Consultation Document 2005-2

Future Options for Broadband in Jersey

26 September 2005

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Introduction

Broadband technologies are set to become the standard means of delivery for telecommunications services over the next few years. Services will include more multimedia services that will require high speed data delivery, such as video-on-demand, streaming data services and other download facilities as well as Internet browsing and traditional voice services. The JCRA wishes to ensure that Jersey consumers receive such services at competitive prices. The development of broadband will ensure that the consumer has more choice and variety.

Currently, in Jersey, the only means of delivering broadband services to the end user is through the Jersey Telecom ('JT') network. At present the only means of broadband delivery in Jersey is based on Digital Subscriber Line ('DSL') technologies (see below and Appendix A), and the only available network is its fixed copper infrastructure. In other jurisdictions the incumbent's fixed copper infrastructure is seen as a fundamental resource for the development of innovative and competitive services in telecommunications. Consequently, pursuant to an EU Regulation National Regulator Authorities ('NRAs') in the European Union have mandated access to this resource in order to encourage competition. Access to the incumbent operator's fixed infrastructure is important in order that broadband services can be delivered economically and effectively, particularly in rural areas.

However, as examined below, there are other options possible for the delivery of these new services which may provide a bypass to the current bottleneck at the network level, that is the current fixed network operated by JT, in the 'last mile' that could affect the roll-out of broadband services.

The JCRA has examined the Jersey market and assessed the opportunities available for promoting diverse services with the current broadband network. The JCRA believes that in order to promote innovation and competition in broadband, it may be necessary for Other Licensed Operators ('OLOs') to be able to more fully utilise JT's access network. The JCRA, in examining broadband development in other jurisdictions, is considering whether JT should be required to open its network to other operators. However, before deciding on whether access should be mandated and if so what type of access, the JCRA wishes to seek stakeholder's views on these issues.

What is Broadband?

Broadband is a technical term that describes data communication technologies that provide a permanent, sometimes termed 'always on' connection to the Internet which enables a variety of services to be delivered over a single 'pipe'. This can include data, voice and video products. The permanent connection capability is particularly important for business applications. Most authorities agree that speeds in excess of 128kb/s are 'fast' connections, which excludes ISDN and other 'dial-up' or 'narrowband' connection provisions, although there is no universal definition.

Currently, in Europe broadband is predominantly delivered over fixed infrastructure, particularly over legacy copper networks. In is generally provided at 256kb/s and multiples thereof up to around 8Mb/s at present. Current system developments for legacy copper infrastructure are extending this bandwidth up to 30Mb/s, although at present these speeds are only available over relatively short copper pairs.

Broadband has developed rapidly throughout the world, particularly in the more developed counties, and Europe has a high penetration in most of the original 15 member states. Jersey also has a relatively high penetration of broadband subscriptions and is at about the European average[1] at about 61% by household. Currently, pricing is falling and basic bandwidth is increasing in most jurisdictions as uptake increases and the technology matures. Most European jurisdictions have competition in broadband which has driven increased uptake and the development of multiple services by providers.

Options to Bypass the Local Loop Bottleneck

In addition to the use of the existing incumbent's fixed network facilities, there are other options possible for the deployment of broadband services on the island. These options are described in more detail in Appendix A. This Consultation Paper now asks stakeholders to comment on the extent to which these alternative technologies may enable bypass of the incumbent fixed network.

Cable Modems

Currently the only operator with a network that may be suited to using this solution on the island is Newtel. As an operator without SMP in the telecommunications market, it would be a commercial decision for it alone to determine whether to offer access to other operators through this route.

Q1. Do stakeholders believe that this could be a suitable solution for the provision of competitive broadband services to business and residential users in Jersey?

Optical Fibre Loops

This is effectively a new infrastructure build which would require some considerable investment by a new entrant. However, this may be mitigated if there were a duct or infrastructure sharing arrangement within the JT Reference Interconnect Offer or commercial agreement with another operator or utility company.

Q2. Do stakeholders believe that such infrastructure build is viable in the local market?

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[1] JCRA Annual Review of Internet Usage 2004

Q3. Do stakeholders believe that this is a suitable solution for the provision of broadband to residential consumers in Jersey?

Q4. Do stakeholders believe that a duct-sharing arrangement should be included in the JT RIO?

Wireless Broadband

This is a developing technology that has much promise in terms of its capability to offer high bandwidth services through fixed wireless infrastructure, that is, point to multipoint non-mobile wireless networks, using both WiFi and WiMax technologies. It has already been rolled out in other jurisdictions and is less costly than fixed infrastructure to install. In Jersey, with its pockets of densely packed low rise urbanization, this would seem to be a suitable technology. There are already some WiFi networks in operation at various points throughout the island.

Q5. Do stakeholders believe that this is a viable technology for providing broadband services to both business and residential users in Jersey?

Power Line Communications

This is a technology that has just started to develop in Europe. There is some uncertainty over issues of radio frequency interference using this technology, however, in a recent EU statement[2] the path would seem to be clear for deployment in EU countries. It is also likely that many of the radio interference concerns elsewhere would be of less importance in Jersey given its relatively low usage of the radio spectrum in other applications and its geographic position.

There would seem to be some opportunity for this technology in Jersey, given its relatively small geographic area and the separation from the main electricity distribution grids. Jersey Electricity ('JE') is the only supplier of the base support infrastructure network in the island.

