Purpose: To give interested parties the opportunity to give their opinions on the proposals in this paper for unbundling the local loop and other network elements and related matters including co-location.
# CONSULTATION

Local Loop and related facilities and services

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1 Introduction

1.1 Background

The “local loop” generally refers to the telecommunications circuit, usually pairs of copper wire, between the user’s premises and the telecommunications operator’s main distribution frame (MDF).

The cost of building the local loop infrastructure or an alternative functionally equivalent access infrastructure is high, requiring long periods of depreciation. This cost, as well as the practical difficulties associated with building such an infrastructure, are significant barriers to entry into fixed telecommunications markets for a second or subsequent operator.

In most countries, the incumbent’s monopoly in the provision of local loop services has led to market dominance particularly in basic services such as telephony. Through this monopoly, the incumbent obtains at least significant market power (SMP) in the markets for other services including internet access and leased line services, and in switched data services such as those provided by frame relay and ATM outside business areas of major cities.

Regulatory authorities in other jurisdictions have essentially fostered competition in the local loop in two ways:

- Licensing and encouragement of alternative access infrastructures, and
- Mandating access by Other Licensed Operators (OLOs) to the local loop by various means.

While it will be possible under the Telecommunications Law to establish an alternative local loop infrastructure, the experiences of other jurisdictions suggests that this is not always the most practical approach.

The requirement for OLOs and Internet Service Providers (ISPs) to have access to the local loop in a non-discriminatory manner arises from the need to reduce the incumbent’s dominance within the local telecommunications market and thereby facilitate the economically efficient use of resources.

1.2 This document

This consultation paper considers access to local loop facilities and services, and related telecommunications facilities and services that an operator dominant in relevant markets may be required to offer to OLOs under Section 57(e) of the Telecommunications Law.

The local loop facilities and services considered in this paper are wholesale DSL, simple DSL resale, ULL, sharing of ducts and sharing of other physical infrastructure.

The related services considered are those necessary for an OLO to use these facilities and services. Related services include co-location services (including DSL co-location), backhaul services, access to Operational Support Systems (OSS), and the information services and implementation services necessary for an OLO to plan, procure and exploit the use of such services.

- This consultation is intended to seek opinions from interested parties regarding the TRA’s proposals concerning local loop and related facilities and services.
1.3 Relationship to other consultations

The TRA is currently undertaking a consultation associated with access markets\(^1\). The access consultation considers, *inter alia*, Batelco’s market power within these markets.

The full liberalisation of the telecommunications market in Bahrain on July 1\(^{st}\) 2004 will enable OLOs to offer numerous services including those that are in part dependent on access to the local loop infrastructure. Non-discriminatory access to the local loop is typically used by alternative service providers for:

- Telephony services;
- Broadband internet access services;
- Leased line services;
- Access to a VPN service;
- Corporate switched services.

The markets for these services are defined in the access consultation paper.

It is the TRA’s opinion that stimulation of such retail markets is best achieved by ensuring that new entrants have access to necessary resources and not by regulating the retail market, although that may be necessary in the short to medium term.

This local loop consultation seeks opinions regarding the impact of access to the facilities and services covered in this paper on those retail markets defined in the access consultation paper, and particularly on Batelco’s market power in those markets.

The markets in which local loop facilities and services are offered by an incumbent to an OLO are functionally different from the retail markets covered by the access consultation. This paper discusses the wholesale markets in which local loop facilities and services are offered. The TRA seeks opinions concerning the definition of these markets, Batelco’s market power within them, and the impact of access to Batelco’s local loop facilities and services on these markets and on Batelco’s market power in them.

1.4 Document structure

The remainder of this document is structured as follows:

Section 2 defines and describes the alternative methods of allowing a new entrant to gain access to the incumbent’s local loop infrastructure.

Section 3 describes the ancillary services that may need to be provided by the incumbent.

Section 4 describes the retail markets that will be affected by opening up the local loop infrastructure and the wholesale markets in which local loop facilities and services will be provided.

Section 5 evaluates the options for access to DSL and ULL facilities and services, and related facilities and services, in Bahrain.

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\(^1\) Dominance in certain markets and the provision of Access services for the purposes of Section 57(e) of the Telecommunications Law
Section 6 discusses pricing of facilities and services.

Section 7 describes the consultation process.

This paper also contains four annexes that provide relevant background detail to the discussion in the main body of the paper.

Annex 1 describes the experience of access to local loop facilities and services in certain other markets around the world, focusing particularly on the OECD and Europe.

Annex 2 describes the current market for DSL services in Bahrain.

Annex 3 describes duct sharing experience in other countries.

Annex 4 makes proposals regarding the characteristics of the services that might form the reference access offer for local loop related facilities and services from a licensed operator dominant in relevant markets. These proposals draw on published material from other jurisdictions.

The Glossary is in Annex 5.

Annex 6 lists the consultation questions.

1.5 Relevant references within the Telecommunications Law and Licences

Any word, phrase or expression used in this consultation shall, unless the context requires otherwise or it is expressly defined herein, have the same meaning as it has in the Telecommunications Law.

Under Section 3(b) of the Telecommunications Law, the TRA has been established to:

“1 Protect the interests of subscribers and users in respect of:
   2 The tariffs charged for services
   3 Availability and provision of service
   4 Quality of services; and
   5 Protection of personal particulars and privacy of services;

2 Promote effective and fair competition among new and existing licensed operators; and

3 Ensure, when assessing applications involving provision of public telecommunications services, that any applicant or any person to whom any such service falls to be provided, shall be able to provide those services.”

Amongst other duties powers set out in Section 3(c), the TRA has the power to:

“13 encourage, regulate and facilitate adequate access and interconnection and interoperability of services, including, where necessary, enforcing the sharing by public telecommunications operators of the benefit of facilities and property;”

The Telecommunications Law defines “Access” as “the making available of telecommunications facilities and/or telecommunications services to another licensed operator for the purpose of providing telecommunications services, including the connection of equipment by wire or wireless means, access to physical infrastructure
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including buildings, ducts and masts, access to mobile networks and access to number translation or networks offering equivalent functionality.”

The Telecommunications Law defines “unbundled local loop” (ULL) as “the physical connection from the subscriber’s premises to the public telecommunications operator’s local exchange, excluding switching or ports, purchased by a licensed operator from another licensed operator.” Local Loop Unbundling (LLU) generally refers to the process in which one licensed operator leases, wholly or in part, the local segment of its telecommunications network to another licensed operator (OLO) and thereby establishes an unbundled local loop.

The Telecommunications Law defines “DSL” as “point-to-point public telecommunications network access that allows multiple forms of telecommunications to be carried over twisted-pair copper wire between the local exchange of the public telecommunications operator and the subscriber.”

The Telecommunications Law, in Section (40), sets down a timetable for the provision “by public telecommunications operators with significant market power”, inter alia:

- Wholesale DSL services (July 1st 2003)
- Unbundled Local Loop (July 1st 2004)
- “Access to telecommunications facilities including DSL co-location, …, and where the Authority so determines, ducts” (July 1st 2004)

The Telecommunications Law in Section (57), Interconnection and Access, specifies in Section 57(e) that “A licensed operator in a dominant position shall offer access to its telecommunications network and telecommunications facilities on fair and reasonable terms to any licensed operator on request. Such operator shall only be under an obligation to offer access to ducts to a licensed operator if the Authority considers that substantive demand exists for such access. Such demand is deemed to exist in the case of a holder of a mobile telecommunications license.”

Section 13.1 of Batelco’s National Fixed Services Individual License defines circumstances whereby Batelco is required to provide access to its national fixed telecommunications network on the reasonable request of any licensed operator. “Access shall be provided in a manner that is non-discriminatory and at a point or level within such a network that is determined by the Regulator to be technically feasible and consistent with the most efficient delivery of telecommunications services to the ultimate consumer of such services” if Batelco is considered to be dominant in a relevant market.

Under Section 13.4 of the same license, “the Regulator may determine all tariffs to be made for the provision by the licensee of access. In determining such tariffs the Regulator shall consider international benchmark charging levels for a similar service and conditions prevailing within the licensed area, including scale, but, in any event, shall ensure that such tariffs are:

(a) cost oriented and sufficiently unbundled so that the acquirer of access services does not pay for network components or facilities that it does not require; and
(b) in all cases reasonable and, with respect to similar situated users, non-discriminatory.”

Moreover, under Section 21 of the same license, Batelco must comply with relevant regulations and technical specifications issued by the Regulator in order to ensure
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interoperability with the services and networks of other licensed operators to the extent technically feasible.
2 Methods of providing access to local loop facilities and services

This section outlines several options that give an OLO access to the local loop facilities and services of an incumbent operator. Some of these options are identified as being appropriate and potentially necessary for the Kingdom of Bahrain.

The related co-location, backhaul, information and implementation services are described in Section 3.

2.1 Infrastructure model

New entrants may access the local loop facilities and services of the incumbent in a number of ways, including:

1. Simple DSL resale – a new entrant resells an undifferentiated DSL access service in conjunction with its own portfolio of value added services;
2. Wholesale DSL or bitstream access - a new entrant delivers its own access services that incorporate DSL elements provided by the incumbent;
3. Provision of an unbundled local loop, including:
   a. Full local loop unbundling – a new entrant uses the physical connection from the subscriber’s premises to the public telecommunications operator’s local exchange, excluding switching or ports, as a constituent part of its own service infrastructure;
   b. Sub-loop unbundling – a new entrant uses the segment of the local loop from the end user’s premises, to an intermediate point in the local loop as a constituent part of its own services;
   c. Line sharing – a new entrant uses the portion of the local loop that is not used for PSTN or ISDN services as an element in its services; the PSTN or ISDN portion remain in the control of the incumbent and may be used by the incumbent to provide other services;
4. Duct sharing – a new entrant places its own infrastructure in the ducts or on the poles of the incumbent; and
5. Trench sharing – a number of operators collaborate to dig a combined trench and each then lays its own ducts and cables.

2.2 Simple resale

Simple resale of the incumbent’s DSL services may be used by individual ISPs and value added service providers to gain access to customers for their own value added services. There is no possibility of differentiating between the resold DSL service and that provided by the incumbent. Simple resale may be attractive to a new entrant because it is rapid to implement and requires minimal investment. A new entrant can compete with the incumbent in internet access through pricing or by offering alternative bundles of services that include internet access as well as the new entrant’s own services. It is of particular interest to new entrants whose core business is in a different market, for example, content provision or e-commerce.
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Simple resale does not increase the variety of services in the market or enable alternative levels of quality of service to be offered in the market but may exert downward pressure on prices.

The TRA is considering whether to regard simple DSL resale as providing access to another operators facilities and services.

Consultation

1. The TRA seeks opinions from interested parties regarding the role of simple resale of Batelco’s DSL services in the Kingdom of Bahrain in terms of the markets that will be affected and the nature of the impact.

2.3 Wholesale DSL (Bitstream access)

“High speed [bitstream] access … refers to the situation where the incumbent installs a high speed access link to the customer premises (e.g. by installing its preferred [DSL] equipment and configuration in its local access network) and then makes this access link available to third parties, to enable them to provide high speed services to customers. The incumbent may also provide transmission services to its competitors, to carry traffic to a ‘higher’ level in the network hierarchy where new entrants may already have a point of presence (e.g., transit switch location). The bit-stream service may be defined as the provision of transmission capacity (upward/downward channels may be asymmetric) between an end-user connected to a telephone connection and the point of interconnection available to the new entrant.”

Bitstream access differs from the simple resale of a DSL service in the degree to which differentiation is possible. Whereas simple resale allows no differentiation, bitstream access allows for some differentiation between the DSL service provided by an OLO and the DSL service provided by the incumbent. Bitstream makes it possible for an OLO to compete with the incumbent in terms of quality of service and to some extent in the range of DSL services offered. Because some differentiation is possible, bitstream access is often referred to as a wholesale DSL service to distinguish it from simple resale.

In Bahrain, wholesale DSL is mandated in Section 40 of the Telecommunications Law. The TRA proposes that the wholesale DSL service mandated under the law be defined as bitstream access. The TRA is currently investigating whether the “Wholesale DSL” service currently offered by Batelco is bitstream access and to what degree it is consistent with proposals for wholesale DSL made in this paper.

The degree of differentiation depends on precisely how bitstream access is implemented. In all cases of bitstream access, the incumbent provides the Digital Subscriber Line Access Multiplexor (DSLAM). The set of DSL services is constrained ultimately by the DSLAM configuration options allowed by the incumbent. Thus, the incumbent will continue to have control over the particular types of DSL service offered – asymmetric or symmetric, standards used, etc, and over the maximum upstream and downstream transmission speeds, although these parameters may be configured differently for an OLO and for the incumbent.

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The Independent Regulators Group (IRG)<sup>3</sup> identifies the four main bitstream options shown in Figure 1. The options refer to the numbers in Figure 1.

1. DSLAM. The incumbent provides the DSL access link and hands over the bitstream to the OLO directly after the DSLAM. The OLO can select DSL profiles defined by the incumbent for the DSLAM and use its own network infrastructure to determine quality of service (e.g. different overbooking and contention parameters) and its own Broadband Remote Access (or Aggregation) Server (BRAS). As the OLO runs the BRAS, it is able to undertake authentication and offer services defined by the BRAS.

2. BRAS. The incumbent provides the DSL access link and a backhaul service to a point of presence at which the OLO has its BRAS. The OLO can specify within the bounds set by the incumbent, the characteristics of the backhaul service. It can therefore control quality of service and BRAS related services.

3. IP point of interconnection. The incumbent provides the DSL access link and a backhaul service, including the BRAS terminated at an IP point of interconnection. While the OLO may still manage quality of service in the backhaul network, it has little control over overbooking within the DSL service itself and cannot differentiate on the basis of BRAS related services.

4. Simple resale (as described in Section 2.2). The incumbent provides end to end connectivity between the end user and the public internet. There is no

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<sup>3</sup> The IRG is a group of European National Telecommunications Regulatory Authorities from EU and EFTA countries established in 1997 to share experiences and points of views on issues of common interest.
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possibility of differentiating on the basis of technical characteristics offered.

Bitstream access differs from the provision of DSL services using full LLU and line sharing in the provisioning of the DSLAM. Bitstream access implies that the DSLAM is under the control of the incumbent. When DSL services are provided using full LLU and line sharing, the DSLAM is under the control of the OLO irrespective of the location of the DSLAM or what organisation undertakes day to day operations.

Telephony services provided by the OLO, with the exception, potentially, of IP telephony, are not enabled over bitstream access.

Consultation

2. The TRA seeks opinions from interested parties regarding wholesale DSL including:
   (a) The point(s) of interconnection that should be enabled for wholesale DSL;
   (b) The DSL profiles that should be offered under wholesale DSL;
   (c) The markets affected by the introduction of wholesale DSL and the impact on those markets.

2.4 Full local loop unbundling

"Full local loop unbundling occurs when the [local loop] connecting a subscriber to the MDF is leased by [an OLO] from the incumbent. The [OLO] takes total control of the [local loop] and can provide subscribers with all services including voice and DSL. The incumbent still owns the local loop and is responsible for maintaining it."4

The TRA is minded to consider full LLU as one method of providing an unbundled local loop as defined in the Telecommunications Law and identified under Section 40 of the Law.

The OLO accesses the local loop at the incumbent’s exchange premises before the signals are processed by any of the incumbent’s facilities. Thus, the OLO gains access to the local loop at the Main Distribution Frame (MDF) or equivalent. Typically a tie cable is provided by the incumbent to extend the local loop to a distribution frame owned by the OLO5. The OLO then provides the facilities for the required customer service behind this distribution frame. Figure 2 below shows the main components of such a configuration when the local loop provides a “metallic path” and the services that are provided over this facility by an OLO comprise a telephony service and a DSL service.

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4 Developments in Local Loop Unbundling, OECD, September 2003
5 The precise configuration depends on the nature of the co-location service used.
As well as the local loop itself, the incumbent would ordinarily offer the following facilities to a new operator.

1. A tie cable (1) connecting the MDF to the OLO’s facilities. The OLO’s facilities may include: a splitter if both telephony and DSL are to be provided, the OLO’s switch or DSLAM if only one service is to be provided, or an external tie cable if the OLO’s facilities are located in its premises rather than co-located in the exchange. The internal tie cable would ordinarily be leased from the incumbent. The external tie cable is often provided by the OLO. However, the incumbent may ‘pull through’ the external tie cable into its premises.

2. Backhaul from the OLO’s DSLAM to its BRAS.

3. A managed IP service to provide the OLO with an IP backbone.

4. Access to the Bahrain Internet Exchange (BIX) as defined under Section 41 of the Telecommunications Law.

5. Access from an OLO’s switch to the PSTN.

Full LLU is facilitated by co-location services provided by the incumbent. These are described further in Section 3.1.

Full LLU gives control of the local loop to the OLO. As a consequence, the OLO is able to deliver any service that may be supported by the local loop. The services that the OLO will be able to provide to end users over this facility will be limited by:

- The precise nature of the local loop; metallic path, fibre, radio transmission, etc;
- The level of radio emissions from the local loop and service equipment resulting from the provision of service;
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- The susceptibility of other services provided on the same or on an adjacent facility to interference as a result of radio emissions;
- The cable length;
- Any line conditioning or other plant that may be installed on the local loop.

Generally, the incumbent and OLOs that are taking ULLs must agree on a standard set of performance characteristics for the equipment to be installed on the lines to ensure that there is no interference with other services provided on the cable. Usually, the incumbent will define a spectral management plan that will set out how available bandwidth may be used.

Consultation

3. The TRA seeks opinions from interested parties regarding:
   (a) The services that Batelco should provide in support of full LLU, for example:
      i. Tie cables to provide a connection from the MDF to the OLO’s facilities.
      ii. Backhaul from the OLO’s DSLAM to its BRAS.
      iii. A managed IP service to provide the OLO with an IP backbone
      iv. Access to the Bahrain Internet Exchange (BIX) as defined under Section 41 of the Telecommunications Law.
      v. Access from an OLO’s switch to the PSTN.
   (b) The definition of the performance characteristics of the equipment that can be attached to local loop to provide customer services and the methods that may be used to come to an agreed definition of these performance characteristics.
   (c) The markets affected by the introduction of full LLU and the impact on those markets.

2.5 Sub-loop unbundling

Sub-loop unbundling allows for the possibility of gaining access to the incumbent’s local loop infrastructure for local loop unbundling at a point outside the parent exchange and closer to the customer than the MDF. It is applicable where line lengths are long or where DSL is required to provide very high speed communication over short distances. Incumbents are obliged to provide sub-loop unbundling in the USA, Japan and the EU, although in the latter a number of countries have yet to comply.

The TRA believes that the issues concerning sub-loop unbundling should be left for later review, since it relies upon the availability of a multi-Mbit/s infrastructure that provides high density coverage. Without such an infrastructure, as is the case in Bahrain at the present, backhaul from sub-loop unbundling points of interconnection would not be possible at the transmission speeds required.

Consultation

4. The TRA requests opinions regarding requirements for sub-loop unbundling and on the TRA’s view that it should be left for a later review.
2.6 Line sharing

Line sharing occurs when the incumbent and the OLO share use of the local loop. The local loop is owned and maintained by the incumbent, who uses it typically to provide PSTN or Basic Rate ISDN services to a subscriber. The OLO leases spectrum on the local loop to provide other services to the same subscriber. The OLO provides DSL services using its own DSLAM and other facilities. In this respect it is similar to full LLU and differs from bitstream access where the incumbent provides the DSLAM.

The TRA is minded to consider line sharing as a method of providing an unbundled local loop as defined in the Telecommunications Law.

Line sharing, in comparison with full LLU, generally gives the advantage of a lower leasing cost. However, it may not be possible for the OLO to deliver some of the services that an OLO may implement over a fully unbundled local loop. For example, telephony, other than IP telephony, and higher bit rate, or extended reach DSL services is not possible.

The nature of the DSL services that an OLO is able to offer using line sharing will be subject to the same kinds of restrictions arising from the potential for radio emissions in the cable or equipment to interfere with other services as are faced with full LLU, with the additional possibility that the DSL service provided by the OLO may interfere with the incumbent’s services on the same local loop. Thus, involved parties must agree the performance characteristics of allowed DSL equipment that covers the potential for interference between the incumbent’s services and the OLO’s services. This definition should be non-discriminatory.

2.6.1 Methods of implementing line sharing

There are two principal approaches to line sharing, based on ownership of the splitter. Some regulatory authorities mandate ownership by the incumbent, others mandate ownership by the OLO, and others allow choice between these two options. Where choice is allowed, there is a price difference between the options based on the cost of providing and maintaining the splitter. The two options are described below.

2.6.2 Incumbent’s splitter

Figure 3 below illustrates the case where the splitter is owned by the incumbent.
Figure 3: Line sharing implemented at the incumbent’s splitter

The point of interconnection is at the incumbent’s splitter. A tie cable (1) links this to the OLO’s DSLAM co-located on the incumbent’s premises or to an external tie cable that links to the OLO’s DSLAM on the OLO’s premises.

The OLO is then responsible for backhaul from the DSLAM. In particular the OLO must provide backhaul to the BRAS (2) and an IP backbone (3) that *inter alia* links to the BIX (4). In the absence of an alternative infrastructure, the incumbent is required to provide (2), (3) and (4) where the facilities are located in different buildings in order for line sharing to be possible.

2.6.3 OLO’s splitter

Figure 4: Line sharing implemented at the OLO’s splitter
Figure 4 above illustrates the case where the splitter is owned by the OLO. The point of interconnection is at the OLO’s splitter. A tie cable (1a and 1b) links the MDF to the OLO’s splitter co-located on the incumbent’s premises and back from the splitter to the MDF for connection to the incumbent’s telephone switch. A second tie cable is then necessary from the splitter to the OLO’s DSLAM or to an external tie cable that links to the OLO’s DSLAM on the OLO’s premises.

The OLO is then responsible for backhaul from the DSLAM. In the absence of an alternative infrastructure, the incumbent is required to provide backhaul to the BRAS (2) and IP backbone (3) and a link to the BIX (4) where the facilities are located in different buildings in order for line sharing to be possible.

Consultation

5. The TRA seek opinions from interested parties regarding how line sharing should be implemented in Bahrain.

(a) The services that Batelco should provide in support of line sharing, for example:
   i. Tie cables to provide a connection from the MDF to the OLO’s facilities.
   ii. Backhaul from the OLO’s DSLAM to its BRAS.
   iii. A managed IP service to provide the OLO with an IP backbone.
   iv. Access to the Bahrain Internet Exchange (BIX) as defined under Section 41 of the Telecommunications Law.

(b) The definition of the performance characteristics of the equipment that can be attached to the local loop to provide customer services when lines are shared, and the methods that may be used to come to an agreed definition of these performance characteristics.

(c) The markets affected by the introduction of line sharing and the impact on those markets.

2.7 Sharing of ducts and other physical infrastructure

Section 40 of the Telecommunications Law indicates that an operator with significant market power must provide access to its facilities, including, where the TRA so determines, access to its ducts from July 1st 2004. Section 57(e) defines criteria that the TRA is required to use in this determination: “An operator shall [not] be under an obligation to offer access to ducts to a licensed operator unless the [TRA] considers that substantive demand exists for such access. Such demand is deemed to exist in the case of a holder of a mobile telecommunications license.”

The TRA, therefore, will have to consider whether sufficient demand is likely to arise (apart from that which may be manifest from the second mobile licensee according to Section 40 (6) of the Telecommunications Law) and in what manner Batelco may be obliged to offer duct sharing.

Several other jurisdictions require incumbents to share physical infrastructure, particularly radio masts and poles. Duct sharing is less common but is mandated in the USA, Australia, Finland and Japan. The conditions relating to duct sharing in these countries are discussed in Annex 3.
Local Loop and related facilities and services

The advantages of sharing physical infrastructure are many:

- Reduced environmental impact;
- Reduced traffic disruption when an OLO builds out a new network;
- Reduced overall investment requirement by a new entrant to a market; and
- Improved return to the incumbent on an investment in infrastructure.

The disadvantages pertaining to Bahrain are mainly concerned with network integrity and the definition and availability of spare capacity.

Duct sharing is usually allowed only if it is possible to provide a separate conduit within a duct for an individual operator. A duct owner is typically not required to share conduits because of the possibility of damage to other cables when pulling through new cable. As the number of conduits is always limited, there is a need for a procedure to determine which operator has priority.

Sharing of ducts also requires sharing of chambers in the ducting system.

An OLO may use duct sharing for its backbone network, to provide comprehensive coverage in a particular area and to install external tie cables for ULL between the incumbent’s exchange and the OLO’s premises. Therefore, within the context of this consultation paper duct sharing would be used for services where an OLO would expect a reasonably high level of penetration by premises. Perhaps the only service where penetration may be sufficiently high is telephony. Leased lines, switched data services and internet access services will all have lower levels of penetration except in areas of high business concentrations.

The TRA is considering the conditions that should be taken into account in requiring Batelco to provide OLOs with access to its ducts, should Batelco be found to be a significant market power in a relevant market. At this stage, the TRA does not have full information about the availability of space within the current ducting systems in Bahrain. If availability of space in ducts was to be found to be limited in some circumstances, then the TRA may consider accepting limits to duct sharing on a case by case basis. Such limits might include, for example, a ‘first come, first served’ approach for allocating space to OLOs and a ‘use it or lose it’ requirement on OLOs.

Consultation

6. The TRA seeks opinions from interested parties on the importance of duct sharing, the availability of suitable ducting by area and the rationing of space available for sharing. The TRA seeks to understand what duct space is required for maintenance, future plans by Batelco and particular pinch point (points where space will be unusually limited) in the network, so that an informed decision can be made about availability. The TRA seeks to understand the likely demand for duct sharing, and the relationship between demand for duct sharing and demand for LLU and line sharing.

7. The TRA seeks to understand the availability of space in chambers within the duct network, the availability of power in these chambers for use by OLOs, and the requirement for space in such chambers.
CONSULTATION

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2.8 Trench sharing

Trench sharing between operators is a means of reducing cost, disruption and environmental impact associated with laying cable to reach newly developed areas. The TRA hopes that operators will in the future be able to cooperate in digging trenches and laying trunking in a non-competitive manner. The TRA does not believe that there is a need, at this stage, to create measures to enforce trench sharing, however, all operators should be treated equally by the relevant authority.

Consultation

8. The TRA seeks opinions concerning trench sharing between licensed operators.
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3 Ancillary services

Local loop facilities and services terminate at the incumbent’s exchange. An OLO that intends to use such facilities and services needs ancillary services to gain access to these services at an exchange.

Ancillary services include:

1. Co-location and other location related services;
2. Backhaul services and delivery of traffic to the internet;
3. Access to ordering systems and operational support systems;
4. Information about the availability of services and the network configuration; and
5. Installation, maintenance and operational services.

Table 1 below shows the relationships between ancillary services and the methods of providing access to local loop facilities and services described in Section 2.

<table>
<thead>
<tr>
<th></th>
<th>Simple DSL resale</th>
<th>Wholesale DSL</th>
<th>ULL Full LLU</th>
<th>ULL Line sharing</th>
<th>Duct sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-location</td>
<td>n/a</td>
<td>n/a</td>
<td>✓</td>
<td>✓</td>
<td>n/a</td>
</tr>
<tr>
<td>Backhaul to OLO’s site</td>
<td>n/a</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>n/a</td>
</tr>
<tr>
<td>Delivery to the internet</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>n/a</td>
</tr>
<tr>
<td>Access to ordering systems</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Information</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Installation, maintenance and operational services</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 1: Relationship between alternative forms of access and ancillary services

3.1 Co-location

Section 40 (6) of the Telecommunications Law identifies DSL co-location as a service required of public telecommunications operators who have significant market power from July 1st 2004. Given the definition of the term DSL in the Telecommunications Law (See Section 1.5 of this paper), The TRA is minded to define DSL co-location as the provision of co-location space to an OLO, who has procured a number of unbundled local loops or a wholesale DSL service, for the purpose of installing and managing equipment that is required to provide a telecommunications service over the procured unbundled local loops or wholesale DSL service.
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Irrespective of the precise definition of DSL co-location however, co-location in general, as a telecommunications facility, is required of a dominant licensed operator under Section 57(e) of the Telecommunications Law.

Co-location in association with access to local loop facilities and services allows an OLO to install and manage equipment that must be located close to the local loop termination point at the incumbent’s premises. Without such co-location, an OLO would have to obtain a site near the exchange and then provide links between its equipment and the incumbent’s MDF using a combination of internal and external tie cable. The greater the distance between the local loop termination point and the equipment, the more likely it is that there will be an adverse effect on the performance of the overall system and hence on the performance of services that the OLO provides over the system. Thus, the absence of co-location services can discriminate against an OLO in the provision of services over the local loop.

The incumbent may provide co-location space within the exchange building or in a nearby location. If co-location is not in the exchange building itself, the location of the OLO’s equipment needs to be sufficiently close to the exchange that the characteristics of the local loop are not adversely affected.

Co-location space may be provided:

- In a distinct caged space accessible to an OLO with or without separate entrance facilities;
- In a separate un-caged space;
- Within a single overall space shared with the incumbent; this form of co-location is often referred to as co-mingling; and
- As virtual co-location space, where the equipment is managed in its entirety by the incumbent.

There are significant disadvantages in the provision of separate caged or un-caged space, both to the incumbent and to OLOs.

The incumbent may be faced with significant reorganisation of facilities in the exchange building to free up space in advance of any request for space by an OLO. Failure to do so may mean that the incumbent is unable to meet required timescales for the installation of an OLO’s equipment. The incumbent is therefore faced with significant costs before knowing whether there will be a return on its investment. As these costs are ordinarily included in the costs of ULL, OLOs would ultimately be disadvantaged by a higher cost for the procured service. In addition, other regulatory authorities have found it difficult to allocate such start up costs between OLOs. Such cost allocation problems have undermined the feasibility of using co-location services, and hence of ULL in those jurisdictions.

Separate areas and caged areas require space to be set aside for circulation and to provide a demarcation between individual OLOs and the incumbent. This additional space requirement may limit the number of OLOs within an exchange, or in some exchanges make co-location impractical due to an overall shortage of space. In addition, rental charges for co-location space will be higher because the net usable space in the exchange is reduced.

In contrast, co-mingling allows space to be allocated in small quantities with no additional requirement for circulation or demarcation. Thus, co-mingling allows an
incremental approach to ULL and therefore offers advantages of cost and speed of implementation over the provision of separate caged or un-caged areas.

In other jurisdictions, incumbent operators have claimed that network security is risked when OLOs are able to move freely within an exchange building to service co-mingled equipment. These claims have generally been proven to be unfounded. The TRA is of the view that security considerations can be successfully managed by agreement between OLOs and the incumbent about requirements for security vetting of installation and maintenance staff.

The TRA believes that the advantages of co-mingling outweigh the disadvantages, and is therefore considering requiring co-mingling as a form of DSL co-location and therefore subject to Section 40 of the Telecommunications Law. The TRA is also considering specifying co-mingling as a form of access to telecommunications facilities or services and therefore subject to Section 57(e) of the Telecommunications Law.

The TRA is considering allowing the provider of such co-location space to propose an allocation of space for an OLO within an exchange or elsewhere, provided that this is done in a fair, reasonable and non discriminatory basis. Furthermore, the TRA is also of the view that the OLO be given the opportunity to object and to propose alternative arrangements. This might be necessary to ensure that for example, an OLO could maintain contiguity of its facilities. A suitable arbitration mechanism might be necessary to ensure that a reasonable compromise could be met.

The TRA is minded to require the unescorted access for a co-locating OLO’s vetted employees or sub-contractors who install, operate or maintain the equipment on operator’s premises except in exceptional circumstances. However, the TRA is also considering requiring co-locating OLOs and the provider of co-location space to agree a vetting procedure for such employees and sub-contractors.

The alternative is for the operator to offer a virtual co-location service to OLOs. While this may be a commercially feasible service, the TRA believes that the availability of such a service is insufficient to meet the needs of OLOs in all cases. Therefore, the TRA is of the view that the operator must allow OLO’s staff to manage OLO’s equipment at any of its exchanges.

The nature of the equipment that may be co-located has been discussed by other regulatory authorities. The TRA’s current view is that a public telecommunications operator should be required to co-locate only equipment “necessary for interconnection or access to unbundled network elements if an inability to deploy that equipment would, as a practical, economic, or operational matter, preclude the requesting carrier from obtaining interconnection or access to unbundled network elements”6 and multifunction equipment “only if the primary purpose and function of the equipment, as the requesting carrier seeks to deploy it, are to provide the requesting carrier with "equal in quality" interconnection or "non-discriminatory access" to one or more unbundled network elements”7 and if the other functions of the equipment do not significantly increase the burden on the incumbent's property.

Given the geographic extent of Bahrain, the TRA does not consider it necessary, at this stage, to require a public telecommunications operator with significant market power to

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6 FCC, 12th July 2001
7 ibid
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provide cross connect facilities between OLOs at its exchanges. However, the TRA seeks opinions specifically concerning this point of consideration since it may place the operator in a superior position to OLOs and therefore be viewed as discriminatory.

Consultation

9. The TRA seeks opinions from interested parties concerning all aspects of co-location, but specifically:
   (a) The definition of DSL co-location;
   (b) Requirements for co-location;
   (c) Availability of space;
   (d) Means of allocating space to individual OLOs;
   (e) Security and vetting of staff;
   (f) The equipment that may be located at an exchange or at other locations within Batelco’s network;
   (g) Cross-connection services at a Batelco exchange.

3.2 Access to offsite facilities

The TRA is considering whether to require Batelco to provide facilities at all exchanges for external tie cables that can enable an OLO to locate its equipment at its own location next to or near to the exchange rather than being co-located within the exchange.

Consultation

10. The TRA seeks opinions concerning external tie cables and other issues associated with offsite access.

3.3 Backhaul to the OLO’s site and to the internet

Backhaul, in the context of the local loop related facilities and services considered in this paper, is a means of conveying traffic from a suitable local loop service termination point to an OLO’s point of presence. It is a required element of all local loop facilities and services except simple DSL resale, since without backhaul, the OLO would not be able to use the local loop facilities and services that it had procured.

It may be some time after full liberalisation before alternative backbone facilities are available in Bahrain. Until that time, the only backbone facilities that might be available to OLOs for backhaul are those that might be provided by Batelco.

Should Batelco be found to have significant market power in a relevant market, the TRA is considering a requirement for Batelco, under Section 57(e) of the Telecommunications Law, to give access to its backbone facilities in the form of an offer of suitable backhaul services. These services will need to be of sufficient capacity to enable the OLO to convey the traffic from hundreds or thousands of broadband connections from any exchange to the OLO’s premises. To ensure fair reasonable and non-discriminatory access to the local loop, the capacity of these services, and the availability should be similar to the capacity available to Batelco itself. Thus services should be available at speeds from 2Mbit/s upwards.

The services to be provided would need to enable the following:
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- OLO access to the back of Batelco’s DSLAM or its own transmission equipment at Batelco’s exchange site;
- OLO access to Batelco’s BRAS at a transmission level; and
- OLO access at from Batelco’s Managed IP network;

In addition, the TRA is considering whether to require Batelco to offer similar services from the OLO’s point(s) of presence to the BIX in the absence of any available alternative.

Consultation

11. The TRA seeks opinions from interested parties concerning backhaul options and in particular whether Batelco should be required to offer:

(a) Transmission level services from each of its exchange sites;
(b) Managed IP services from each of its exchange sites;
(c) Backhaul from an OLO’s point of presence to the BIX.

In addition:

(d) What transmission speeds should be provided?
(e) What other service characteristics should be provided?

3.4 Access to ordering systems and operational support systems

It will be important that OLOs and Batelco’s retail and customer support systems have access to similar ordering processes and operational support in order to ensure that the provision of local loop services to OLOs is fair, reasonable and non-discriminatory. These systems will need to provide a similar level of response to all parties.

The TRA is considering, therefore, whether to require Batelco to provide a suitable electronic ordering service for OLOs and access to Batelco’s operational support systems in conjunction with a clearly defined order process and processes for fault and performance management for local loop access and agreed service levels.

Consultation

12. The TRA seeks opinions from interested parties on the process and system requirements for planning, ordering, provisioning and operational support associated with local loop, co-location and backhaul services.