Q6. Do stakeholders believe that this is a viable solution in the local market?

Q7. Given the position of JE in the local market, do stakeholders believe that it should be subject to the same regulatory rules on access to infrastructure as are dominant telecommunications operators in the broadband market?

[2] MEMO/05/119 Date: 08/04/2005

Mobile Telephony Data Services

Data transmission is possible over existing 2½G and future mobile networks. The available bandwidth varies depending on the upgrade level of the network but, at certain enhancement levels, it can be considered as broadband. It is expected that the next generations of mobile networks will provide higher bandwidths.

Q8. Do stakeholders believe that present and future data options available through mobile radio telephony networks are likely to provide a suitable platform from which to offer a full range of broadband service to both business and residential users in Jersey?

DTTV and Satellite

This is a developing area in some jurisdictions but as outlined an Appendix A has certain limitations in implementation or cost. In the Channel Islands there is also some uncertainty regarding the availability of DTTV and thus other technologies may prove more attractive.

Q9. Do stakeholders believe that this will be a suitable platform for the provision of broadband services to business and/or residential users in Jersey?

Access to JT's network

It is generally accepted that broadband services will be the future competitive area for telecommunications operators. Greater public awareness of the Internet and of its associated technologies makes it an attractive option for the development of value added services and innovation in a market where traditional services on both fixed and mobile have saturated the market.

In addition, most governments recognize the advantages of a 'wired nation' where many services can be accessed by citizens from home and thus reduce the costs of social and government administration. In other jurisdictions competitive access to infrastructure has brought about the development of innovative services and has also had the effect of driving down consumer prices.

Incumbent operators have over the last few years developed broadband through the installation of xDSL services using their legacy networks. Such a configuration is shown in Figure 1 below. The configuration is typical, utilizing a Digital Subscriber Line Access Multiplexer ('DSLAM'), Asynchronous Transfer Mode ('ATM') access network, Broadband Remote Access Server ('BRAS') and Internet Protocol ('IP') backhaul.

NRAs across Europe have taken diverse steps in dealing with broadband and the EU Voice Telephony Directive[3] deals with this matter. In general, NRAs favour handover to the OLO at either point 1 (DSLAM) or point 2 (ATM) of Figure 1 (below). In this way OLOs are offered non-discriminatory access to the data bit stream or a configurable data stream ('bitstream access') at a manageable point in the network, with the option of providing some of the network elements themselves through co-location or co-mingling agreements.

In some jurisdictions, full Local Loop Unbundling ('LLU') is available which enables OLOs to provide all services over the network with minimum incumbent involvement.

In a few jurisdictions, wholesale is simply a discounted version of the incumbent's retail product with minimal differentiation possible. This is the present case in Jersey. However, where this type of provision is offered, the NRAs have either started regulatory action to migrate to bitstream access solutions or have imposed significant wholesale discounts off the incumbent's retail product, typically in the order of 40%-50%[4].

The options available for broadband connection over the existing JT fixed infrastructure are enumerated below and Figure 1 is used as a reference. They are grouped into relevant sections dependent on the form of access.

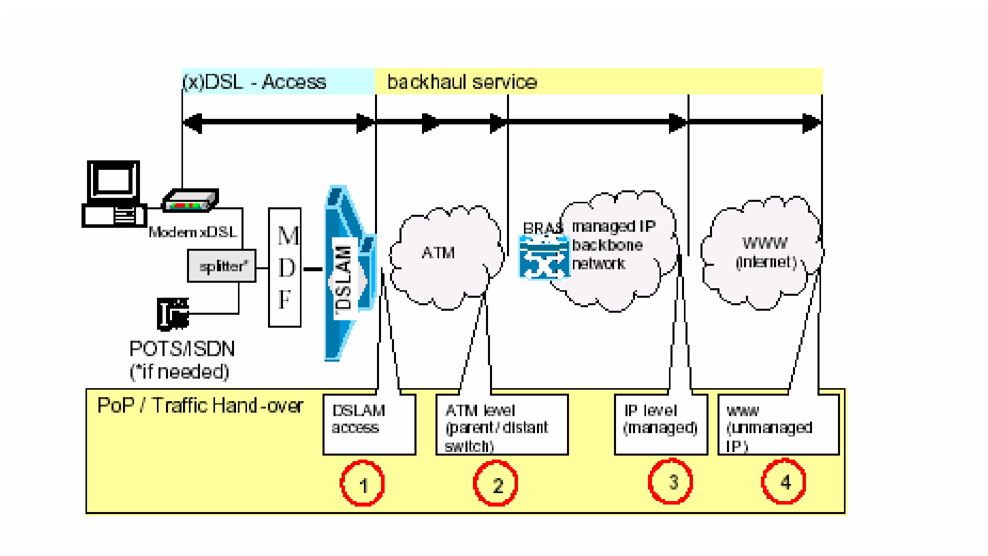

Fig 1

Most incumbents operate an Internet Service Provider ('ISP') type service and JT is no exception as it offers both dialup and broadband Internet access services at the retail level as well as wholesale.

The JT ISP wholesale product incorporates all of the stages of the model shown in Figure 1. The JT wholesale products are currently simply discounted versions of its

[3] (98/10/EC).
[4] Annex COCOM03-04Rev2

retail products. JT is currently dominant in the fixed line narrowband and broadband delivery market for both retail and wholesale services. It is likely to retain this position, especially in rural areas, for the foreseeable future.