3.5 Information about the availability of services and the network configuration

OLOs will require information (See Annex A4.3) from the provider of local loop facilities and services during planning and at the provisioning stage in order to complete individual customer orders and subsequent service operation. Likewise, the provider will need to understand in advance likely requirements of OLOs for service at each of its exchange.

Consultation

13. The TRA seeks opinions on the information requirements of OLOs and Batelco associated with the planning, ordering, provisioning and operation of local loop, co-location and backhaul services.
3.6 Installation, maintenance and operational services

Installation, maintenance and operational services required to enable the provision of LLU services can be expected to include:

- The provisioning of ducts, chambers and co-location services for use by an OLO;
- Pull through services associated with external tie cables; and
- The provision and installation of internal tie cables.

Requirements for these services are given in Annex A4.

Consultation

14. The TRA seeks opinions on the requirements of OLOs and Batelco associated with installation, maintenance and operational services associated with local loop facilities and services.
4 Markets affected by the provision of access to the local loop to OLOs

A distinction may be drawn between the retail markets that are affected by enabling OLOs to access local loop facilities and services, and the wholesale market in which OLOs procure these facilities and services. This section first identifies the retail markets that are affected and discusses the impact of enabling access on these markets. The section goes on to discuss the wholesale markets in which the OLOs procure facilities and services.

4.1 Retail markets

The provision of duct sharing, local loop unbundling and related services by an incumbent will allow an OLO access to a subscriber’s premises for any service that may be delivered over the local loop without interfering with services on adjacent lines. Table 2 below indicates which markets the TRA believes may be affected by giving OLOs access to the incumbent’s local loop infrastructure. In some cases, the market is not affected without further development of the service that is currently available at a retail level. Where this is so, the required change to the service is noted.

<table>
<thead>
<tr>
<th>Market</th>
<th>Simple DSL resale</th>
<th>Wholesale DSL (Bitstream)</th>
<th>ULL</th>
<th>Duct sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed telephony (PSTN, ISDN)</td>
<td></td>
<td>IP telephony only</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leased lines</td>
<td></td>
<td>Symmetric DSL required</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switched data services</td>
<td></td>
<td>Symmetric DSL required in most cases</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Internet access</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Retail markets affected by different kinds of access to the local loop

4.2 Fixed telephony

The market for fixed telephony services comprises all household, business and public premises in the Kingdom of Bahrain. The definition of the relevant market for telephony services has been discussed in the prior consultation “Retail price controls” ERU/CN/013 issued on 9th August 2003. The market may be defined as the supply of fixed access and national calls, however, it may be more appropriate to distinguish between residential and ‘business’ (i.e. including government and other public sector customers) fixed telephony markets as the terms of supply and possible substitutes vary between these markets. The supply and demand conditions across Bahrain are relatively homogeneous and Batelco is currently the only supplier in this market. Once the market is liberalised, other suppliers may enter the market, but it is the TRA’s view
that Batelco is likely to have significant market power in this market for a protracted period.

The lack of a suitable alternative local loop infrastructure may inhibit market entry to the telephony market by OLOs. Without access to the local loop, an OLO either has to build its own, without the scale economies of the incumbent, or is limited to the provision of indirect access, international services and other switched services.

Full LLU would give access to the baseband element of the local loop which is necessary for delivery of ISDN and analogue telephony services. However, IP telephony could in principle be delivered using DSL, provided sufficient quality of service was maintained. Thus, IP telephony could be delivered using wholesale DSL, full LLU or line sharing.

The TRA notes that experience in other jurisdictions suggests that the role of ULL in the stimulation of competition in the telephony market is very limited.

The TRA believes, therefore, that the possibility of access to local loop facilities and services may stimulate OLOs to consider the market for telephony services in the Kingdom of Bahrain. Some OLOs may enter the market using wholesale DSL or ULL to provide limited coverage in areas with a preponderance of high value customers. Batelco’s market power will be reduced as a result of the possibility of competition or actual competition. Competition might encourage the provision of new services, improve quality and reduce costs.

Duct sharing may also assist in the development of competition in the telephony market by reducing the cost of establishing an alternative local loop infrastructure. The TRA would like to know whether there is demand for duct sharing in association with the provision of telephony services in order to determine whether Batelco should be required under Section 40 of the Telecommunications Law to provide access to its ducts.

**Consultation**

The TRA seeks the opinions of interested parties on:

15. The extent to which access to local loop facilities and services would impact on the fixed telephony market in the Kingdom of Bahrain in relation to other factors that may inhibit market entry by OLOs;

16. The extent of demand for duct sharing for the provision of telephony services and other services in the Kingdom of Bahrain.

### 4.3 Leased lines

Demand for retail leased lines arises mainly from businesses and larger public sector organisations within the Kingdom of Bahrain. The definition of the market for retail leased lines has been discussed in the access consultation “Dominance in certain markets and the provision of Access services for the purposes of Section 57(e) of the Telecommunications Law”, ERU/CN/014.

For an OLO to compete with Batelco in the leased line market, it will need an infrastructure with coverage of the built areas of Bahrain that can be readily configured to meet the needs of individual business subscribers. This infrastructure may be provided by the OLO, or may use a combination of Batelco’s infrastructure and its own infrastructure.
For an OLO to compete with Batelco in the leased line market, it will require a continuous path between the two premises to be linked by the leased line. Such a path may be provided by:

1. A dedicated point to point connection between the two sites, for example, a microwave link;
2. A more complex arrangement that links each of the sites to an OLO point of presence and if on separate points of presence, a circuit between the two points of presence.

It is likely that the first arrangement, the dedicated point to point connection, would be owned and managed by the OLO.

The second more complex arrangement could be built in a variety of ways: using facilities owned and managed by the OLO, using Batelco’s facilities to which the OLO had access, or using a combination of the two.

The tails from the customer’s sites to the points of presence may be: a partial private circuit rented from the incumbent, a leased line rented from the incumbent, a wireless link (microwave, infrared, laser) provided by the incumbent or self-provided, dedicated fibre, an unbundled local loop (full or shared) or a bitstream service.

The use of unbundled local loops for the tails in conjunction with a transmission level backhaul service from Batelco would enable an OLO to build a leased line that would provide up to 4Mbit/s within certain geographic constraints. Such high speed leased lines are not currently offered by Batelco. Thus, ULL would enable the range of leased line services to be extended and the provision of substitute services from OLOs. The TRA believes, therefore, that the availability of ULL would reduce Batelco’s market power in the retail leased line market.

Wholesale DSL would enable an OLO to offer the same coverage as is provided by Batelco’s DSL service. The service definition would be constrained by the point of interconnection chosen by the OLO and would require a transmission level point of interconnection. Speeds would be limited to those defined by the reference wholesale DSL offer. The reference offer would require symmetric DSL.

Implementation timescales may affect the feasibility of using ULL and wholesale DSL for leased lines. Implementation timescales defined for ULL and wholesale DSL should ensure that an OLO that uses these services is not disadvantaged by implementation timescales in the leased line market.

The prices of ULL, wholesale DSL and related co-location and backhaul services will have a marked impact on the feasibility of using them to provide leased lines. In other jurisdictions prices of ULL and wholesale DSL equivalent services are low in comparison with leased line prices. However, relatively high prices for these services could create a margin squeeze. Therefore, should Batelco be found to have significant market power in the leased line market, the TRA believes that prices of ULL, wholesale DSL, co-location and backhaul will need to be set at a level that avoids this possibility.

In summary, ULL and symmetrical wholesale DSL would enable an OLO to establish leased circuits rapidly and at relatively low cost.

The availability of ULL and wholesale DSL should stimulate the supply of leased line services from OLOs potentially at higher speeds than are currently available.
Symmetrical wholesale DSL and ULL are complimentary services since one end of a leased line may be serviced using ULL and the other using wholesale DSL. Thus, an OLO may start by implementing leased lines using wholesale DSL, giving it the same coverage as the incumbent. Subsequently, it may differentiate further by replacing or supplementing wholesale DSL with ULL.

**Consultation**

The TRA seeks the opinions of interested parties on:

17. The extent to which full LLU, line sharing, wholesale DSL, co-location and backhaul services will impact on the leased line market and whether, in particular, a symmetric wholesale DSL service should be provided;

18. Pricing and service delivery timescales for full LLU, line sharing, wholesale DSL, co-location and backhaul services in relation to the leased line retail pricing and terms.

**4.4 Switched data services**

Demand for switched data services, like that for leased line services, largely arises from medium and large sized companies and public sector organisations in the Kingdom of Bahrain. The market is described in the access consultation paper. In that consultation paper, the TRA distinguished the market for switched data services from that for leased lines in terms of the different service demand and supply characteristics.

It can be argued that there are two segments in this market, business centres - areas of a country that are predominantly used for business premises, and remaining areas of a country. OLOs often compete successfully with the incumbent in business centres in other countries. In this segment they provide leased line and switched data services within and between such centres, focussing mainly on high capacity access requirements. It is possible for an OLO to build a fibre network in a business centre that is equivalent to an incumbent’s, and to service the market at an equivalent cost and to similar implementation timescales. Therefore, the incumbent has fewer advantages over a new entrant OLO in the business centres.

OLOs find it more difficult to compete with the incumbent in a segment of the market that comprises medium and large sized companies and public sector organisations located in areas of the country that are not business centres, and in all areas where the requirement is for relatively low speed access. In these areas, the incumbent’s ubiquitous presence gives it facilities that it may employ incrementally to provide services, whereas an OLO will usually have to build a new facility. This means that the OLO has a cost disadvantage that it is difficult to overcome.

The advantages of proximity and available plant that reduce the cost of meeting a requirement give the incumbent market power that restricts competition and allows the incumbent to maintain its market share.

The incumbent’s dominance in this second segment also gives the incumbent an advantage in the first segment of this market. Some customers for switched data services will have a combination of larger and smaller sites. Some of these sites may be in business centres, others may be outside such centres. The incumbent, because of its ability to service smaller sites, and sites outside business centres, will have a significant advantage over an OLO in supplying such customers. Thus, the OLO will not always be able to compete successfully with the incumbent in business centres even for
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customers with a requirement for large amounts of capacity. Moreover, because the incumbent has access to a larger market, for a given market share it should have greater scale and therefore be able to exploit scale economies to supply services at a lower cost than an OLO.

To enable competition across all areas, therefore, it can be argued that OLOs need access to the local loop facilities of the incumbent to give them the same advantages of coverage, availability of plant and scale.

It is the TRA’s view that ULL or wholesale DSL would facilitate competition in the switched data services market by enabling an OLO to provide access to sites where the demand for bandwidth is limited in any area of the Kingdom of Bahrain. Wholesale DSL, in conjunction with a backhaul service would enable an OLO to provide general coverage of the Kingdom of Bahrain. ULL would enable the OLO to compete by differentiating its services from those of the incumbent in areas where the OLO has provided ULL facilities.

ULL and wholesale DSL would give an OLO an ability to access sites with limited requirements that is similar to the ability of the incumbent. The introduction of this capability would increase the attractiveness of the market to OLOs, and encourage alternative sources of supply. As a result, it would improve the availability and quality of service, and reduce service prices. Symmetrical wholesale DSL would be required.

The TRA is therefore considering an obligation on Batelco to provide ULL and symmetrical wholesale DSL in order to stimulate the market for switched data services in the Kingdom of Bahrain.

Consultation

The TRA seeks the opinions of interested parties on:

19. The extent to which wholesale DSL, full LLU, line sharing, co-location and backhaul services will impact on the switched data services market and on Batelco’s market power.

20. The pricing and service delivery timescales of wholesale DSL, full LLU, line sharing, co-location and backhaul services in relation to switched data service retail pricing and terms.

4.5 Internet access

The retail internet access market is discussed in the access consultation paper. The consultation paper considers whether this market is one market or two markets, i.e. narrowband internet access, broadband internet access, or a combined internet access market. The paper concludes that the TRA believes Batelco to be dominant in both narrowband and broadband segments, and hence in the wider internet access market in the Kingdom of Bahrain. Hence, the number of internet access markets is not material at this stage for regulatory purposes.

This consultation paper on local loop facilities and services is concerned only with broadband internet access.

In general, a relatively wide range of facilities can be used by OLOs to offer broadband internet access. Those relevant to the Kingdom of Bahrain include simple DSL resale, wholesale DSL, ULL, fixed wireless access, mobile wireless access (GPRS and 3G data services), fibre and satellite. While there are differences in access speed and
Local Loop and related facilities and services

capacity, and other differences in terms of the characteristics of the services that may be offered over these different facilities, there is the potential to substitute between a number of these facilities and services. In particular, experience in other jurisdictions indicates that there is the possibility of demand substitution between simple DSL resale, wholesale DSL, full LLU and line sharing. Fixed wireless access for broadband has had little success in areas where DSL or cable modem services are available. Like satellite, it is generally used only for dedicated internet access (as opposed to contended internet access) or in areas where DSL or cable modem services are not available. Thus, the TRA believes that it is not apparent that fixed wireless access is a satisfactory substitute for access to the incumbent’s local loop for the provision of internet access.

A survey of broadband prices (see Annex 2) demonstrates that Batelco’s broadband prices are high relative to those prevailing in comparison with many countries that are comparable in terms of wealth and education. Moreover, there is a clear lack of variety in the services that Batelco offers. Customers have no opportunity to access the internet using facilities other than those of the incumbent.

It is the TRA’s view that the availability of a simple resale DSL service, wholesale DSL and line sharing would give a portfolio of services that would open up the internet access market to ISPs. If full LLU was available, then this could also be used in substitution for line sharing.

These different services are complimentary and may appeal to different types of new entrant. The simple resale offer would enable new entrants that wished to differentiate themselves from the incumbent in other areas of service, for example, by providing a portal for e-commerce or through access to international capacity with a lower overbooking rate, to gain access to customers without building an access network in the Kingdom of Bahrain In contrast, line sharing would enable a new entrant that intended to provide high performance broadband services to business to install its own DSL equipment and define its own broadband access service suitable for its business market.

The introduction of access to local loop facilities and services should enable competition in the broadband internet access and, in addition, stimulate the market by reducing prices, improving quality of service and include the variety of services offered.

The TRA is therefore considering whether to require Batelco to provide the full range of wholesale and unbundled services, i.e. simple DSL resale, wholesale DSL, full LLU and line sharing, in order to facilitate competitive entry and to reduce Batelco’s market power in the internet access market.

Consultation

The TRA seeks respondents’ opinions on:

21. The extent to which simple DSL resale, wholesale DSL, full LLU, line sharing, co-location and backhaul services will impact on the internet access market and Batelco’s market power.

22. The pricing and service delivery timescales of simple DSL resale, wholesale DSL, full LLU, line sharing, co-location and backhaul services in comparison with retail pricing and terms for broadband access in the Kingdom of Bahrain.
4.6 Wholesale services

4.6.1 The market for local loop facilities and services

The market for local loop facilities and services comprises OLOs in the Kingdom of Bahrain that intend to offer telecommunications services in one or other of the retail markets identified in Section 4.1 of this paper. The discussion of requirements for local loop facilities and services by market in subsequent sections indicates that this wholesale market is not homogenous. The TRA believes that there are three distinct wholesale markets:

- Facilities and services required by ISPs to access customers
- The market for wholesale broadband services
- The market for local loop facilities

4.6.2 Facilities and services required by ISPs to access customers

Section 4.5 identified a number of facilities and services that may be substituted for each other by an OLO in the Kingdom of Bahrain in order to provide an internet access service. Substitutes include: simple DSL resale, wholesale DSL with a related backhaul service from incumbent or from another operator, or ULL in conjunction with a co-location service from the incumbent and a backhaul service from the incumbent or another operator. This last option also requires the OLO to procure DSL facilities to install in the co-location space. In addition to these substitutes, which are based on the incumbent’s facilities, an OLO may substitute a point to multipoint wireless LAN infrastructure. This would not ordinarily be provided by the incumbent.

In other jurisdictions, where ISPs have been using such local loop facilities and services for some time, the only infrastructures that have been widely used for contended broadband services are twisted copper pairs and cable TV. Wireless systems have failed to gain significant market share. The use of simple DSL resale, wholesale DSL, full ULL and line sharing varies by jurisdiction largely, the TRA believes, because of the prices and conditions established for the use of these facilities and services or related co-location and backhaul facilities by the relevant authorities.

If international experience is applied to Bahrain, the absence of cable TV and the limited success in using wireless systems to provide broadband services limits an OLO’s options for providing broadband internet access to the use of Batelco’s facilities. Thus, it is the TRA’s view that Batelco will have significant market power in the market for broadband facilities and services required by ISPs to access customers as well as the broadband internet access market itself.

Should Batelco be found to be dominant in both the retail and the associated wholesale market, the TRA is minded to require Batelco to include access facilities and services associated with broadband internet access in its reference access offer. To do otherwise, would leave an opportunity for Batelco to institute a margin squeeze on OLOs that would limit their ability to enter the market.

4.6.3 The market for wholesale broadband services

Products in this market enable an OLO to provide leased lines and switched data services, and other services that do not require access to the internet. Applicable local loop facilities and services include: wholesale DSL, full ULL and line sharing as well
Local Loop and related facilities and services

as alternative infrastructures such as microwave links and point to point radio. Co-location services and backhaul services are also required.

Experience in other jurisdictions indicates that OLOs are able to compete with the incumbent in these markets using microwave and radio links, and in business centres using their own local loop infrastructure. Thus, an OLO can compete in the relevant retail markets without using local loop facilities and services from the incumbent.

Nevertheless, in other jurisdictions, the use of an incumbent’s facilities has often been valuable in enabling market entry by an OLO, and to extend geographic coverage beyond the immediate vicinity of a point of presence.

The TRA is minded to consider that Batelco’s market power in the market for wholesale broadband services is more limited than it is in the market for facilities and services for ISPs to access their customers, but without such services, OLOs will find it difficult to enter the market and to extend their geographic coverage.

4.6.4 The market for local loop facilities

Products in this market enable an OLO to provide telephony services within the Kingdom of Bahrain. Products include duct sharing, full LLU and the set of services used for the provision of an alternative local loop infrastructure by the OLO.

Experience in other jurisdictions demonstrates that the possibility of competition in this market is limited by the cost of building an alternative infrastructure. There is limited experience in jurisdictions in Europe and the Americas of using full LLU to provide ISDN services.