Its present wholesale service is currently delivered at point 3 in Figure 1, that is, the service offered to the OLO ISP is effectively the same as JT's own retail offering. The only opportunity for product differentiation is on marginal price and basic services, such as the inclusion of email accounts and web space.

Greater flexibility and therefore the opportunity for more differentiated services is only possible if the OLO has access to the data stream closer to the subscriber. There are different configurations available to achieve this.

Access to infrastructure

In Europe the key driver to the uptake of broadband has been through the development of DSL. This technology is able to be supported on existing legacy network infrastructure, typically owned and operated by former monopoly operators. Most NRAs have mandated some form of shared access in order to develop this service. There are several ways of achieving this and they are outlined below.

Option 1: Local Loop Unbundling

Under this option the OLO is able to control the DSLAM. The advantage to the OLO would be that it could configure the DSLAM and backhaul to provide different Qualities of Service ('QoS') to provide various types of service to its subscribers, for example, VoIP. This can be achieved in different ways:

1.1 Full LLU.

In this case OLOs have direct access to the copper infrastructure of the incumbent operator. The OLO leases the line from the incumbent, who continues to maintain the cable pairs as part of their network. All other services are provided by the OLO including POTS, although some European operators only offer voice services over broadband (VoIP) to their unbundled customer base.

Under this scenario, it is also necessary for the OLO to be able to co-locate or co-mingle equipment in the incumbent's exchanges. Therefore, there is a need to enable such access through provisions in the JT Reference Interconnect Offer ('RIO'). JT already has a form of co-location[5] available which it is currently offering to other ISPs. It would therefore seem relatively simple for an extension to this service to be incorporated into its RIO.

[5] Jersey Telecom Colocation Service Terms And Conditions Issue 5.3, 12/05/05

Q10. Do stakeholders believe that full LLU is a suitable solution for the local market?

Q11. Do stakeholders believe that it is economic to provide equipment in all of the existing JT exchange buildings?

Q12. Do stakeholders agree that RIO based co-location or co-mingling and facilities are necessary to facilitate non-discriminatory access to broadband services?

1.2. Sub-loop unbundling

In this arrangement, the OLO interconnects with the incumbent's network at a roadside distribution point. This is particularly relevant in accessing the 'last mile' in order to provide higher bandwidth applications. Typically, the OLO would provide a separate roadside box containing its multiplex equipment adjacent to the incumbent's. A copper cable would be provided between the cabinets to enable interconnection. This type of connection is realistic in densely populated areas since the economics of providing backhaul need to be considered by a new entrant. The 'last mile' copper pairs are maintained by the incumbent but all services are provided by the OLO. This configuration would also require additional RIO services.

Q13. Do stakeholders believe that this will be a viable option in the local market?

Q14. Do stakeholders believe that this would be a suitable solution in an evolving network?

Option 2: Bitstream Access

In this option, the subscriber loop and the DSLAM remains in the control of the incumbent operator and the OLO leases all or part of it through the facilities offered in the RIO.

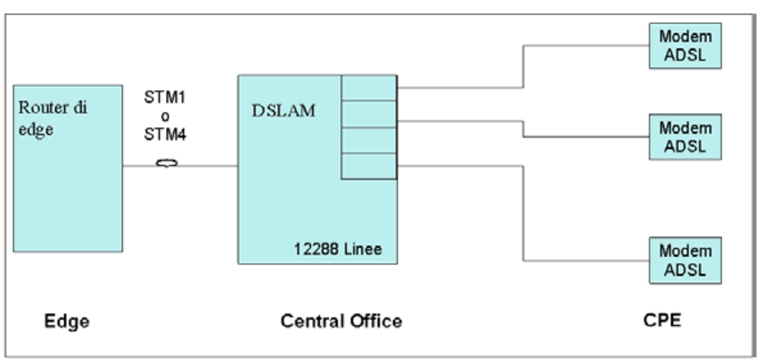

Fig 2

2.1 DSLAM Access

The OLO is able to manage the data traffic over its SDH backhaul also through the means of the RIO. The STM1 to STM4 interface as shown in Figure 2 could be part of an existing interconnect with the incumbent or it could be dedicated to the OLO's broadband network. This would be equivalent to an interconnection at point 1 in Figure 1.

In this configuration the incumbent retains control of the DSLAM part of which it may also use for its own broadband services, while the OLO is able to manage its own data traffic and set its own QoS parameters. In this way the OLO is able to differentiate its broadband product and is able to provide a full set of competitive services. This configuration enables the most cost effective use of network hardware. However, the provision of an STM is expensive and unless the OLO could justify such capacity, the economic case, especially in a small jurisdiction, may not viable. However, in some applications Ethernet has been substituted successfully as DSLAM backhaul which can provide a more cost effective solution.

The line and POTS services remains in the control of the incumbent but the data services part of the line is leased by the OLO. This arrangement also requires co-location or co-mingling services within the RIO.

Q15. Do stakeholders believe that this model is suitable for the local market?

Q16. Do stakeholders believe that this is a viable interconnection method in a small market?

2.2 ATM access

This provision does not require as much bandwidth to interconnect with the OLO's POP as the DSLAM option above and would prove more economic for smaller deployments. Furthermore, most incumbents aggregate their DSLAM backhaul over their own ATM network which would provide a more economic option for the OLO's backhaul, since it would be from a single network point. ATM access provides the OLO with a reasonable opportunity for service differentiation.

Q17. Do stakeholders believe that this solution should be offered alone or as part of an overall offer including other access methods?

Q18. Do stakeholders believe that options 2.1 and/or 2.2 should be offered in addition to full LLU to enable access for smaller OLOs?

Q19. Do stakeholders believe that backhaul provision is also a possible bottleneck product?

2.3 IP access

This provision is the simplest solution and is currently offered by JT to OLOs. The present offer is arranged in different configurations to provide a variety of user options. For example, 512 / 256 Kbit/s download/upload at 40:1 contention ranging to 2048/384 Kbit/s download/upload at 5:1 contention. However, the OLO is reliant on the configuration of the JT network and has little or no control of the QoS. It is also subject to the possibility that JT will change system configurations that can impose extra cost or reduction of service on its own network.

In most EU jurisdictions DSL is now being offered at higher entry level speeds (typically 1Mb/s) or as a 'burstable' option (that is a standard rate is quoted but depending on concurrent traffic, higher rates are deployed for downloading).

Q20. Do stakeholders believe that this solution is sufficient for the present and future needs of broadband users in Jersey?

Q21. Do stakeholders believe that the range of product configurations should be augmented in order to take account of evolving needs of users, for example, increasing the base data rate of the entry level offer or offering 'bursting'?

Subscriber line broadband products are a likely area for product development by JT as their broadband network develops and they migrate to a Next Generation Network (see Appendix B). Therefore, new versions of xDSL will be introduced by JT at various places and times in the future. This does possibly give JT the opportunity of market foreclosure if these products are brought to market before OLOs can develop their own services on the new platform.

Q22. Do stakeholders believe that JT should introduce new broadband retail products into the market only after an equivalent wholesale product has been developed?

Q23. To what extent do stakeholders believe that the current dominance of JT's broadband network will be eroded by other last mile access technologies?

Network Evolution

As discussed in Appendix B, the local network will evolve over the next few years into a different topology. The 'last mile' will become closer to the initial network switching point and the existing network structure between the last mile and the network control point will migrate from a predominantly copper circuit base to an optical fibre broadband base. Such a network will enable the migration of consumers to VoIP instead of traditional POTS. For OLOs to compete fairly, number portability between POTS and VoIP platforms should be available. There are various options for achieving this, but ENUM appears to be gaining popularity. However, as discussed in Appendix B, there are some security concerns with this solution.

Q24. Do stakeholders agree that number portability will be an important feature of broadband network development?

Q25. Do stakeholders agree that the introduction of ENUM databases would be helpful in assisting number portability in future network structures?

Q26. Are stakeholders concerned at the possible security issues that the introduction of ENUM may bring?

This evolution will change the way in which OLOs will be able to gain access to the incumbent's network. A decentralized network will require that access is made at street cabinet level or via a broadband service operated by the incumbent. This is likely to change the economics of LLU unless the OLO is prepared to invest in some network infrastructure. It does not, however, totally exclude competition at the virtual circuit level and in future networks, many users will be migrating to all-broadband service delivery, thus OLOs will still be able to achieve some form of configurable access from the incumbent.

Q27. Do stakeholders agree that network evolution may change the economics of LLU?

Q28. Do stakeholders believe that network evolution may strengthen the case for bitstream access solutions?

While this consultation paper has attempted to examine the current options on the provision of broadband to consumers, the JCRA is aware of the dynamics of the telecommunications industry. It therefore invites stakeholders to comment on these proposals and also to offer any other innovative solutions that may be included in future policy and strategy plans by the JCRA.

Q29. Do stakeholders believe that there may be other viable solutions to last mile access?

Consultation Period

Written comments on this Consultation Paper are invited, to be received no later than **5PM on 21 October 2005.** Submissions should be clearly marked "Comments on the Future Options for Broadband in Jersey" and may be supplied either in hard copy or electronically, addressed (as appropriate) to:

Mr G. Marett
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Jersey Competition Regulatory Authority
6th Floor Union House
Union Street
St Helier
Jersey
JE2 3RF

E-mail: enquiries@jcra.je

N.B. The JCRA reserves the right to publish on its website any submissions to this or other consultations. Any commercially sensitive information that a stakeholder may wish to submit as part of a response should therefore be clearly marked as such.

APPENDIX A

Broadband Technologies

Most regulatory authorities view broadband as the next stage of communications network development. There are a number of technologies currently available and a number of others in various stages of development. The following provides a summary of the most prevalent technologies available that are feasible at this time in the local environment.

Digital Subscriber Line (DSL)

This is the dominant technology in Europe today and is also the fasted growing means of delivery of services. DSL works by using sophisticated technology to deliver digital signals over existing telephone lines. Telephone lines are considered to be a legacy technology, consisting of twisted copper wire underground cable or overhead 'dropwires' which were designed to deliver narrowband or plain old telephone services ('POTS') to telephone subscribers. This infrastructure has been in place many years and, as a result of this gradual development, wholesale replacement would be uneconomic. Therefore, a technology that is able to utilize existing networks is highly cost effective.

The basic configuration of a DSL provision is shown in Figure1.