The TRA believes that the lack of alternatives to Batelco’s own infrastructure ensures that Batelco is dominant in this wholesale market.

4.6.5 Conclusions

The TRA believes that Batelco has at least significant market power in each of these wholesale markets as well as the related retail markets. The TRA believes, therefore, that it may be possible for Batelco to act in an uncompetitive manner to restrict market entry by OLOs. The TRA is considering, therefore, a requirement for Batelco to include access to local loop facilities, to co-location space and to its backbone network in its reference access offer, to provide and price such access in a fair and non-discriminatory manner, taking account of prices and service characteristics prevalent in the related retail markets.

Consultation

The TRA seeks respondents’ opinions on:

23. The definitions of the wholesale markets for:
   (a) Services required by ISPs
   (b) Broadband services
   (c) Local loop facilities.

24. Batelco’s dominance in the wholesale markets for:
   (a) Services required by ISPs
   (b) Broadband services
   (c) Local loop facilities.
5 Options

This section discusses the potential options, introduced in the previous sections, that the TRA is considering in its formulation of appropriate measures to enable competition in local access services and the local loop.

5.1 Intervention

There is an argument that intervention to require an incumbent to give OLOs access to its local loop and related facilities and services has had little impact on the telephony, leased line, switched data services and internet access markets (see Annex 1). Nevertheless, there have been notable successes in individual country markets particularly in meeting the objectives set out in the Telecommunications Law associated with tariffs charged, quality of service and variety of service.

Without such intervention in the Kingdom of Bahrain, the TRA believes that competition in individual retail markets would be limited. It would be difficult for competition to become established at all in the internet access market. Competition in the markets for leased lines and switched data services would be constrained to higher bit rate services. Competition in the telephony market would be limited to international services and value added services.

Moreover, the TRA believes that the very possibility of access by OLOs to local loop facilities and services itself reduces an incumbent’s market power in relevant retail markets, since the incumbent has to consider the possibility of competition when setting prices and defining services. Consequences include price reductions and improvements in service quality and variety.

The TRA is of the opinion that Batelco will have substantial market power in each of these retail markets at least until it is required to provide access to local loop and related facilities and services. In addition, the TRA is of the opinion that Batelco may be a significant market power in each of the wholesale markets. TRA is therefore minded to intervene in order to ensure that access is provided in a fair, reasonable and non-discriminatory manner.

The rest of this section considers how the TRA may intervene in each access element.

Consultation

25. The TRA seeks opinions on the proposal to include local loop facilities and services in the reference access offer

5.2 Simple DSL resale

The TRA is of the opinion that the availability of simple DSL resale would enable ISPs to enter the market for broadband internet access and would lead to a reduction in Batelco’s market power in this market, mostly through the introduction of price competition and the availability of a wider variety of bundled services in Bahrain.

Simple DSL resale would have little impact on the quality of internet access unless it was coupled with the provision of alternative international access to the internet through the BIX by an ISP. It would have no impact on the availability of service, and the variety of internet access services offered. Therefore, the justification of requiring
simple DSL resale is limited to the rapid introduction of competition that it should stimulate.

Consultation

26. The TRA seeks the opinions of interested parties regarding the need or otherwise to include simple DSL resale in Batelco’s reference access offer.

5.3 Wholesale DSL

The TRA is of the opinion that the availability of a wholesale DSL in conjunction with an IP backhaul service would enable ISPs to enter the market for internet access, provide an opportunity for ISPs to offer new broadband services, and give some limited opportunity to OLOs to offer switched data services.

Without a symmetrical DSL offer from Batelco, the provision of leased lines using wholesale DSL would not be possible.

The Telecommunications Law requires, and TRA expects, Batelco to offer a wholesale DSL service. The TRA is of the opinion that this wholesale service should be a bitstream service, and that this service should:

- Have an extended range of speed options that should include symmetrical services (i.e. equivalent bandwidth available upstream and downstream);
- Provide the OLO with the ability to control contention;
- Provide the OLO with suitable backhaul from the OLO’s BRAS at a transmission level;
- Provide a transmission level service or a managed IP service to link the OLO’s point of presence to the BIX as described in Section 3.4; and
- Provide suitable ordering, OSS and information services as described in Section 3.4 and Section 3.5.

These characteristics may stimulate competition by OLOs in the switched data market and may stimulate ISPs to offer differentiated services in the internet access market. The possibility of competition should stimulate Batelco to extend the speed options and lower the prices of switched data services and broadband internet access services.

Consultation

27. The TRA seeks the opinions of interested parties regarding the inclusion of wholesale DSL in Batelco’s reference offer and the specific characteristics required.

5.4 ULL: full local loop unbundling and line sharing

The TRA is of the opinion that the availability of full LLU and line sharing would enable ISPs to enter the market for broadband internet access with a wide variety of broadband internet access services, and give OLOs the opportunity to offer switched data services and leased line services. In addition, full LLU would enable OLOs to offer telephony services.

Full LLU and line sharing would enable new entrants to introduce higher rate and symmetric internet access, leased circuits and access to switched data networks. Thus, OLOs would be able to compete by introducing new or highly differentiated services.
The possibility of such competition would reduce Batelco’s market power in the internet access, leased line and switched data services markets. The impact of this may be to encourage Batelco to introduce higher rate services into this market ahead of any competition.

The provision of ULL will introduce a requirement for co-location space at exchanges. A new entrant is also likely to require backhaul facilities.

In providing full LLU and line sharing, the new entrant will also require access to some elements of Batelco’s OSS for fault and performance monitoring associated with the local loop, power and environmental conditions in the co-location facilities and transmission facilities. Batelco will have access to information about the new entrant’s customer base, including the links made to each site. This information must remain secure and not be made available to Batelco’s sales and marketing organisations.

The TRA is, therefore, currently of the opinion that the services that Batelco should provide under the requirement for ULL in the Telecommunications Law should be:

- Full local loop unbundling;
- Line sharing;
- A co-location services as described in Section 5.6;
- A suitable backhaul service to an OLO’s point of presence;
- Access to ordering, OSS and information services as described in Section 3.4 and Section 3.5.

Consultation

The TRA seeks respondents views regarding the inclusion in Batelco’s reference offer of:

28. Full LLU and
29. Line sharing.

5.5 Sub-loop unbundling

The TRA is currently of the opinion that sub-loop unbundling is not considered to be an immediate requirement in the Kingdom of Bahrain.

Consultation

30. The TRA seeks opinions regarding the need or otherwise to include sub-loop unbundling in Batelco’s reference offer.

5.6 Co-location

In some countries the lack of availability of space and the inability to define a fair method of pricing co-location space has created barriers to entry, which have ultimately led to the near failure of the introduction of local loop unbundling.

To avoid such market failure, it is important that physical co-location is defined in such a way that:

- The preparation and subsequent management of the co-location space does not add significantly to the cost of the incumbent; and
Local Loop and related facilities and services

- The cost is incremental in the sense that a new entrant only has to pay for the space that it uses itself, and not the space or facilities made available for co-location but left unused.

In addition, it is important that facilities are made available, as an alternative to physical co-location for termination of the local loop on a metallic path that leads to a nearby premises available for use as a point of presence by the new entrant. The availability of such facilities gives an OLO a range of options, and reduces the potential for co-location to be a bottleneck in the provision of ULL. This competition in the provision of co-location space may minimise the need for price controls on co-location in the medium term. However, in the short term, it is not clear that suitable premises will be available sufficiently near to the exchange for such distant co-location to be feasible. Therefore, in the short term, the TRA is of the view that Batelco will have significant market power in the co-location market associated with ULL, and its pricing of these services should therefore be part of the reference offer.

To avoid the problems associated with laying aside space in an exchange building for co-location that may be left unused, the TRA believes that it is important for a co-mingling service to be provided. The TRA understands Batelco’s need for secure access to its facilities. New entrants would also require such security. However, co-mingling is used by other regulatory authorities with suitable security vetting of maintenance and other staff. The new entrant would undertake normal day to day operation of its facilities remotely, and would require access only when physical configuration or equipment maintenance was necessary.

In addition, TRA is of the opinion that Batelco should offer a facility for linking internal tie cables to external tie cables to facilitate distant co-location.

Consultation

31. The TRA seeks opinions from interested parties about co-location services required for ULL, and about the need or otherwise to include co-location in Batelco’s reference offer.

5.7 Backhaul

Backhaul facilities are an integral part of the DSL simple resale option. For wholesale DSL and ULL, there is a need for backhaul from one or more points in Batelco’s network to a new entrant’s point of presence. Additionally, there is a requirement for a new entrant to be able to terminate its network in a Batelco exchange building at a point where it is convenient to access any co-located equipment belonging to the new entrant.

It is the TRA’s view that for wholesale DSL, Batelco should give access at points that enable the new entrant to provide the broadband remote access server functions, which include user authentication and the definition of particular service characteristics such as bandwidth limitations and contention.

For ULL, backhaul may be required from co-located facilities.

It is the TRA’s opinion that Batelco should offer a transmission facility that would enable a new entrant to build a backbone network so that it can access its equipment and facilities on Batelco’s premises and implement the service characteristics of the wholesale DSL service proposed in Section 5.3.
In the absence of any alternative, at least in the short term, the TRA is of the view that backhaul is a bottleneck causing Batelco to have significant market power in this backhaul market.

New entrants are likely to require access capacity of at least 100Mbit/s. However, initial capacity is likely to be less. Therefore Batelco should offer a graded service with price points set at suitable break points in the capacity hierarchy.

Batelco may wish to provide higher level services such as a managed IP network.

The TRA is of the opinion that backhaul should therefore be included in Batelco’s reference access offer.

Consultation

32. The TRA seeks the opinions of interested parties about backhaul services required for wholesale DSL and ULL, and opinions regarding the need or otherwise to include backhaul services in Batelco’s reference offer.

5.8 Ordering, operational support systems and information provision

As indicated in Sections 3.4 to 3.6, provision of local loop related services is reliant on non-discriminatory access to information about the availability and characteristics of the services, ordering processes and systems, and operational support processes and systems.

Consultation

33. The TRA seeks respondents views regarding what ordering, operational support systems and information provision are required for local loop facilities and services, and whether access to ordering operational support systems and information systems should be included in the reference access offer.
6 Pricing

6.1 Pricing issues

The TRA considers simple DSL resale, wholesale DSL, ULL, and duct sharing, and related co-location services and backhaul services to be access services under the terms of Section 57(e) of the Telecommunications Law, meaning access to telecommunications facilities and services provided by another licensed operator.

The telecommunications Law gives the TRA specific powers associated with access tariffs and terms offered by a dominant operator. In Section 57(e) the Law indicates that the TRA “…may publish regulations in connection with access, including regulations regarding a reference access offer similar to a reference interconnect offer. … If the [TRA] considers the tariffs and terms on which access is offered by a licensed operator in a dominant position are unreasonable, it may determine such tariffs and terms as it considers reasonable, and the provisions of [Section 57](b) shall apply in this respect.” It is the TRA’s opinion that the relevant provisions of Section 57(b) are concerned with the timing of the reference access offer, the content of the reference access offer, and the method of determining the tariffs. It indicates that tariffs and terms should be non-discriminatory and may differ between different types of licensed operator “only where objectively justifiable on the basis of the [access service] provided.”

As discussed in the prior access consultation (ERU/CN/014), a range of pricing principles may be applied, varying between forward-looking long-run incremental costs, and retail prices. In many cases, it is expected that access services will be provided at ‘wholesale’ or ‘retail minus’ prices.

However, section 13.4 of Batelco’s National Fixed Telecommunications Services License states that tariffs for access services provided to other licensed operators shall be:

(a) “cost oriented and sufficiently unbundled so that the acquirer of access services does not pay for network components or facilities that it does not require; and”

(b) “in all cases reasonable and, with respect to similarly situated users, non-discriminatory.”

In this context “cost oriented” means based on cost, and may include a reasonable profit. Different cost methodologies may be applied for different facilities or services. Therefore, the TRA expects that a dominant operator would offer services in a manner that represents a fair reflection of the underlying costs.

The TRA believes that the costs of providing information, a suitable order processing system and processes, and access to operational support systems and processes should be included within the overall costs of access services.

The cost of capital will need to be taken into consideration in any cost based approach to tariffing of access services. In ERU/DE/004, the TRA determined that the different rates for the cost of capital would be used for:

- Connection (last mile) network services
- Core or fixed network services and international facilities and services
- Mobile network services
In calculating the asset base against which the cost of provision is assessed, account must be taken of any concessionary terms Batelco may have received or is currently receiving from the Government.

Although some of these concessions may be considered to represent intangible benefits, value has still accrued to Batelco and this has the effect of reducing the asset base for Batelco’s network that should be used in calculating the relevant costs.

Moving forward, Batelco must be treated by the relevant authorities in a non-discriminatory manner in respect of other operators within the market. Where there may be justified economic reasons for such preference, this advantage must be assessed when calculating the relevant costs for products and services supplied to other operators seeking access (or indeed interconnection) by Batelco.

Tariff rebalancing is currently under consideration for telephony services. To avoid cross-subsidisation and discrimination, a consistent cost basis is required for the local loop elements, the co-location elements and the backhaul elements of each of these services.

The TRA is therefore currently considering the following approaches to pricing for each of the access services.

6.2 Simple DSL resale

The TRA is of the opinion that simple DSL resale should be tariffed using a retail minus approach. There is a clearly identifiable retail service with defined tariffs that may be used as the basis for the resale tariff. Moreover, simple DSL resale is not a bottleneck service.

6.3 Wholesale DSL

The TRA is of the opinion that wholesale DSL should be tariffed using a cost-oriented approach, and that the basis of the costing should be the fully allocated costs of supplying the service to the OLO. This is not a bottleneck service, since ULL will be available to OLOs, who may then choose to provide their own DSL facilities to build an equivalent service. The TRA is minded to require that the cost of capital for wholesale DSL is set at level used in the costing of retail DSL services.

6.4 ULL

The TRA is of the opinion that both forms of ULL should be tariffed using a forward looking incremental cost approach. The TRA believes that ULL is a bottleneck service since there are no substitutes that may provide the equivalent service at the same cost. Other jurisdictions have taken this view. For example, the EU specified that “costing and pricing rules for local loops and related facilities should be transparent, non-discriminatory and objective to ensure fairness. Pricing rules should ensure that the local loop provider is able to cover its appropriate costs in this regard plus a reasonable return, in order to ensure the long term development and upgrade of local access infrastructure. Pricing rules for local loops should foster fair and sustainable competition, bearing in mind the need for investment in alternative infrastructures, and ensure that there is no distortion of competition, in particular no margin squeeze
Local Loop and related facilities and services

between prices of wholesale and retail services of the notified operator. In this regard, it is considered important that competition authorities be consulted." The UK has interpreted this as enabling a LRIC (including a proportion of common costs and a reasonable return on capital employed) approach to the pricing of full LLU and line sharing. Ireland and Germany have also adopted a LRIC approach. The Netherlands, however, uses a historical cost approach. Outside the EU, the USA has adopted TELRIC, Canada has adopted, an incremental cost approach which is considered to give an outcome similar to LRIC, and Australia has adopted its Total Service LRIC principles for ULL.

The TRA believes ULL is an Access Network Service as defined in the determination of Batelco’s cost of capital, ERU/DE/004, and the cost of capital should be set accordingly.

6.5 Duct sharing

The TRA is of the opinion that duct sharing should be tariffed using a forward-looking incremental cost approach. Ducts may form a bottleneck facility. The precise terms of duct sharing will be finalised as a result of this consultation. However, the supplier of ducts is expected to face no risk, since it is likely that it will be required to supply ducts only if the conduits supplied are surplus to capacity. Moreover, the TRA is of the opinion that duct sharing is a Access Network Service as defined in the determination of Batelco’s cost of capital.

6.6 Co-location

The TRA is of the opinion that co-location should be tariffed using a forward-looking incremental costs approach, since it represents a bottleneck in the supply of ULL. The cost of co-location should be based on a reasonable utilisation of space that allows for expansion in the use of facilities by Batelco and demand by OLOs. If Batelco is required to make space available for OLOs then it will face a risk that this space will not be used. The TRA is of the opinion that there should be a reasonable risk premium included in the price of co-location space.

6.7 Backhaul

The TRA is of the opinion that OLOs will be able to provide their own backbone networks in the Kingdom of Bahrain. An OLO could therefore collect traffic from ULL.

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9 Local loop unbundling: final charges for shared access, OFTEL, October 2001
10 Report on the ODTR consultation on local loop unbundling, Decision Notice D6/00, ODTR, April 2000
11 Pricing of unconditioned local loop services (ULLS) Final Report, Australian Consumer & Competition Commission, March 2002
12 The EU has adopted the same ‘cost orientation for co-location that it has adopted for ULL. Consistent with this, the pricing principles used in the UK for co-location are similar to the ones used for ULL itself – LRIC, and in addition, a reasonable return on investment and a mark up for common costs.
or wholesale DSL services and carry it on its own backbone to its principal site and to the BIX. However, the TRA believes that by doing this, the OLO will incur costs that an incumbent will not incur, principally those of linking the OLO’s backbone to the incumbent’s exchange sites. These costs may be sufficiently large to make the availability of backhaul by Batelco a bottleneck service. Therefore the TRA is minded to consider access to Batelco’s backbone, like co-location, critical to the success of ULL and wholesale DSL.

It is not apparent to the TRA that there should be any distinction in terms of pricing methodology between the pricing of transmission based backhaul and the pricing of TCP/IP based backhaul.

The TRA is minded, therefore, to propose a forward-looking incremental costs approach to all backhaul services used in conjunction with ULL and wholesale DSL.

6.8 Access to OSS and customer support systems

The TRA believes that the costs of access to OSS and customer support systems, and to information required to use the local loop and related facilities and services, should be included in the price of other services.

Consultation

34. The TRA seeks the opinions of interested parties regarding tariffs and terms for all local loop facilities and services considered in this section, and in particular:

(a) The principles that should be used for tariffing each facility or service

(b) The impact of alternative principles on the price of services and Batelco’s market power in relevant markets.
7 Consultation

The TRA welcomes comments on the relevant markets identified for services that may be requested by other licensed operators in the provision of wholesale DSL, unbundled local loops and related services and the proposed determinations of dominance for Batelco, in addition to the specific questions raised in this consultation.

Views submitted will be considered by the TRA in drawing up its Determination on the requirements for local loop unbundling and co-location.