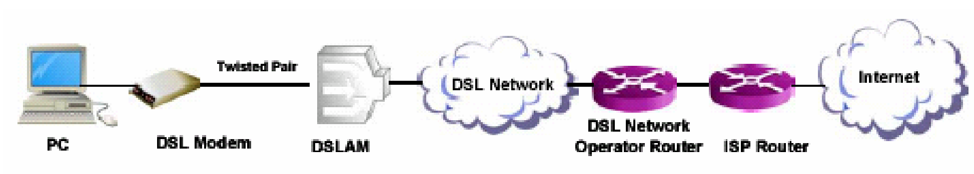

Fig 1

DSL is able to offer a number of configurations and data speeds from around 256kb/s up to 8Mb/s and potentially higher speeds. The most common offering is Asymmetric DSL ('ADSL') which transmits data in the down stream (towards the subscriber) at higher speeds than the upstream (towards the Internet). There are other versions of DSL that are capable of offering the same data rate in both directions. These are commonly referred to as xDSL systems.

JT has already launched its DSL technologies into the local market with both ADSL and Symmetric DSL ('SDSL'), which are available as retail and wholesale products. However, the current JT wholesale products are retail minus offers of its own retail products connected at IP level which gives the OLO little opportunity for product differentiation. Possible solutions to this problem is to offer bitstream access (that is, a connection at a base level to the JT DSLAM) or for the OLO to provide its own DSLAM in the JT exchange, that is, Local Loop Unbundling ('LLU'). The economics of each solution depend on user numbers and the exchange location. Densely populated areas would appear to have a better economic case for LLU than rural areas. However, by providing both types of access, the economics for the OLO are better served. Nevertheless, for JT, this would require the development of alternate products, which would perhaps be duplication of effort, especially if the take-up of one or other of the products was not at economic levels.

Cable Modems

Cable Internet connections are delivered over Cable Television ('CATV') networks. The service is delivered over the same infrastructure as CATV services. The basic configuration of such a service is shown in Fig 2.

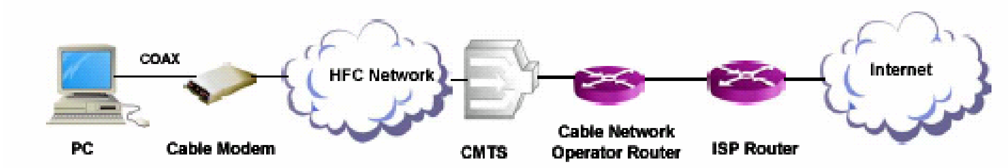

Fig 2

However, for this to be a reality, the CATV network has to be reconfigured to provide bi-directional transmission capability. Existing CATV systems are usually designed as unidirectional analogue transmission networks. Upgrading to support digital bi-directional data is a non-trivial task, since the simple root and branch topology of the analogue network needs to be completely redesigned, usually with the incorporation of switching structures. In addition to the increase in complexity, the cost of such an upgrade is considerable.

The advantage of cable over DSL is that symmetrical speeds of up to 10Mb/s can be achieved, but this can be mitigated by contention factors if there is insufficient switching infrastructure incorporated in the network.

In Jersey, Newtel is the incumbent CATV provider and it currently operates an analogue distribution network around the main conurbations. It has also recently announced that it has completed some work to enable broadband backhaul to its Point of Presence ('POP') from a fibre network around the main business districts in St Helier. Such infrastructure could certainly be utilised if the network has been suitably upgraded to incorporate digital transmission.

Optical Fibre Loops

Optical fibre is an evolutionary step in network provision. It enables a quantum step in the speed of data delivery. The network configuration is shown in Fig 3.

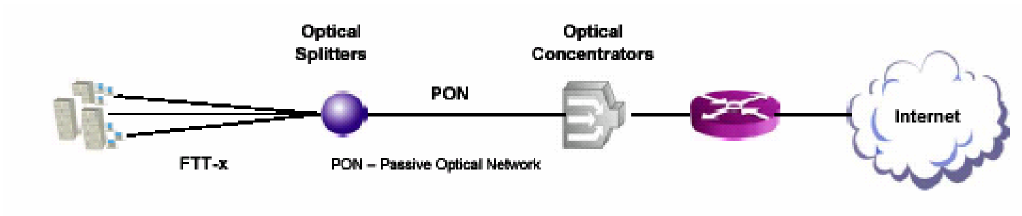

Fig 3

This is effectively a new infrastructure build. It is unlikely that new entrants would wish to adopt this technology but it is an option for incumbent operators that already have existing cable duct infrastructure in place. There is a possibility of infrastructure sharing, for example with the incumbent providing access to its existing ducts or sharing installation cost with or infrastructure facilities of other utility companies.

It is nevertheless expensive to upgrade a complete network and so where this technology is used it is usually deployed in stages as networks require major maintenance. Clearly, it is more attractive to install in business districts than in residential areas, and so cannot be considered as a short term solution for the universal provision of broadband. As noted above, however, Newtel has in part provided such a solution in St Helier.

Broadband Wireless Access

This technology provides a broadband Internet connection via a radio frequency transmission medium typically around the 3500MHz range. This solution effectively overcomes the 'last mile' bottleneck between the backbone network and the subscriber. As shown in Fig 4, it is a point-to-multipoint fixed wireless network.