Responses may be sent in writing, by post or e-mail to:

The Telecommunications Regulatory Authority
PO Box 10353
Manama
Bahrain

Email: consult@tra.org.bh

The closing date for comments is 20 June 2004.
A1 Annex 1: ULL experience elsewhere

An analysis of ULL regulation, deployment and use has been made for OECD countries in general and EU countries in particular. This comparison is summarised in Table 7 to Table 12 below.

It is the TRA’s opinion that the OECD provides a forward looking benchmark that sets a target for broadband services in Bahrain in terms of market liberalisation, pricing, service variety and service quality. It is the TRA’s opinion that a benchmark against GCC countries does not set such a forward looking benchmark, since GCC countries are only now beginning the process of liberalisation.

Deployment of ULL is shown in Table 7. This shows that while ULL is broadly implemented across OECD and EU member states, deployment is patchy. The only countries with more than 1% of lines unbundled are shown in Table 3.

<table>
<thead>
<tr>
<th>Proportion of lines unbundled</th>
<th>Unbundling start date</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>4.91%</td>
</tr>
<tr>
<td></td>
<td>1996, with significant changes in 1999</td>
</tr>
<tr>
<td>Denmark</td>
<td>2.28%</td>
</tr>
<tr>
<td></td>
<td>1998</td>
</tr>
<tr>
<td>Finland</td>
<td>1.92%</td>
</tr>
<tr>
<td></td>
<td>1997</td>
</tr>
<tr>
<td>Japan</td>
<td>1.9%</td>
</tr>
<tr>
<td></td>
<td>September 2000</td>
</tr>
<tr>
<td>Germany</td>
<td>1.73%</td>
</tr>
<tr>
<td></td>
<td>1998, with line sharing from 2001</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1.66%</td>
</tr>
<tr>
<td></td>
<td>1997, with resolution guidelines defined in 1999</td>
</tr>
<tr>
<td>Italy</td>
<td>1.5%</td>
</tr>
<tr>
<td></td>
<td>2000</td>
</tr>
</tbody>
</table>

Table 3: Leaders in unbundling

In addition, France, while having a low penetration, is growing rapidly, as a result of significant large reductions in the ULL tariff arising from action taken by the regulator.

Except for Australia, Austria and Canada, all other OECD countries that have implemented LLU did so in 2001. New Zealand has, however, recently rejected the implementation of full LLU on the basis that the benefit for a country such as New Zealand has not been demonstrated sufficiently. Instead the regulator has advocated an approach based on wholesale bitstream services.

Broadband services

The most common application of ULL is to enable an OLO or ISP to offer broadband services. Broadband may be part of an OLO or ISP’s internet access offer, or used to provide the ‘last mile’ access to a private network or the ends of a leased line.

In the provision of broadband services, full LLU is in competition with line sharing, bitstream access, simple resale of DSL services, cable modem services and radio
Local Loop and related facilities and services

Communications. Where available cable modem services have proved to be the most successful competitor to an incumbent’s DSL offer, for the following reasons:

- Cable modem services have tended to be launched earlier than DSL services.
- Cable modem services tend to be lower priced than DSL services, and certainly a lower base price;
- The cable operator has a pre-existing relationship with the customer because of its provision of cable TV and possibly telephony services.

The use of full LLU, line sharing, wholesale DSL and resale has varied between countries depending on:

- The relative importance that the regulator has placed on line sharing, bitstream access and resale in comparison with full LLU;
- The timing of the introduction of each service;
- The relative costs of these alternatives and
- The relative costs and availability of the related co-location and backhaul services.

Competition in the broadband market, shown by the proportion of broadband connections that are provided by an organisation other than the incumbent telecommunications operator, is largely driven by the availability of cable. Thus in Australia, Austria, Canada, Czech Republic, Mexico, the Netherlands, Poland, Portugal, and Turkey, a majority of broadband connections are delivered over an alternative infrastructure.

Simple resale and wholesale (bitstream) DSL services are also important in creating diversity in retailing of broadband services, although the incumbent is then responsible for much of the delivery of the service. Countries where wholesale DSL and simple resale of DSL comprise over 10% of broadband sales by volume are shown in Table 4.

<table>
<thead>
<tr>
<th>Share of broadband</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
</tr>
<tr>
<td>United Kingdom</td>
</tr>
<tr>
<td>Italy</td>
</tr>
<tr>
<td>Spain</td>
</tr>
<tr>
<td>Sweden</td>
</tr>
<tr>
<td>Ireland</td>
</tr>
</tbody>
</table>

*Table 4: Share of broadband subscriptions that comprise wholesale or simple resale DSL*

The most significant countries where full LLU and line sharing have a role to play in broadband are shown in Table 5.

Overall, the countries with the largest proportions of broadband connections retailed by an organisation other than the incumbent are ones where there is a significant use of an
alternative infrastructure or where simple resale and wholesale bitsream services are available.

<table>
<thead>
<tr>
<th>Share of broadband</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan 50%</td>
</tr>
<tr>
<td>Finland 18%</td>
</tr>
<tr>
<td>Denmark 10%</td>
</tr>
<tr>
<td>Italy 9%</td>
</tr>
<tr>
<td>The Netherlands 8%</td>
</tr>
<tr>
<td>Greece 7.6%</td>
</tr>
<tr>
<td>Germany 7%</td>
</tr>
<tr>
<td>Ireland 5.6%</td>
</tr>
</tbody>
</table>

Table 5: LLU and line sharing share of broadband subscriptions

Thus, LLU creates little incentive for OLOs or ISPs to offer broadband services.

The major determinant of broadband take up has been the length of time broadband has been available in a given market. Additionally, there is a factor of two difference in the rate of growth of broadband in the fastest growing markets and the slowest growing markets. The rate of growth in broadband is not particularly affected by the penetration of non-incumbent sales of DSL services.

The price of broadband services is not related to the penetration of ULL. However, ISPs typically offer services at a discount to the incumbent, and may exercise some restraint on the incumbent’s pricing of broadband services where there is competition in the retail market.

Other services

In some countries ULL is being used by OLOs to provide PSTN and ISDN services.

The following countries have deployed full LLU for services other than broadband on more than 0.5% of lines. No other country has more than 0.05% (10x less) of lines deployed for services other than broadband.

<table>
<thead>
<tr>
<th>No of lines</th>
<th>Proportion of lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States 4,378,144</td>
<td>2.27%</td>
</tr>
<tr>
<td>Netherlands 100,078</td>
<td>1.24%</td>
</tr>
<tr>
<td>Germany 555,000</td>
<td>1.12%</td>
</tr>
<tr>
<td>Italy 233,000</td>
<td>0.86%</td>
</tr>
<tr>
<td>Finland 17,500</td>
<td>0.55%</td>
</tr>
</tbody>
</table>

Table 6: Full LLU share of broadband subscriptions

As a vehicle for stimulating competition in basic telephony, therefore, ULL is weak in comparison with the various forms of carrier selection that may be available in a market.
## CONSULTATION

### Local Loop and related facilities and services

<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Incumbent Lines</th>
<th>LLU used for DSL</th>
<th>Line sharing</th>
<th>Other uses</th>
<th>Total unbundled loops</th>
<th>LLU used for DSL</th>
<th>Line sharing</th>
<th>Other uses</th>
<th>Total unbundled loops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>mid 2002</td>
<td>11,245,000</td>
<td>5,000</td>
<td>-</td>
<td>-</td>
<td>5,000</td>
<td>0.04%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.04%</td>
</tr>
<tr>
<td>Austria</td>
<td>Sep-03</td>
<td>3,060,000</td>
<td>9,750</td>
<td>-</td>
<td>9,960</td>
<td>19,710</td>
<td>0.32%</td>
<td>0.00%</td>
<td>0.33%</td>
<td>0.64%</td>
</tr>
<tr>
<td>Belgium</td>
<td>Sep-03</td>
<td>4,705,854</td>
<td>3,416</td>
<td>2,562</td>
<td>-</td>
<td>3,416</td>
<td>0.07%</td>
<td>0.05%</td>
<td>0.00%</td>
<td>0.07%</td>
</tr>
<tr>
<td>Canada</td>
<td>end 2002</td>
<td>21,435,000</td>
<td>144,360</td>
<td>-</td>
<td>-</td>
<td>144,360</td>
<td>0.67%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.67%</td>
</tr>
<tr>
<td>Czech-Republic</td>
<td>mid 2002</td>
<td>4,126,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Denmark</td>
<td>Sep-03</td>
<td>2,216,522</td>
<td>50,485</td>
<td>11,694</td>
<td>-</td>
<td>50,485</td>
<td>2.28%</td>
<td>0.53%</td>
<td>0.00%</td>
<td>2.28%</td>
</tr>
<tr>
<td>Finland</td>
<td>Sep-03</td>
<td>3,180,000</td>
<td>43,500</td>
<td>21,500</td>
<td>17,500</td>
<td>61,000</td>
<td>1.37%</td>
<td>0.68%</td>
<td>0.55%</td>
<td>1.92%</td>
</tr>
<tr>
<td>France</td>
<td>Sep-03</td>
<td>34,000,000</td>
<td>3,500</td>
<td>132,000</td>
<td>-</td>
<td>3,500</td>
<td>0.01%</td>
<td>0.39%</td>
<td>0.00%</td>
<td>0.01%</td>
</tr>
<tr>
<td>Germany</td>
<td>Sep-03</td>
<td>49,400,000</td>
<td>302,000</td>
<td>20</td>
<td>555,000</td>
<td>857,000</td>
<td>0.61%</td>
<td>0.00%</td>
<td>1.12%</td>
<td>1.73%</td>
</tr>
<tr>
<td>Greece</td>
<td>Sep-03</td>
<td>5,673,299</td>
<td>432</td>
<td>-</td>
<td>-</td>
<td>432</td>
<td>0.01%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.01%</td>
</tr>
<tr>
<td>Hungary</td>
<td>mid 2002</td>
<td>4,320,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Iceland</td>
<td>end 2001</td>
<td>192,000</td>
<td>458</td>
<td>-</td>
<td>-</td>
<td>458</td>
<td>0.24%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.24%</td>
</tr>
<tr>
<td>Ireland</td>
<td>Sep-03</td>
<td>1,700,000</td>
<td>250</td>
<td>960</td>
<td>-</td>
<td>250</td>
<td>0.01%</td>
<td>0.06%</td>
<td>0.00%</td>
<td>0.01%</td>
</tr>
<tr>
<td>Italy</td>
<td>Sep-03</td>
<td>27,022,000</td>
<td>172,000</td>
<td>19</td>
<td>233,000</td>
<td>405,000</td>
<td>0.64%</td>
<td>0.00%</td>
<td>0.86%</td>
<td>1.50%</td>
</tr>
<tr>
<td>Japan</td>
<td>Dec-01</td>
<td>74,285,000</td>
<td>1,411,126</td>
<td>-</td>
<td>-</td>
<td>1,411,126</td>
<td>1.90%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>1.90%</td>
</tr>
<tr>
<td>Korea</td>
<td>mid 2002</td>
<td>27,213,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>Sep-03</td>
<td>315,000</td>
<td>1,050</td>
<td>-</td>
<td>150</td>
<td>1,200</td>
<td>0.33%</td>
<td>0.00%</td>
<td>0.05%</td>
<td>0.38%</td>
</tr>
<tr>
<td>Mexico</td>
<td>mid 2002</td>
<td>13,833,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Sep-03</td>
<td>8,060,075</td>
<td>33,581</td>
<td>95,578</td>
<td>100,078</td>
<td>133,659</td>
<td>0.42%</td>
<td>1.19%</td>
<td>1.24%</td>
<td>1.66%</td>
</tr>
</tbody>
</table>
## Local Loop and related facilities and services

<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Incumbent Lines</th>
<th>LLU used for DSL</th>
<th>Line sharing</th>
<th>Other uses</th>
<th>Total unbundled loops</th>
<th>LLU used for DSL</th>
<th>Line sharing</th>
<th>Other uses</th>
<th>Total unbundled loops</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>mid 2002</td>
<td>1,765,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Norway</td>
<td>mid 2002</td>
<td>3,318,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Poland</td>
<td>mid 2002</td>
<td>16,360,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Portugal</td>
<td>Sep-03</td>
<td>4,048,274</td>
<td>605</td>
<td>-</td>
<td>125</td>
<td>730</td>
<td>0.01%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.02%</td>
</tr>
<tr>
<td>Slovak-Republic</td>
<td>mid 2002</td>
<td>1,663,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Spain</td>
<td>Sep-03</td>
<td>17,266,520</td>
<td>12,937</td>
<td>-</td>
<td>-</td>
<td>12,937</td>
<td>0.07%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.07%</td>
</tr>
<tr>
<td>Sweden</td>
<td>Sep-03</td>
<td>5,534,000</td>
<td>5,763</td>
<td>15,047</td>
<td>-</td>
<td>5,763</td>
<td>0.10%</td>
<td>0.27%</td>
<td>0.00%</td>
<td>0.10%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>mid 2002</td>
<td>5,383,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Turkey</td>
<td>mid 2002</td>
<td>18,959,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Sep-03</td>
<td>29,300,000</td>
<td>4,650</td>
<td>3,175</td>
<td>-</td>
<td>4,650</td>
<td>0.02%</td>
<td>0.01%</td>
<td>0.00%</td>
<td>0.02%</td>
</tr>
<tr>
<td>United States</td>
<td>mid 2002</td>
<td>192,494,000</td>
<td>5,082,856</td>
<td>-</td>
<td>4,378,144</td>
<td>9,461,000</td>
<td>2.64%</td>
<td>0.00%</td>
<td>2.27%</td>
<td>4.91%</td>
</tr>
</tbody>
</table>

*Table 7: ULL for Broadband and other uses in comparison with total number of lines*
### Local Loop and related facilities and services

<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Incumbent Lines</th>
<th>Total broadband</th>
<th>Total DSL</th>
<th>Incumbent retailed DSL</th>
<th>Simple resale DSL</th>
<th>Wholesale DSL</th>
<th>Wholesale + simple resale DSL</th>
<th>LLU used for DSL</th>
<th>Line sharing</th>
<th>Other broadband technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>mid 2002</td>
<td>11,245,000</td>
<td>261,100</td>
<td>111,800</td>
<td>106,800</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5,000</td>
<td>149,300</td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>Sep-03</td>
<td>3,060,000</td>
<td>592,750</td>
<td>242,750</td>
<td>188,000</td>
<td>45,000</td>
<td>45,000</td>
<td>9,750</td>
<td>-</td>
<td>350,000</td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>Sep-03</td>
<td>4,705,854</td>
<td>1,135,406</td>
<td>708,606</td>
<td>596,771</td>
<td>-</td>
<td>105,857</td>
<td>105,857</td>
<td>3,416</td>
<td>2,562</td>
<td>426,800</td>
</tr>
<tr>
<td>Canada</td>
<td>end 2002</td>
<td>21,435,000</td>
<td>3,657,178</td>
<td>1,614,365</td>
<td>1,470,005</td>
<td>-</td>
<td>144,360</td>
<td></td>
<td>2,042,813</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czech-Republic</td>
<td>mid 2002</td>
<td>4,126,000</td>
<td>33,880</td>
<td>7,260</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>25,410</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>Sep-03</td>
<td>2,216,522</td>
<td>611,434</td>
<td>428,402</td>
<td>344,186</td>
<td>22,037</td>
<td>22,037</td>
<td>50,485</td>
<td>11,694</td>
<td>183,032</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>Sep-03</td>
<td>3,180,000</td>
<td>359,000</td>
<td>281,000</td>
<td>207,360</td>
<td>8,640</td>
<td>8,640</td>
<td>43,500</td>
<td>21,500</td>
<td>78,000</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Sep-03</td>
<td>34,000,000</td>
<td>2,851,795</td>
<td>2,503,500</td>
<td>1,488,000</td>
<td>-</td>
<td>880,000</td>
<td>880,000</td>
<td>3,500</td>
<td>132,000</td>
<td>348,295</td>
</tr>
<tr>
<td>Germany</td>
<td>Sep-03</td>
<td>49,400,000</td>
<td>4,372,020</td>
<td>4,252,020</td>
<td>3,950,000</td>
<td>-</td>
<td>-</td>
<td>302,000</td>
<td>20</td>
<td>120,000</td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>Sep-03</td>
<td>5,673,299</td>
<td>5,704</td>
<td>3,366</td>
<td>2,695</td>
<td>239</td>
<td>239</td>
<td>432</td>
<td>-</td>
<td>2,338</td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>mid 2002</td>
<td>4,320,000</td>
<td>88,306</td>
<td>53,173</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>34,183</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iceland</td>
<td>end 2001</td>
<td>192,000</td>
<td>10,478</td>
<td>9,978</td>
<td>9,520</td>
<td>-</td>
<td>458</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>Sep-03</td>
<td>1,700,000</td>
<td>21,570</td>
<td>13,390</td>
<td>9,800</td>
<td>-</td>
<td>2,380</td>
<td>2,380</td>
<td>250</td>
<td>960</td>
<td>8,180</td>
</tr>
<tr>
<td>Italy</td>
<td>Sep-03</td>
<td>27,022,000</td>
<td>1,892,019</td>
<td>1,672,019</td>
<td>1,100,000</td>
<td>-</td>
<td>400,000</td>
<td>400,000</td>
<td>172,000</td>
<td>19</td>
<td>220,000</td>
</tr>
<tr>
<td>Japan</td>
<td>Dec-01</td>
<td>74,285,000</td>
<td>2,839,348</td>
<td>1,524,348</td>
<td>113,222</td>
<td>-</td>
<td>1,411,126</td>
<td>1,315,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>mid 2002</td>
<td>27,213,000</td>
<td>10,988,787</td>
<td>6,810,487</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4,183,043</td>
<td></td>
<td></td>
<td></td>
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**Ref:** ERU/CN/018

**Telecommunications Regulatory Authority**

**Date:** 1 June 2004

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13 Cable Modem and fixed radio technologies
### Table 8: Technologies and services used for DSL services

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<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Incumbent Lines</th>
<th>Total broadband</th>
<th>Total DSL</th>
<th>Incumbent retailed DSL</th>
<th>Simple resale DSL</th>
<th>Wholesale DSL</th>
<th>Wholesale + simple resale DSL</th>
<th>LLU used for DSL</th>
<th>Line sharing</th>
<th>Other broadband technologies</th>
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## Local Loop and related facilities and services