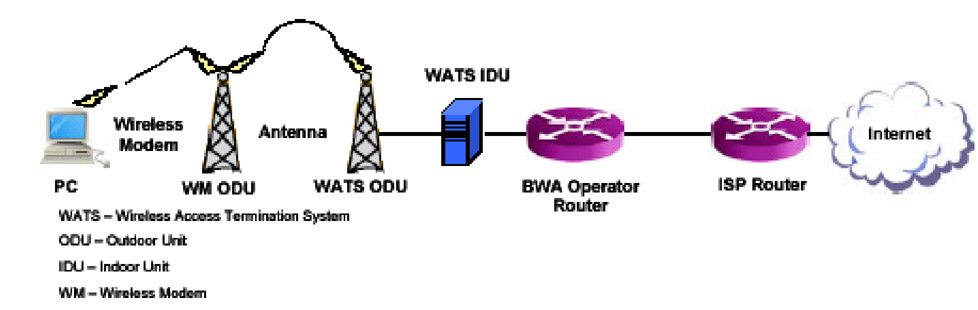

Fig 4

This technology permits the provider to bypass the incumbent fixed line operator's local loop while still providing broadband services. The basic infrastructure is supported by leased lines that connect the distribution units back to the service provider's POP where it is connected to the Internet. The reliance on the incumbent operator providing the leased line connection can be mitigated by using point-to-point wireless interconnects between distribution units. At present, this solution has largely been deployed as localized Wireless Fidelity ('WiFi') solutions rather than complete public broadband networks, although interest in this technology is growing with the deployment of enhanced wireless broadband ('WiMax') services in some jurisdictions. For example, the UK government is encouraging the deployment of such services in rural areas through its Remote Area BroadBand Inclusion Trial ('RABBIT') and one provider, Internet Airworks, has already started services in Devon. Yet other operators are integrating WiFi and WiMax services into mobile telephony packages.

Power Line Communication (PLC)

Although various versions of this technology have been around for some years, it has only just reached a stage of development that enables it to be reliably and commercially deployed. The configuration of this system is shown in Fig 5.

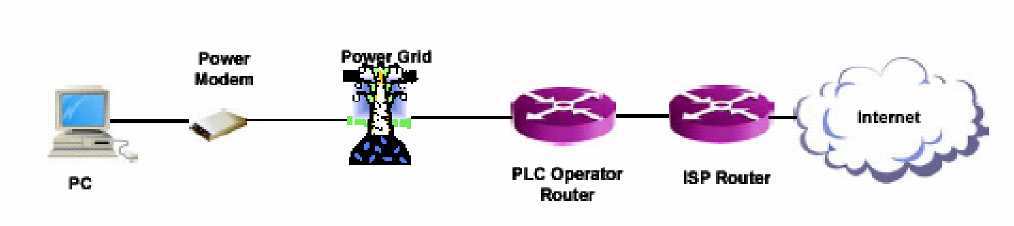

Fig 5

PLC broadband operates at frequencies between 1.6MHz and 30MHz using a protocol similar to DSL and the signal is inserted into existing power cables at suitable network points, typically at voltage conversion transformer stations. There are currently few commercial operations of this technology in Europe[6], and this position is not aided because of regulatory uncertainty regarding radio frequency interference that is possible from such networks. However, if these hurdles are cleared, the possibilities of PLC are enormous, since effectively, every island home already has a complete network in place that could support broadband delivery by virtue of the presence of electrical sockets in every room of every household. The Jersey Electricity Company has been trailing a similar system for remote meter reading.

Mobile Radio GPRS/3G

Existing mobile networks ('2G') and future networks ('3G') are capable of providing data connections at speeds of up to 2Mb/s. This technology is primarily designed to be a mobile solution to data delivery and theoretically enable data-on-the-move. However, the maximum data rates are likely to be achievable only while the handset is stationary.

This technology was developed as an enhancement of mobile telephony, initially as an upgrade to 2G technology, (sometimes known as '2½G') by the introduction of

[6] http://www.electrosuisse.ch/es/041021_%20Whitepaper%20PLC%202004.pdf

General Packet Radio Services (‘GPRS’). This can be further enhanced by the application of Enhanced Data GSM Environment (‘EDGE’) technology but the economic argument for this is less convincing in small networks. The cost of data delivery is therefore likely to be higher than that of fixed wire or fixed radio networks because of the inherent complexity of cellular radio networks. While this technology will no doubt find a niche market, it is unlikely in the short term to become a major factor in the general provision of broadband service delivery to the residential market.

In the local marketplace, JT operates a GPRS data service on its existing 2½G network. The JCRA has developed a 3G strategy with a view to introducing services in the near future.

Satellite and Digital Terrestrial Television (‘DTTV’)

Satellite is currently deployed in some jurisdictions as both unidirectional and bidirectional broadband services. The former is often accompanied by a dial-up narrow band uplink while the latter is considerably more expensive to deploy and is largely restricted to remote areas. Satellite also suffers from the problem of latency, that is, the delay experienced by the round-trip transmission delay of the geostationary satellite uplink. DTTV is similar in concept and would also rely on a separate uplink. DTTV is likely to be considerably delayed in the Channel Islands due to the regional prioritization provisions of the UK broadcast service operators. Although these technologies provide an alternative solution, it is thought unlikely that either will play a major role in the local market because of uncertainty of market entry timing and that other technologies may be cheaper or more readily available.

APPENDIX B

Evolving Networks

The lifespan of existing legacy circuit switched networks is drawing to a close and operators are starting to move towards a new more distributed switching infrastructure. The evolution from current telecommunications networks to next generation networks ('NGN') will mainly be gradual and will initially develop in network cores eventually moving out toward the network edges and the access segments. However, while some next generation networks will evolve from existing architectures others may be developed as entirely new networks. Nevertheless, public networks will have to integrate with one another regardless of the level of advancement or protocol types used.