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<th>Simple DSL resale</th>
<th>Wholesale DSL</th>
<th>Wholesale + simple resale</th>
<th>LLU used for DSL</th>
<th>Line sharing</th>
<th>LLU for DSL and line sharing</th>
<th>Other broadband technologies</th>
<th>All non-incumbent retailed</th>
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Ref: ERU/CN/018
### Local Loop and related facilities and services

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<th>LLU used for DSL</th>
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*Table 9: Technologies and services used in broadband in proportion to total broadband*
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<th>Simple DSL resale</th>
<th>Wholesale DSL</th>
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<th>Line sharing</th>
<th>Line sharing</th>
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<th>All non-incumbent retailed</th>
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<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td></td>
</tr>
<tr>
<td>Luxembourg</td>
<td>89%</td>
<td>0%</td>
<td>1%</td>
<td>1%</td>
<td>9.79%</td>
<td>0.00%</td>
<td>9.79%</td>
<td>10.92%</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td></td>
</tr>
</tbody>
</table>
## Local Loop and related facilities and services

<table>
<thead>
<tr>
<th>Country</th>
<th>Incumbent retailed DSL</th>
<th>Simple DSL resale</th>
<th>Wholesale DSL</th>
<th>Wholesale + simple resale</th>
<th>LLU used for DSL</th>
<th>Line sharing</th>
<th>LLU for DSL and line sharing</th>
<th>All non-incumbent retailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>83%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>4.39%</td>
<td>12.48%</td>
<td>16.87%</td>
<td>16.94%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Norway</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Poland</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Portugal</td>
<td>84%</td>
<td>0%</td>
<td>16%</td>
<td>16%</td>
<td>0.41%</td>
<td>0.00%</td>
<td>0.41%</td>
<td>16.07%</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>84%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Spain</td>
<td>80%</td>
<td>8%</td>
<td>11%</td>
<td>20%</td>
<td>0.90%</td>
<td>0.00%</td>
<td>0.90%</td>
<td>20.49%</td>
</tr>
<tr>
<td>Sweden</td>
<td>72%</td>
<td>24%</td>
<td>1%</td>
<td>24%</td>
<td>1.15%</td>
<td>2.99%</td>
<td>4.14%</td>
<td>28.43%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>Turkey</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>0.00%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>49%</td>
<td>0%</td>
<td>51%</td>
<td>51%</td>
<td>0.34%</td>
<td>0.23%</td>
<td>0.57%</td>
<td>51.31%</td>
</tr>
<tr>
<td>United States</td>
<td>Insufficient information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 10: Technologies and services used for DSL in proportion to total DSL*
## Local loop unbundling by country

<table>
<thead>
<tr>
<th>Country</th>
<th>Regulatory requirement for local loop unbundling</th>
<th>Cost methodology for unbundled loops</th>
<th>Number of unbundled loops (mid-2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Unconditioned local loop service, mandated in July 1999, was made available in the second half of 2000 by the incumbent. A draft decision made by the ACCC in April 2002 that a line sharing service would be in the long-term interests of end users, but that if Telstra offered reasonable commercial terms to access seekers the ACCC would exercise regulatory forbearance.</td>
<td>Total service long run incremental cost plus contribution to indirect costs.</td>
<td>5 000</td>
</tr>
<tr>
<td>Austria</td>
<td>Implemented on July 1999. Sub-loop unbundling and penalties in case of incumbent’s failure to meet lead times have been implemented. The incumbent, since September 2001, has to make available shared access for local loops.</td>
<td>Cost-oriented (FL-LRAIC) based on a bottom-up cost model calculation. The cost for shared access for a local loop is 50% of the monthly charge for the full unbundled line. Costs are 50% of the monthly charge for the full unbundled line.</td>
<td>4 800</td>
</tr>
<tr>
<td>Belgium</td>
<td>Full unbundling, shared access and sub-loop unbundling in place since 1 March 2001.</td>
<td>Recurring charges are based on a “retail minus” formula and non-recurring charges on a LRIC methodology.</td>
<td>1 190 full unbundled; 684 shared access.</td>
</tr>
<tr>
<td>Canada</td>
<td>Announced in May 1997. Facilities that were classified as essential are subject to mandatory unbundling. Rate reductions of 30%-40% have been implemented since 1997.</td>
<td>Incremental costs plus a mark-up to recover fixed and common costs. The mark-up was reduced from 25% to 15% in 2002.</td>
<td>144 360 (end 2002)</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Legislative process ongoing; due to elections the date of coming into force was postponed.</td>
<td>Under consideration.</td>
<td>n/a</td>
</tr>
<tr>
<td>Finland</td>
<td>Implemented in 1997.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>Available from 1 January 2001. Includes raw copper unbundling and line sharing.</td>
<td>Long run incremental costs.</td>
<td>500</td>
</tr>
<tr>
<td>Germany</td>
<td>The incumbent has been obliged to offer access to the local loop since 1998. In 2001 the obligation to offer shared access was implemented.</td>
<td>Long run incremental costs.</td>
<td>700 794 (March 2002)</td>
</tr>
</tbody>
</table>
### Local loop unbundling by country

<table>
<thead>
<tr>
<th>Country</th>
<th>Regulatory requirement for local loop unbundling</th>
<th>Cost methodology for unbundled loops</th>
<th>Number of unbundled loops (mid-2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>Unbundling came into effect on 1 January 2001.</td>
<td>Prices for full unbundled loops as well as shared access are based on LRAIC methodology using current costs.</td>
<td>93</td>
</tr>
<tr>
<td>Hungary</td>
<td>Unbundling came into force on 1 July 2001 and the first reference unbundling offer was accepted in 2002. From 2002 full unbundling and shared access available.</td>
<td>Individual approvals using the fully distributed cost methodology in 2002 and from 2003 a long run incremental cost methodology.</td>
<td></td>
</tr>
<tr>
<td>Iceland</td>
<td>Came into force on 1 October 2000.</td>
<td>Using a cost-based tariff model using historic costs.</td>
<td>458 (end 2001)</td>
</tr>
<tr>
<td>Ireland</td>
<td>Bit stream unbundling available from 2000. Full unbundling in April 2001.</td>
<td>Prices are reviewed by the regulator and based on historic costs.</td>
<td>20</td>
</tr>
<tr>
<td>Italy</td>
<td>During 2000 different decisions of the regulator led to full implementation of unbundling. This was supplemented in January 2001 by decisions to implement shared access and sub-loop unbundling.</td>
<td>Historical cost methodology used.</td>
<td>25 000 (April 2002)</td>
</tr>
<tr>
<td>Japan</td>
<td>The Ministry issued a document in August 1999 clarifying that the incumbent was required to provide interconnection to the main distribution frame and line sharing. Unbundling of optical fibre implemented in April 2000. Full unbundling and line sharing implemented in September 2000.</td>
<td>Costs for unbundled lines are calculated using the interconnection accounting information.</td>
<td>1 411 126 (December 2001).</td>
</tr>
<tr>
<td>Korea</td>
<td>Full unbundling and line sharing available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Luxembourg</td>
<td>EC Directive applied.</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Mexico</td>
<td>Not available.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>Unbundled access to the local loop available since December 1997. In March 1999, OPTA laid down guidelines indicating the way in which it would settle any disputes over unbundled access. Implementation of EC Directive came into effect in January 2001.</td>
<td>Prices are regulated and subject to cost orientation which means the cost of the service plus a reasonable profit margin.</td>
<td>208 224 (May 2002)</td>
</tr>
</tbody>
</table>
## Local Loop and related facilities and services

### Local loop unbundling by country

<table>
<thead>
<tr>
<th>Country</th>
<th>Regulatory requirement for local loop unbundling</th>
<th>Cost methodology for unbundled loops</th>
<th>Number of unbundled loops (mid-2002)</th>
</tr>
</thead>
</table>
| New Zealand | In December 2003, the Telecommunications Commissioner recommended that the following services should be designated services:  
  - Access to an ADSL bitstream service suitable for residential and business use with a related interconnection  
  - Backhaul transmission service to be used in conjunction with the designated bitstream service. 
  
  In addition, operational support systems in association with the designated services should be available. 
  
  The Commissioner recommended that LLU and line sharing should not be specified or designated or that further access to unbundled elements be provided. 
  
  Source: Report on access to the unbundled elements of Telecom’s local loop network and access to the unbundled elements of and interconnection with Telecom’s fixed Public Data Network under section 64 and Schedule 3 of the Telecommunications Act 2001, Commerce Commission, New Zealand, December 2003 | n/a | n/a |
<p>| Norway | From 6 February 2001 the incumbent is obliged to offer full access, shared access and bitstream access. Prices should be cost oriented. | | |
| Poland | Draft amendments to the Telecommunication Law contain provisions for local loop unbundling. | | |
| Portugal | The EC regulation on unbundling came into force in January 2001. Cost estimations and international benchmarking for reference purposes. Cost estimations used the incumbent’s cost accounting system, based on historical costs. When assessing new services for which historical information was not available, certain present costs were used. | 20 | |</p>
<table>
<thead>
<tr>
<th>Country</th>
<th>Regulatory requirement for local loop unbundling</th>
<th>Cost methodology for unbundled loops</th>
<th>Number of unbundled loops (mid-2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slovak Republic</td>
<td>The Telecommunication Act will be amended to allow for unbundling.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>Since 2001 the dominant carrier has been required to provide full unbundled access, shared access and bitstream access.</td>
<td>Based on costs justified by the operator to the regulator.</td>
<td>72 unbundled loops (May 2002)</td>
</tr>
<tr>
<td>Sweden</td>
<td>The EC regulation brought unbundling into force in January 2001. The incumbent offers full unbundling, shared access and sub-loop unbundling.</td>
<td>Costs are calculated with a top down fully distributed cost model based on current costs. Tariffs for ULL are set on a geographically averaged basis.</td>
<td>3,393 fully unbundled lines 1,670 shared lines (end June 2002)</td>
</tr>
<tr>
<td>Switzerland</td>
<td>A process is underway to introduce full access and shared line access.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>Monopoly. LLU not applicable.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>From January 2001 the incumbent has published a reference offer that includes fully unbundled loops, shared lines and sub-loop unbundling.</td>
<td>Charges are cost-oriented and geographically averaged.</td>
<td>785 (July 2002)</td>
</tr>
<tr>
<td>United States</td>
<td>The Telecommunications Act of 1996 required incumbent local exchange carriers to provide unbundled network elements on a non-discriminatory basis. In 1999 the unbundling rules were reviewed and changes made to the list of network elements required to be unbundled. In December 1999 line sharing was mandated for xDSL-based services. 72% of exchanges are able to offer unbundled local lines.</td>
<td>Based on forward-looking economic costs.</td>
<td>9,461,000</td>
</tr>
</tbody>
</table>

**Table 11: Local loop unbundling by country**

Source: OECD Communications Outlook, 2003
### A1.1.1 Comparison of ULL pricing by country

The current pricing of ULL services by country is shown below in Table 12. Prices have been converted to Bahraini Dinars as of 02/04.

<table>
<thead>
<tr>
<th>Country</th>
<th>Monthly charge (BD)</th>
<th>One off connection charge (BD)</th>
<th>Residential line rental</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full LLU</td>
<td>Line sharing</td>
<td>Full LLU</td>
</tr>
<tr>
<td>Australia</td>
<td>2.63</td>
<td>-</td>
<td>3.42</td>
</tr>
<tr>
<td>Australia</td>
<td>11.95</td>
<td>-</td>
<td>4.44</td>
</tr>
<tr>
<td>Austria</td>
<td>3.55</td>
<td>1.78</td>
<td>17.77</td>
</tr>
<tr>
<td>Belgium</td>
<td>3.69</td>
<td>1.05</td>
<td>25.66</td>
</tr>
<tr>
<td>Canada</td>
<td>1.48</td>
<td>-</td>
<td>5.56</td>
</tr>
<tr>
<td>Canada</td>
<td>12.66</td>
<td>-</td>
<td>5.56</td>
</tr>
<tr>
<td>Czech</td>
<td>Not implemented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>2.70</td>
<td>1.35</td>
<td>14.77</td>
</tr>
<tr>
<td>Finland</td>
<td>3.91</td>
<td>2.45</td>
<td>68.48</td>
</tr>
<tr>
<td>France</td>
<td>3.42</td>
<td>0.95</td>
<td>35.20</td>
</tr>
<tr>
<td>Germany</td>
<td>4.07</td>
<td>1.55</td>
<td>38.20</td>
</tr>
<tr>
<td>Greece</td>
<td>3.74</td>
<td>2.25</td>
<td>40.23</td>
</tr>
<tr>
<td>Hungary</td>
<td>4.31</td>
<td>4.23</td>
<td>-</td>
</tr>
<tr>
<td>Iceland</td>
<td>3.81</td>
<td>1.09</td>
<td>12.83</td>
</tr>
<tr>
<td>Ireland</td>
<td>5.48</td>
<td>2.94</td>
<td>39.63</td>
</tr>
<tr>
<td>Italy</td>
<td>3.52</td>
<td>1.42</td>
<td>26.69</td>
</tr>
<tr>
<td>Japan</td>
<td>6.09</td>
<td>0.54</td>
<td>-</td>
</tr>
<tr>
<td>Korea</td>
<td>2.71</td>
<td>1.80</td>
<td>-</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>4.32</td>
<td>2.46</td>
<td>29.72</td>
</tr>
<tr>
<td>Mexico</td>
<td>Not implemented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>4.40</td>
<td>1.83</td>
<td>25.76</td>
</tr>
<tr>
<td>New-Zealand</td>
<td>Not implemented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>4.07</td>
<td>5.09</td>
<td>49.28</td>
</tr>
<tr>
<td>Poland</td>
<td>Not implemented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>3.90</td>
<td>2.55</td>
<td>27.00</td>
</tr>
<tr>
<td>Slovak</td>
<td>Not implemented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>3.66</td>
<td>1.55</td>
<td>6.52</td>
</tr>
<tr>
<td>Sweden</td>
<td>3.78</td>
<td>1.79</td>
<td>53.81</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Not implemented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>Not implemented</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United-Kingdom</td>
<td>5.27</td>
<td>2.28</td>
<td>45.49</td>
</tr>
<tr>
<td>United-States</td>
<td>8.95</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>United-States</td>
<td>2.65</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Table 12: Tariffs for LLU and related services*
A2 The DSL Market in Bahrain

A2.1.1 DSL Availability
Batelco reported to the TRA that DSL services are potentially available on 97% of all lines. Areas where service is not available are limited to Hawar Island and some remote areas of Zallaq. This level of availability is greater than in all OECD countries. In comparison, Belgium reported 93% availability for 2001 and Denmark, the next highest, reported 90% availability. By end 2004 both countries are projected to reach 95% availability\textsuperscript{14}. Typical broadband penetration in developed countries is “beginning to group around the 80-90% mark”\textsuperscript{15}.

A2.1.2 DSL services
Batelco’s DSL services are somewhat limited in comparison with those available elsewhere. Only Asymmetric DSL is available, and maximum speed is limited to 1Mbit/s. Batelco does not offer premium services with guaranteed quality of service.

In comparison, most OECD countries now have 2Mbit/s ADSL services, even for the residential market, while many have 4Mbit/s ADSL and higher. Some countries have symmetric DSL services at various speeds up to 2Mbit/s. Service providers in Sweden and Germany offer 4Mbit/s symmetric services in selected areas. Service providers in Sweden, Germany and the USA offer symmetric services at 2Mbit/s or greater. Such services enable high performance virtual private networks to be built using switched data services.

A2.1.3 DSL pricing
Batelco’s DSL pricing is high in comparison with rates in other countries outside the GCC. Figure 5 and Figure 6 show Batelco’s pricing for its 256Kbit/s and 512Kbit/s business services against a benchmark basket of service offers from France, Germany, Sweden, United Kingdom and the USA by Oftel\textsuperscript{16}. In Figure 5 the prices are compared with all business services in the benchmark, including both symmetric and asymmetric services. In Figure 6, Batelco’s prices are compared with those services of equivalent speed, differentiating where appropriate between asymmetric and symmetric services. Batelco’s pricing for both 256 and 512Kbit/s is higher than the equivalent services from service providers in the benchmark, and even higher than most 2Mbit/s service prices. On this basis Batelco’s prices for business services appear to be expensive and to offer less in terms of performance and quality of service than those available in markets where there is competition.

Batelco’s pricing for residential services is also relatively high. In this case, they are more than double those of equivalent services in the Oftel basket, and higher than any of the services, including those at 2Mbit/s and above (see Figure 7).

\textsuperscript{14} OECD Communications Outlook 2003
\textsuperscript{15} British Telecom Plc, Memorandum to the UK Parliament Select Committee on Trade and Industry, 24\textsuperscript{th} October 2003
\textsuperscript{16} OFTEL: International benchmarking report, June 2003, Annex C
The Oftel benchmark only covered four countries, and it may be argued that these countries are not representative. However, the OECD price comparison shown in Figure 8 demonstrates that these countries are representative of service pricing more generally, whereas Bahrain pricing is high, with prices equivalent to those in Eastern Europe, Mexico and Turkey.

Batelco business DSL service pricing in comparison with a basket of European and US service providers

![Batelco business DSL service pricing in comparison with a basket of European and US service providers](image)

*Figure 5: Batelco’s business DSL service pricing in comparison with a basket of European and US service providers*

In comparison with regional benchmarks as shown in the table below, UAE is offering the most competitive price whilst others are comparable with Bahrain.

<table>
<thead>
<tr>
<th>Country</th>
<th>Monthly rental in BD</th>
<th>Download speed offered in kbit/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Arab Emirates</td>
<td>25</td>
<td>384</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>23 +12</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>38 +12</td>
<td>256</td>
</tr>
<tr>
<td>Qatar</td>
<td>30.9</td>
<td>256</td>
</tr>
<tr>
<td>Bahrain (residential)</td>
<td>40</td>
<td>256</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>384</td>
</tr>
</tbody>
</table>

17 OECD Communications Outlook 2003
Batelco business DSL service pricing in comparison with equivalent services in a basket of European and US service providers

Figure 6: Batelco’s business DSL service pricing in comparison with equivalent services from European and US service providers

Batelco residential DSL service pricing in comparison with a basket of European and US service providers

Figure 7: Batelco’s residential DSL service pricing in comparison with residential services from European and US service providers
A2.1.4 DSL market penetration

In February 2004, Batelco reported [10,318] DSL connections, comprising: [9,161] residential connections, [1,037] business connections and [121] connections to education establishments. This gives a penetration of 1.57 per 100 inhabitants. This level of penetration is relatively low in comparison with the EU and OECD member states (see Table 13).

However, when a comparison of penetration is made taking into account GDP/capita, the strength of demand in Bahrain can be seen to be high in comparison with OECD countries generally. This strength of demand is shown in Figure 9 which shows penetration in relation to GDP/capita.

This strong demand is particularly evident when the high price of DSL services is taken into account. Figure 10 shows Bahrain penetration in relationship to the affordability of DSL services in comparison with the OECD benchmark. The proxy for affordability used is the monthly charge for broadband service in comparison with GDP/capita. The monthly charge used for the Bahrain service was 50BD, equivalent to Batelco’s tariff for the Residential 384Kbit/s service.

Figure 8: Batelco’s DSL service pricing in comparison with DSL pricing in OECD member state

Source: OECD: Communications Outlook 2003; Batelco
## Local Loop and related facilities and services

<table>
<thead>
<tr>
<th></th>
<th>DSL</th>
<th>Cable Modem</th>
<th>Other Platforms</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
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Source: OECD [www.oecd.org/sti/telecom]

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Source: Batelco

*Table 13 Broadband access in OECD countries per 100 inhabitants, June 2003*
1.0 Broadband penetration in relation to GDP per capita

\[ R^2 = 0.4495 \]

GDP per capita (Dinars, PPP)

Penetration, lines per 100 inhabitants

Figure 9: Broadband penetration in Bahrain and OECD countries in relation to GDP/capita

1.0 Broadband penetration in relation to affordability

\[ R^2 = 0.592 \]

Broadband monthly charge as a %age of GDP/capita

Figure 10: Broadband penetration in Bahrain and OECD countries in relation to affordability
CONSULTATION

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A3  Duct sharing

A consortium of consultants carried out a review of facilities sharing amongst selected countries out for the European Commission in 1998\(^{18}\). Of the countries reviewed, duct sharing was mandated in the USA, Finland and Australia. In addition, duct sharing is allowed in Japan. The following describes the rules and experiences in these countries.

A3.1  USA

The FCC Rules require utilities to provide a carrier with non-discriminatory access to any pole, duct, conduit or right-of-way. Access may be denied if there is insufficient capacity or for safety, reliability or engineering reasons.

Requests must be in writing and must be fulfilled within 45 days otherwise written reasons must be given why the request is being denied.

60 days notice must be given of removal or modification to facilities, apart from emergencies.

A carrier may file a petition against the removal or modification of a facility within 15 days of receiving notice, and the respondent may file a reply within 7 days. The complainer has to establish a prima facie case, except where the complaint relates to the charges and the utility argues that the rate is less than its incremental costs, when the utility carries the burden of proof.

The costs of modifying facilities are borne by all parties who obtain access to the facility as a result of the modification and are shared proportionately. A party with an attachment that exists before the modification is considered to benefit (and must therefore share costs) if it adds to or modifies its attachment after it receives notice of the modification. However a party with a pre-existing attachment does not have to bear any costs of rearrangement or replacement if the change is necessitated solely by an additional attachment or modification sought by another party. A party that makes an attachment after a modification has to share the costs of the modification if the modification made the attachment possible.

Figure 11 shows Bell Atlantic’s duct sharing process.

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\(^{18}\) Recommended Practices for Co-location and other Facilities Sharing for Telecommunications Infrastructure, EUTELIS Consortium for the European Commission, January 1999
Figure 11: Bell Atlantic’s duct sharing process
A3.2 Finland

A formal requirement for duct sharing was introduced in 1997 and modified in subsequent government decisions. Operators have a duty to lease any free segments of cable channels constructed by it and any free antenna places in radio masts belonging to a public telecommunications network to other telecommunications operators for the operation of public telecommunications, on request. This duty arises only if the construction of parallel cable channels or radio masts is inexpedient due to reasons relating to environmental protection, zoning or regional planning and if the cable channels and antenna places are no longer necessary for the present and reasonable future needs of the own users of the telecommunications operator. This duty is the legal basis for sharing.

The following principles are applied.

- There is a general duty to take account of the needs of other operators in constructing ducts and radio masts, and provides powers to resolve disputes by the relevant ministry.
- An operator that owns ducts or masts has a duty to lease capacity for a reasonable remuneration if it cannot show that it needs the capacity within the next two years.
- If negotiations take more than two months the Ministry may be requested to decide the commercial arrangements.
- After capacity is leased, if the owner needs to recover the capacity for its own use, it must give at least two years notice.
- Duct sharing always involves renting the whole duct or inner duct so that the chance of damage to existing cables is minimised.

A3.3 Australia

Under the Australian Telecommunications Act of 1997, there is an obligation to share radio-communications towers and ducts when it is technically feasible. This obligation has been documented in a code of practice. ¹⁹

The code contains a comprehensive set of guidelines for access to telecommunications transmission towers, sites of towers and underground facilities with which licensed carriers have to comply. Part of the proposed code is mandatory, e.g. the rights of refusal and complying with the Telecommunications Act, and compliance with these parts is a licence condition of all carriers. Other parts of the code are not mandatory and can be regarded as a safety net. This permits carriers to agree to deviate from the code where such agreement offers mutual advantages. Major changes due to the proposed code relate to:

- Preliminary site investigations which can be carried out by the party seeking access;

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¹⁹ A code of access to telecommunications transmission towers, sites of towers and underground facilities, Australian Competition and Consumer Commission, 1999.
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- Make Ready Work (MRW) which can be carried out by the party seeking access. These provisions try to strike a balance between on the one hand timely access and on the other hand the protection of structural integrity of the facility;
- Restrictions on a carrier’s reservation rights in respect of facilities for future use;
- Pricing principles; and
- Sharing of information between parties.

Under the new Telecommunications Act, licensed carriers are subject to all federal, state and local government planning and environmental laws. There are some exceptions for low impact facilities. Further, the Australian Communications Authority (ACA) has the authority to override local environmental regulation by granting a facilities installation permit on grounds of new facilities with national significance. However, this has never been applied and the ACA anticipates that the process would be lengthy. Therefore, local councils have become very influential in the area of facilities sharing, particularly towers, but also duct sharing. The criteria for local governments to determine the environmental impact depends on the facilities. The criteria distinguish between low and high impact facilities. Currently, only minor facilities, such as antennas on a building or traffic lights (see figure below), are still immune from state and environmental law. Therefore, most facilities require approval of local councils, taking into account health concerns (radiation), environmental and visual impact (wild life, fauna) and the impact of constructional work (heritage, archaeological buildings).

A3.4 Japan

According to the Telecommunications Business Law (TBL), Type 1 carriers are entitled to rights of way for public water and private land. Nonetheless, due to the fragmented regulations on rights of way, new carriers have experienced difficulties in establishing their own networks even after receiving Type 1 carrier licenses. Since there are many laws (e.g. the Road Law, the National Asset Law and the Local Autonomy Law) with different jurisdiction over rights of way, carriers are required to receive separate permission from a number of government bodies.

New Type 1 entrants have claimed that the current situation gives an unfair advantage to the incumbent and prevents them creating from infrastructure competition. Since new entrants face difficulties in constructing new infrastructure, even after they have received Type 1 licenses, regulations on facility sharing (such as sharing of ducts) become even more important for ensuring that new entrants have fair access to end users. If facility sharing is effective, new entrants can construct new networks relatively cheaply and rapidly.

According to the TBL, Type 1 carriers and special Type 2 carriers can request arbitration if they fail to reach an agreement for facility sharing. If a party is not satisfied with the result of the arbitration by the Minister, it can file a suit within three months of the decision. In principle, then, any Type 1 or special Type 2 carrier can request facility sharing with NTT and other utility-based Type 1 carriers that own duct systems. In practice, when interconnection occurs at an NTT building, NTT should provide facility sharing for other carriers using NTT’s conduits, ducts and poles from the point of interface to the first manhole. This exception aside, the use of the facilities
of NTT and other utility-based Type 1 carriers is subject to commercial negotiation and ultimately to ministerial authorization.

However, many new entrants have difficulty reaching facility-sharing agreements with NTT and utility-based Type 1 carriers because there are no standardized charges and no limit on negotiation periods. Because of these difficulties, some new entrants have argued for mandatory facility sharing, but the counter-argument made is that this would result in “free riding”. In the face of criticism about the fragmented regulations on rights of way, a Japanese Government study group reported on conditions of access to poles, conduits, ducts and rights of way on 25 December 1998. The report suggested improvement of current procedures to ensure timely, non-discriminatory and transparent access to the resources. Since there were so many regulations on rights of way, it recommended that guidelines be published to access rights of way for new entrants in order to help them acquire the necessary information.
A4 Services requirements

This annex comprises TRA’s initial views for the contents of a reference offer for access services associated with the local loop. The requirements set out are derived in large part from the principles of implementation and best practice developed by an international group of regulators and draw on experience in a number of countries.

Consultation

35. The TRA seeks opinions on detailed requirements for local loop facilities and services that should form the definition of the facilities and services in the reference access offer.

A4.1 Service overview

Five groups of services have been identified as a minimum set of services required to enable full and shared access to the local loop and required for a LLU or line sharing reference offer:

1. Ducts
2. Local loop
3. Co-location services
   o Co-location facilities in the following forms:
     Physical co-location
     Distant or adjacent co-location
     Virtual or managed co-location
   o Hand-over Distribution Frame (HDF), including the street cabinet where this is relevant to sub-loops
   o Tie Cables
   o Internal Tie Cable
   o External Tie Cable
   o OLO’s External Tie Cable Pull-Through Service
   o Transmission and backhaul Services
   o Power
   o Air conditioning/chilling/heating (as relevant)
   o Access to co-location space
   o Equipment moving assistance (where lifting/hosting apparatus is needed)
4. Interface to Operational Support Systems e.g. provisioning, ordering, fault resolution, maintenance etc

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This Annex is based on Principles of implementation and best practice regarding LLU as decided by the Independent Regulators Group, 18 October 2001 and amended in May 2002
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5. Provision of information (e.g. network information)

All the above mentioned services should be provided as a minimum set of services.

A4.2 Local loop facility

A4.2.1 General requirements

Provision and maintenance of a metallic twisted pair extending between the end user Network terminating Point (NTP) and the serving Main Distribution Frame (MDF) or equivalent distribution point closer to the user premises. It includes any metallic pair that can be provisioned in accordance with a minimum set of technical standards. The unbundled local loop does not necessarily have to be the existing customer’s telephone line. Spare pairs can be used, where a connection is or can be made available. The OLO should be able to request and be supplied with a loop, even when this requires the establishment of a new local loop within the existing infrastructure.

Usage restrictions may follow from in-cable spectral management (and, for line sharing, in-pair). In-cable spectral management is concerned with the allowable pollution on other uses of the access network.

The development of spectral management should not lead to delays for introduction of ULL. Development of in-cable spectral management might take place in a later phase, as introduction of ULL will not impose an immediate threat to network integrity, because of the limited broadband penetration at the start. The incumbent operator should consult OLOs when developing a spectral management plan.

To keep interference to other users in a cable within acceptable levels, in-cable (and where relevant, in-pair) spectral management may lead to limitations on the systems used, system reach, cable fill, system performance or power spectral density. These limitations should be equally applied to all OLOs and the incumbent operator.

In-cable spectral management (and where relevant in-pair) should be flexible and facilitate the introduction of new systems.

In-cable spectral management should include clear procedures for allowing new systems/masks.

Existing deployment should not automatically be given protective status.

Maintenance and quality objectives of cables should be the same whether the cable is used exclusively by the incumbent operator or shared with other OLOs.

All changes in the network affecting the products and service of OLOs sharing the unbundled local loop should be notified in advance to make it possible for the OLO to respond.

Incumbent operators should inform end users and OLOs about maintenance issues on an equal basis.

A service level agreement should set a maximum repair time. If the incumbent operator offers special performance to end users, OLOs must also be able to make use of these special conditions. These different levels of service should be negotiated between the incumbent operator and OLOs.
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Each operator should be required to inform its end users connected by ULL of the fault handling procedure and the demarcation points or limitations of responsibilities for the offered services.

Maintenance, provisioning, ordering and repair of unbundled local loops should be non-discriminatory.

The incumbent operator should not be able to limit access to the local loop for maintenance purposes to a particular time period; operators should have the ability to carry out such tasks at any reasonable time, as long as they have been agreed in advance.

A4.2.2 Requirements of shared access

The reference offer for unbundled access to local loops and related facilities provided by the incumbent operator should at a minimum enable the OLO to provide to its own end customers a DSL offer corresponding to the offer provided to end customers by the incumbent operator. However, OLOs must be free to define and offer a differing service.

The incumbent operator should incorporate the required specifications of all the interfaces for the splitters and DSLAM in the reference offer for ULL and related facilities. Such specifications may not impose higher requirements on the OLO than the specifications of the interfaces as used by the incumbent operator in providing his own DSL applications.

In order to avoid interference in its network, the incumbent operator is entitled, if on the basis of objective justification, to require that the OLO should comply with such specifications as long as the interfaces have not been fully standardised by international bodies like ETSI and ANSI. After full standardisation, the incumbent operator should only require compliance with the applicable standards of international bodies like ETSI and ANSI. The reference offer for unbundled access to their local loops (including line sharing) and related facilities provided by the incumbent operator may specify that equipment used directly or indirectly by the OLO and whose interfaces have not been fully standardised by international bodies like ETSI and ANSI must be replaced by the OLO should they not comply with subsequent standards from international bodies like ETSI and ANSI and should there consequently be demonstrable degradation or risk of degradation to network integrity, network security or service interoperability.

The shared access service provided by the incumbent operator to an OLO should be terminated when the end-user cancels the voice telephony services provided by the incumbent operator. A potential minimum duration of the existing voice telephony contract applies. The incumbent operator should inform the OLO without undue delay about the end-user cancellation of service. The shared access service should be seamlessly converted into full LLU on demand of the end-user and if the OLO agrees to the conversion and fulfils the necessary requirements to provide such a service.

A4.2.3 Co-location services

An OLO will need a co-location facility in order to provide service over an unbundled loop. In addition the OLO will need some additional services in order to exploit co-location. These additional services will vary with the form of co-location an OLO chooses to adopt.
A4.2.4 Co-location

Co-located OLOs should have the option to choose from at least three different forms of co-location:

1. Physical co-location where an OLO can request space to locate its equipment within the incumbent operator local MDF site or equivalent distribution point closer to the user premises, either in the building containing the MDF or in other space that could be made available in the site (such as adjacent buildings, car parks or warehouses). This space can be fitted and operated in an area within a incumbent operator’s exchange where the incumbent operator could or does house its own equipment, without a permanent barrier between them (co-mingling) or be shared with other OLOs or be in a separate room, depending on the requirements of the requesting OLO and the availability of suitable space.

2. Distant or adjacent co-location where an OLO can choose to use its own premises and connect to the incumbent operator’s local MDF site or equivalent distribution point closer to the user premises.

3. Managed or virtual co-location - where the incumbent operator houses, owns and runs equipment located in its premises at the MDF site or equivalent distribution point closer to the user premises on behalf of the OLO.

A4.2.5 Security and access to co-location space

Security processes between OLOs and the incumbent operator should be clear in terms of accreditation of staff, contractors, liability for health and safety etc.

The definition and provision of co-location products should not create complexities in other areas, such as access and security, health and safety.

The incumbent operator should allow unescorted access to the co-location facilities located in its co-location sites associated with LLU and line sharing. However, there may be special circumstances where such access cannot be provided, in which case the incumbent operator should provide escorted access services that meet reasonable demand (including access at short notice to repair faults). The TRA would expect that such escorted access would be an exceptional requirement.

Equipment moving assistance should be provided where lifting/hoisting apparatus is needed at co-location sites.

A4.2.6 Hand-over Distribution Frame (HDF)

An HDF will be needed to terminate the tie cables which extend the local loop from the MDF or equivalent distribution point closer to the user premises to the OLOs’ co-location space. The OLOs should have the option of self providing the HDF or requesting the incumbent operator to supply it.

A4.2.7 Tie Cables

Tie cables, consisting of metallic twisted pairs, should be provided between the MDF and the HDF. When the OLO is physically co-located with the incumbent operator the tie cable will remain inside the incumbent operator’s building (internal). When the OLO is employing distant or adjacent co-location the tie cables will need to connect the MDF site and the OLO’s premises. In this case the OLO will need a tie cable which
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runs inside the incumbent operator’s building (internal) and a tie cable that runs outside the incumbent operator’s building (external).

Therefore the incumbent operator should supply:

1. Internal tie cable. Provision, including testing, termination and maintenance of a metallic twisted pair between the MDF and the HDF (if the OLO is physically co-locating) or between the MDF and the incumbent operator’s joint in cable chamber (if the OLO is employing distant or adjacent co-location).

2. External tie cable. Provision, including testing, termination and maintenance of a metallic twisted pair between the incumbent operator’s joint in cable chamber and the HDF in the OLO’s Distant co-location space (if the OLO is employing distant or adjacent co-location). The OLOs should have the option to self provide the external tie-cable.

3. OLO’s External Tie Cable Pull-Through Service. The OLOs who wish to employ distant or adjacent co-location should have to option of self-providing the external tie cable. In this case the incumbent operator should provide a cable pull through service from a defined Footway Box adjacent to the MDF Site or equivalent distribution point closer to the user premises, so that the OLO’s cable can be drawn into the MDF site or equivalent distribution point closer to the user premises and subsequently connect to the MDF, either directly or by the use of internal extensions. This service should include co-operative end to end metallic circuit testing and labelling.

A4.2.8 Power, air conditioning, etc

Appropriate environmental conditions should be provided in co-location facilities including:

1. Power. For physical co-location the OLOs should have the choice of being supplied power by the incumbent operator or arranging their own power feed from a power company. If the incumbent operator is to provide the power then the OLOs will need to negotiate whether this will be AC and/or DC and whether it is generator and/or battery backed-up. Where achievable, options should be available in cost efficient and reasonable increments.