In Jersey, JT has announced its intention to migrate to a 'softswitch' based network. A typical configuration is shown in Figure 1. This migration is stimulated both by the suppliers withdrawing support on existing network switching products, the introduction of value added services, such as video streaming, and the need to keep concurrent with other network operators.

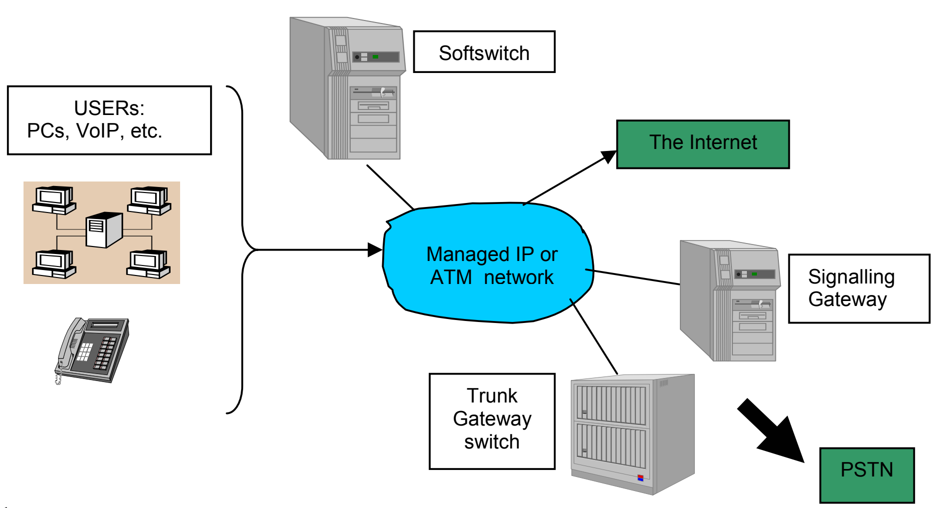

Fig 1

A feature of NGNs is that while the network core retains the 'intelligence' the switching components are moved to the 'edge' of the network. The network is thus still largely managed centrally but the data packets are routed through switches mounted at the edge of the network.

In a typical legacy network, the copper cable pairs are distributed throughout the external lineplant network through a series of interconnection points which ultimately terminate on the exchange Main Distribution Frame ('MDF'). All interfacing, regardless of the message protocol, is completed at the exchange site. Thus, in an existing network, broadband interfacing equipment is located alongside each MDF, and POTS is split at this point into the legacy switching and broadband systems. Typically, DSLAMs connect subscriber data services to ATM core switches which interconnect with uplink broadband services on other network segments or the Internet. Other data connections, such as Frame Relay and Ethernet, can also be interfaced at this point.

In the evolving network, the incumbent operators will start to move the DSLAMs away from the MDF towards the 'last mile' by the gradual introduction of fibre backhaul and network-edge packet switches and routers. Traditional POTS may even be replaced by Voice over Data ('VoD', sometimes called VoIP or Voice over Broadband 'VoB') services at a suitable point when such services can be supported entirely by power feed from the DSLAM. The network edge is an intelligent multiservice softswitch which enables the interconnection of various services between network segments and protocols as shown in Figure 9.

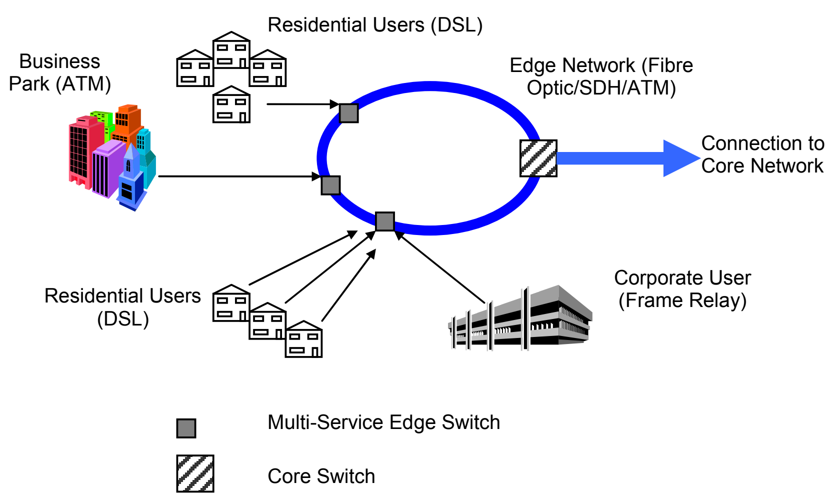

Fig 2

This new network architecture will impact on the way that services are delivered. The incumbent operator will have an advantage as deployment of DSLAMs and LLU will become more segmented. DSLAM costs have fallen but controlling servers and switches and backhaul will be distributed throughout the network thus imposing additional costs on OLOs who wish to co-locate or interconnect.

There may be some opportunity for fibre optic rings around densely populated areas where OLOs can interconnect at the incumbents 'last-mile' street cabinet connection points. The economics of this will depend on whether the OLO has access to its own duct or existing broadband networks. In some instances WiMax or point-to-point microwave circuits could perhaps be utilized. Alternatively, as part of the LLU offer, the incumbent may include a duct space access product through its RIO.