2. Air conditioning/chilling/heating as relevant. Options should be available in cost efficient and reasonable increments.

A4.2.9 Transmission and backhaul services

The OLOs will need to connect the equipment in their co-location space to their core networks (a process referred to as backhaul). Backhaul describes the link that is used to connect an access site and the connection point within the OLO’s network or the connection of one access site and another access site. The OLOs should be able to either request backhaul from the incumbent operator at all adequate ranges of bandwidth requested or to provide their own backhaul. In the latter case, the incumbent operator should provide a pull-through and routing service to enable the OLO’s fibre to reach its co-location space. The incumbent operator should also provide access to its duct space.

The OLOs may also wish to choose an alternative supplier to the incumbent operator for backhaul (including the possibility of sharing backhaul with an alternative supplier)
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and, if this supplier co-locates in the same site, they should be able to make the connection within the co-location site. In this case, the incumbent operator should permit the installation and use of the necessary equipment in the co-location sites and of the necessary cables on the incumbent operator’s premises.

A4.2.10 Safety standards

Technical standards surrounding co-location should ensure safe operation without allowing ‘gold plating’ of co-location spaces by the incumbent operator via high demands on equipment or building services.

A4.2.11 Technical standards

Technical standards surrounding co-location space should be set in terms of a minimum requirement acceptable to OLOs and that conforms to appropriate legalisation, such as health and safety.

A4.2.12 Rules for the allocation of space where co-location space is limited

The allocation of limited co-location space will be very contentious as will the initial rollout of the exchanges capable of housing co-location equipment. There may be a situation in some exchanges whereby some OLOs will not gain access to the facilities they demand. The industry needs to devise an allocation method which is inclusive of the needs of all operators. The efficient use of co-location space should be ensured by encouraging collaboration between OLOs in the initial phase of the product rollout.

Ideally, co-location space should be allocated on the basis of a clearly defined set of principles, agreed by the industry subject to a “use or lose clause.” The allocation system needs to take into account the diverse needs of users and OLOs and yet still be acceptable to the TRA.

The sharing of co-location space should be possible.

A4.2.13 Conditions for OLOs to inspect the locations at which physical co-location is available or sites where co-location has been refused on the grounds of lack of capacity

The burden of proof in terms of the non-availability should fall on the incumbent operator and not on the OLO.

A4.2.14 Interface to Operational Support Systems and Electronic Ordering Systems OSS

The introduction of electronic interfaces between the incumbent operator and OLOs for processing local loop orders is generally an appropriate way to reduce the time required to collect and process orders and to increase the accuracy of the procedure, compared with a paper-based – e.g. fax – ordering system. An electronic interface may thus also lead to a reduction in the connection charge. The interface may also be adapted to provide access to incumbent operator’s operational support systems (OSS), information systems or databases for pre-ordering, provisioning, maintenance and repair requests and billing. Also, the interface may be adapted to enable the OLO to request an adequate, timely, updated list of information.

The incumbent operator should make available access to its OSS for ordering, maintenance and repair, and billing purposes as these represent ancillary services.
necessary for use of ULL, co-location and backhaul services. Access to the incumbent operator’s OSS should be granted to all OLOs on fair and non-discriminatory terms.

In order to permit access, the incumbent operator will provide technical specifications concerning an interface between its own and the OLOs’ information systems.

### A4.3 Provision of information

#### A4.3.1 Provision of information

Provision of information and information concerning the locations of physical access sites is a key element of the ULL product portfolio. This general information should be sufficient to enable OLOs to make technical and commercial judgments on the same basis as the incumbent operator, although it should not include confidential commercial information on customers in the incumbent operator’s possession. This information needs to be updated regularly to reflect changes in the availability of services and increased knowledge of network capabilities. An OLO should have information before, during and following the signing of an agreement on ULL. An OLO should be provided with, on request, adequate, timely, updated information, during and after the negotiations with the incumbent operator.

The following specific requirements should be met:

1. On request, OLOs should have sufficient information for informing their business case.
2. Sufficiently detailed information should be provided (at the latest) at the beginning of the negotiation with the incumbent operator, possibly subject to conclusion of a confidentiality agreement. This may be subject to a service level agreement, and should generally be provided free of charge.
3. After the conclusion of the agreement for access to a specific MDF, the OLO should have access to any relevant information for operating lines from that MDF.

#### A4.3.2 Information on request

*Cabling system and co-location facilities*

The basic information on the cabling system could cover:

1. List and/or map of MDFs including:
   - postcode coverage or postcode to MDF mapping, or equivalent;
   - total number of usable loops and number of loops in use;
   - data on known disturbers per MDF and per cable;
   - line length distribution per MDF (weighted average distribution); and
   - general information concerning cable characteristics including typical type and quality of cable (e.g. diameter, results from quality tests that have been conducted, number of lines, technical interference control and spectral management plan).

1. Statistical information about the network, e.g. loop characteristics.
2. Standard spectrum masks and/or list of approved systems.
3. Availability of co-location space and type.
4. Power availability.

5. MDF space availability.

6. Co-location features available (air conditioning, uninterruptible power supply, security, etc)

**Information during negotiations**

1. Latest update of above information.

2. Per MDF where the OLO wants to have access:
   - location (physical address information) associated with the MDFs and the name of the associated;
   - local switch and/or number ranges associated with MDFs (whatever is nationally relevant);
   - exact user coverage of each MDF if a unique mapping to postcodes or streets is not possible (e.g. overlapping MDF regions);
   - detailed information concerning loop characteristics, any known limitations or incompatibilities;
   - results of any DSL tests;
   - any foreseeable limitations on space for MDF-extensions; and
   - detailed description of procedures and conditions relating to ULL.

3. MDF access - type of access proposed by incumbent operator, either:
   - directly on the MDF;
   - in-house on HDF (distance, cable type and size (number of pairs));
   - outside (remote) on HDF (distance, cable type and size (number of pairs)); or
   - cable entry points and capacity available.

4. Co-location
   - availability of co-location space and type, detailed drawings if space has to be set-up by the OLOs
   - co-location features available (air conditioning, uninterruptible power supply, security, …), technical constraints, terms and conditions of use
   - access conditions to the facilities

5. Reference offer
   - a site-specific costs, terms or conditions.

**Information to be provided after conclusion of the agreement for access to a specific MDF**

1. Any foreseeable changes to the above mentioned items should be announced at the latest 6 months before the change will occur. Changes involving civil work should be announced even earlier, with respect of locally relevant authorisation procedures and delays for undertaking such civil work.
Local Loop and related facilities and services

2. Unforeseeable changes should be notified immediately as the need for the change occurs.

3. On request: Line-Quality test results of a specified local loop serving an identified subscriber. If no test has been done so far on that line, the incumbent operator should make the test and provide the result. Costs may be charged to the OLO.

A4.4 Ordering, provisioning and service level agreements

The term “Electronic Ordering System” is used in this context to mean one of a set of ordering systems ranging from, at its simplest, emails of structured form to an internet-based process to, at its most complex, an electronic data exchange (e.g. EDI). The decision to introduce an electronic ordering system, and if so in which form, will depend on whether the benefits (i.e. increase of accuracy, reducing time, cost reduction) to be gained outweigh the costs of its implementation. The decision will take into consideration the quantity of orders to be processed via the interface and the possibility of adapting the system for other purposes (i.e. access to OSS, information systems of databases and the exchange of information).

Agreement on the introduction and the nature of the electronic interface and on technical and operational details is required between the operators concerned. The decision about whether to implement an electronic ordering system, and which form it should take, should be based on a transparent and objective analysis of the costs and benefits of the available options.

An electronic interface should be installed for submitting and processing local loop orders as far as this serves to increase efficiency.

The development and introduction of an electronic interface should be undertaken jointly by the incumbent operator and OLOs.

A4.5 Performance Management

Performance management is a tool to control the agreed quality of level of the processes between the interfacing parties. Quality in this respect has to cover elements of correctness as well as timeliness.

The term Service Level Agreement (SLA) is used only to indicate individual service levels corresponding with particular Key Performance Indicators (KPIs).

A KPI identifies one critical success factor within a particular interface process. An individual SLA pins down the corresponding KPI on a certain value. While the KPI itself does not incorporate any norm, being merely a unit of measurement, the SLA states as accurately and clearly as possible the boundaries of the actual measured performance.

Ordering and provisioning procedures should follow the general principles of transparency and non-discrimination. Furthermore, requested services should be provisioned within a defined period of time. This should be subject to a service level agreement containing KPIs, reporting obligations and sanctions in case of underperformance. In the case that a requested service is refused, the incumbent operator should give a sufficiently detailed reason for the refusal in a timely fashion, so as to enable the OLO to adapt its plan of access accordingly.
In terms of quality of services the SLAs offered in the wholesale market should not worsen the SLAs offered in the retail market.

The services offered by the incumbent operator should be offered on a non-discriminatory basis both in terms of service definitions, quality and prices.

A4.6 Key performance indicators (KPI)

The reference offer should provide a set of key performance indicators for the services provided. These should include the provision of information about MDF, co-location and interfaces to ordering, provisioning and operational support systems prior to agreements being made, during the agreement process and subsequently. The IRG recommends KPIs for the following.

- Timely response on local loop request;
- Quality of local loop request;
- Quality of acceptance process;
- Delivery time;
- Delivery precision;
- Timely rectification of failed provision;
- Timely delivery of forecast;
- Quality of forecast.
A5 Glossary

Backhaul: A means of conveying traffic from a suitable local loop service termination point to an OLO’s point of presence.

Bitstream access: See wholesale DSL.

BIX: Bahrain Internet Exchange.

BRAS: Broadband Remote Access (or Aggregation) Server.

DSL: Point-to-point public telecommunications network access that allows multiple forms of telecommunications to be carried over twisted-pair copper wire between the local exchange of the public telecommunications operator and the subscriber.

DSL co-location: The provision of co-location space to an OLO, who has procured a number of unbundled local loops or a wholesale DSL service, for the purpose of installing and managing equipment that is required to provide a telecommunications service over the procured unbundled local loops or wholesale DSL service.

DSLAM: Digital Subscriber Line Access Multiplexor.

Duct sharing: An OLO places its own infrastructure in the ducts or on the poles of the incumbent.

Full local loop unbundling (Full LLU): An OLO uses the physical connection from the subscriber’s premises to the public telecommunications operator’s local exchange, excluding switching or ports, as a constituent part of its own service infrastructure.

Line sharing: An OLO uses the portion of the local loop that is not used for PSTN or ISDN services as an element in its services; the PSTN or ISDN portion remain in the control of the incumbent and may be used by the incumbent to provide other services.

Local loop: The telecommunications circuit, usually pairs of copper wire, between the user’s premises and the telecommunications operator’s main distribution frame (MDF).

Local loop facilities and services: Wholesale DSL, simple DSL resale, ULL, sharing of ducts and sharing of other physical infrastructure.

Local Loop Unbundling (LLU): The process in which one licensed operator leases, wholly or in part, the local segment of its telecommunications network to another licensed operator and thereby establishes an unbundled local loop.

MDF: Main Distribution Frame; the point in the local exchange where a local loop is terminated.

OSS: Operational Support System.
## Local Loop and related facilities and services

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple DSL resale</td>
<td>An OLO resells the incumbent’s undifferentiated DSL access service in conjunction with its own portfolio of value added services</td>
</tr>
<tr>
<td>Splitter</td>
<td>A device for separating telephony transmission from DSL transmission</td>
</tr>
<tr>
<td>Sub-loop unbundling</td>
<td>An OLO uses the segment of the local loop from the end user’s premises, to an intermediate point in the local loop as a constituent part of its own services</td>
</tr>
<tr>
<td>Tie cable</td>
<td>A cable used to extend one or more local loops from the incumbent's MDF to a distribution frame owned by the OLO or from the OLO’s distribution frame to the incumbent’s distribution frame</td>
</tr>
<tr>
<td>Trench sharing</td>
<td>A number of operators collaborate to dig a combined trench and each then lays its own ducts and cables</td>
</tr>
<tr>
<td>Unbundled Local Loop (ULL)</td>
<td>The physical connection from the subscriber’s premises to the public telecommunications operator’s local exchange, excluding switching or ports, purchased by a licensed operator from another licensed operator</td>
</tr>
<tr>
<td>Wholesale DSL</td>
<td>An OLO provides an access service that incorporates DSL elements provided by the incumbent</td>
</tr>
</tbody>
</table>
A6 Consultation questions

The TRA seeks opinions from interested parties regarding the following issues.

2. The role of simple resale of Batelco’s DSL services in the Kingdom of Bahrain in terms of the markets that will be affected and the nature of the impact.

3. Wholesale DSL including:
   (a) The point(s) of interconnection that should be enabled for wholesale DSL;
   (b) The DSL profiles that should be offered under wholesale DSL;
   (c) The markets affected by the introduction of wholesale DSL and the impact on those markets.

4. Full LLU including:
   (d) The services that Batelco should provide in support of full LLU, for example:
      i. Tie cables to provide a connection from the MDF to the OLO’s facilities.
      ii. Backhaul from the OLO’s DSLAM to its BRAS.
      iii. A managed IP service to provide the OLO with an IP backbone
      iv. Access to the Bahrain Internet Exchange (BIX) as defined under Section 41 of the Telecommunications Law.
      v. Access from an OLO’s switch to the PSTN.
   (e) The definition of the performance characteristics of the equipment that can be attached to local loop to provide customer services and the methods that may be used to come to an agreed definition of these performance characteristics.
   (f) The markets affected by the introduction of full LLU and the impact on those markets.

5. Requirements for sub-loop unbundling and the TRA’s view that it should be left for a later review.

6. How line sharing should be implemented in Bahrain and in particular:
   (a) The services that Batelco should provide in support of line sharing, for example:
      i. Tie cables to provide a connection from the MDF to the OLO’s facilities.
      ii. Backhaul from the OLO’s DSLAM to its BRAS.
      iii. A managed IP service to provide the OLO with an IP backbone.
      iv. Access to the Bahrain Internet Exchange (BIX) as defined under Section 41 of the Telecommunications Law.
   (b) The definition of the performance characteristics of the equipment that can be attached to the local loop to provide customer services when lines are shared, and the methods that may be used to come to an agreed definition of these performance characteristics.
   (c) The markets affected by the introduction of line sharing and the impact on those markets.
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7. The importance of duct sharing, the availability of suitable ducting by area and the rationing of space available for sharing. The TRA seeks to understand what duct space is required for maintenance, future plans by Batelco and particular pinch point (points where space will be unusually limited) in the network, so that an informed decision can be made about availability. The TRA seeks to understand the likely demand for duct sharing, and the relationship between demand for duct sharing and demand for LLU and line sharing.

8. The availability of space in chambers within the duct network, the availability of power in these chambers for use by OLOs, and the requirement for space in such chambers.

9. Trench sharing between licensed operators.

10. All aspects of co-location, but specifically:
   (h) The definition of DSL co-location;
   (i) Requirements for co-location;
   (j) Availability of space;
   (k) Means of allocating space to individual OLOs;
   (l) Security and vetting of staff;
   (m) The equipment that may be located at an exchange or at other locations within Batelco’s network;
   (n) Cross-connection services at a Batelco exchange.

11. External tie cables and other issues associated with offsite access.

12. Backhaul options, and in particular whether Batelco should be required to offer:
   (f) Transmission level services from each of its exchange sites;
   (g) Managed IP services from each of its exchange sites;
   (h) Backhaul from an OLO’s point of presence to the BIX.
   In addition:
   (i) What transmission speeds should be provided?
   (j) What other service characteristics should be provided?

13. The process and system requirements for planning, ordering, provisioning and operation of local loop, co-location and backhaul services.

14. Information requirements associated with the planning, ordering, provisioning and operation of local loop, co-location and backhaul services.

15. Requirements for installation, maintenance and operational services associated with local loop facilities and services.

16. The extent to which access to local loop facilities and services would impact on the fixed telephony market in the Kingdom of Bahrain in relation to other factors that may inhibit market entry by OLOs;

17. The extent of demand for duct sharing for the provision of telephony services and other services in the Kingdom of Bahrain.
CONSULTATION

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18. The extent to which full LLU, line sharing, wholesale DSL, co-location and backhaul services will impact on the leased line market and whether, in particular, a symmetric wholesale DSL service should be provided;

19. Pricing and service delivery timescales for full LLU, line sharing, wholesale DSL, co-location and backhaul services in relation to the leased line retail pricing and terms.

20. The extent to which wholesale DSL, full LLU, line sharing, co-location and backhaul services will impact on the switched data services market and on Batelco’s market power.

21. The pricing and service delivery timescales of wholesale DSL, full LLU, line sharing, co-location and backhaul services in relation to switched data service retail pricing and terms.

22. The extent to which simple DSL resale, wholesale DSL, full LLU, line sharing, co-location and backhaul services will impact on the internet access market and Batelco’s market power.

23. The pricing and service delivery timescales of simple DSL resale, wholesale DSL, full LLU, line sharing, co-location and backhaul services in comparison with retail pricing and terms for broadband access in the Kingdom of Bahrain.

24. The definitions of the wholesale markets for:
   (a) Services required by ISPs
   (b) Broadband services
   (c) Local loop facilities.

25. Batelco’s dominance in the wholesale markets for:
   (a) Services required by ISPs
   (b) Broadband services
   (c) Local loop facilities.

26. On the proposal to include local loop facilities and services in the reference access offer.

27. Whether simple DSL resale should be included in the reference access offer.

28. Whether wholesale DSL should be included in the reference access offer, and the special characteristics required.

29. Whether full LLU should be included in the reference access offer.

30. Whether line sharing should be included in the reference access offer;

31. Whether sub-loop unbundling should be included in the reference access offer;

32. What co-location services should be included in the reference access offer;

33. What backhaul services are required for wholesale DSL and ULL and whether backhaul services should be included in the reference access offer;

34. What ordering, operational support systems and information provision are required for local loop facilities and services, and whether access to ordering operational
Local Loop and related facilities and services

support systems and information systems should be included in the reference access offer.

35. Tariffs and terms for all local loop facilities and services and in particular:

(a) The principles that should be used for tariffing each facility or service
(b) The impact of alternative principles on the price of services and Batelco’s market power in relevant markets.

36. Detailed requirements for local loop facilities and services that should form the definition of the facilities and services in the reference access offer.