Service Considerations

With the migration to NGNs there will inevitably be a change of services offered to the end user as legacy networks are withdrawn. Some of consequences of this movement is that OLOs will have the opportunity of offering the end user a full range of services through access to the last mile, whether this is via access to the incumbent's fixed network or by some other means of accessing the 'last mile'.

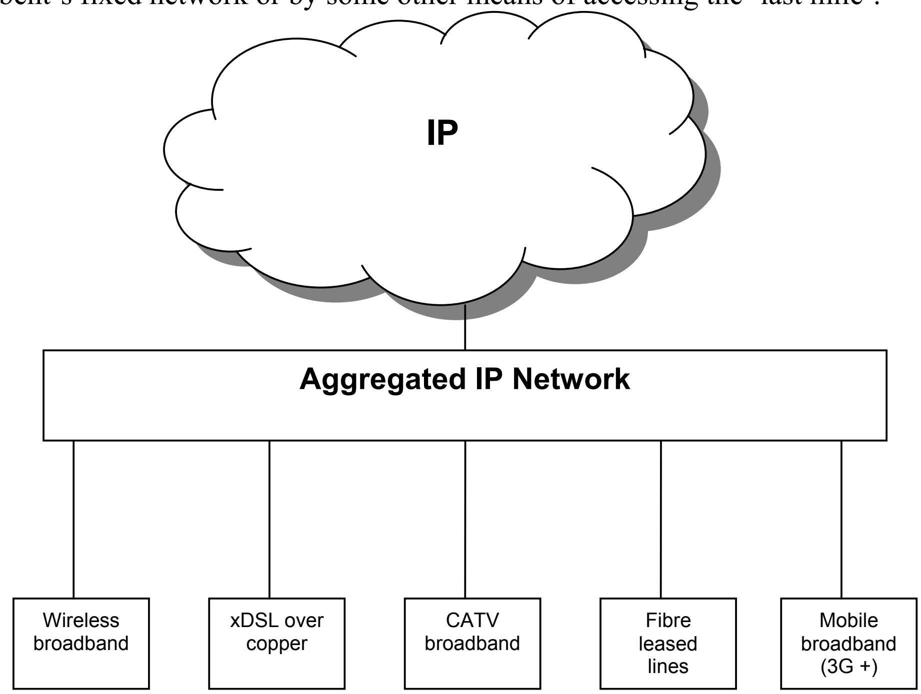

Fig 3

Figure 3 shows in outline how new communications networks will evolve. There will be a convergence between current network structures enabling an easier transfer of data between existing access platforms. Such a network will enable the development of new and innovative products and services for consumers. This consolidation of access technologies should deliver cost savings for network operators. While it will not substantially change the delivery of services over the last mile, there will also be alternative delivery mechanisms available to operators that can, in some cases, bypass the incumbent telephone operator's network.

During the process of network migration it is also important to consider the implications on existing wholesale services, for instance, xDSL and leased lines. The incumbent operator will need to ensure that there is a clear transition path available to ensure service continuity of the consumers of products already provided by OLOs. However, one important consideration is how to treat the users and providers of dial-up Internet services, since in migrating to NGN, which is broadband based, such services will become irrelevant.

New services will include the provision of voice services and in future the possibility of ENUM[7] call routing over IP networks connected by broadband backhaul to the Internet. The word 'ENUM' refers to the Internet Engineering Task Force ('IETF') protocol that takes a complete, international telephone number and resolves it to a series of URLs using a Domain Name System ('DNS')-based architecture.

With the increase in broadband access and increased bandwidth technologies, it is probable that providers will endeavour to migrate customers from traditional POTS services onto VoB in order to avoid duplication of network switching systems. This will require the provision of Number Portability from existing switched service directory numbers onto VoB IP protocol or ENUM equivalent identifiers. Ofcom has already consulted on this matter and has accepted that VoB providers can be allocated Geographic Numbers. Number portability will also enable the convergence of fixed and mobile numbers onto a single unique (IP) identifier that will follow the owner onto whatever network on which the user wishes to register anywhere in the world. Thus telephone numbers will no longer be tied to a fixed geographic location but jurisdiction will be identified by the ITU E.164 National Country Code associated with the translated telephone number, in the case of Jersey this is currently 44 as Jersey is a member of the UK NTNP. This, then, does not reflect the exact jurisdiction of the user of the number. It also raises the question of who 'owns' the number; the regulatory authority or the user? This highlights the issue of security and privacy on public DNS servers, even secure DNSSEC servers, as a certain amount of personal data is necessary for authentication. Registration of numbers needs to be certified by a suitable trusted or regulatory authority to reduce the possibility of identity 'hijacking' and misuse of data. It is therefore important that the data concerned is covered by legislation in the appropriate jurisdiction. In the UK a recent DTI consultation[8] had concluded that this process should be left to the private sector although it will be monitored by Ofcom under the UK E.164 number.

It is thus clear that it will be necessary for incumbent operators of legacy networks, or networks in the course of migration to NGN, to provide number portability to OLOs in order to promote fair competition. Fortunately, ENUM is only at the early stage of development, but there are signs that it will become more relevant as operators migrate to NGN. Nevertheless, whether ENUM is invoked or not, number portability to broadband service providers will be an important feature necessary for fair competition between incumbent operators and OLOs.

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[7] Further information can be found at www.enum.org and www.itu.int

[8] http://www.dti.gov.uk/consultations/files/publication-1286.pdf ENUM - Consultation on the Proposed Arrangements.