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**DEVELOPMENTS IN LOCAL LOOP UNBUNDLING**

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## **FOREWORD**

This report was presented to the Working Party on Telecommunications and Information Services Policy (TISP) in June 2002 and was declassified by the Committee for Information, Computer and Communications Policy in March 2003.

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## SUMMARY AND CONCLUSIONS

A number of OECD countries have stressed the economic and social importance of developing high-speed (broadband) Internet infrastructures and ensuring rapid growth in their subscriber base. Broadband has been viewed as important from the perspective of economic growth and productivity, and provides one of the key foundations for the development of a knowledge-based economy.

Following their existing frameworks for the creation of open competitive telecommunications markets and their WTO commitments, most OECD governments have based their policies for expanding broadband infrastructures and services on the development of competition based on a framework which ensures fair and non-discriminatory conditions of access to network resources and unrestricted competition for provision of services. Building on traditional regulatory telecommunication frameworks, many regulators have in recent years expanded these frameworks to ensure that new facility-based entrants and Internet service providers can compete with incumbents in offering broadband access and services. A number of OECD countries have over the last several years taken a major regulatory initiative by requiring the incumbent facility-based operators to offer local loop unbundling (LLU) to new access seekers.

Unbundling, as a policy, is built on the recognition that incumbent carriers have a dominant position in the provision of local communication access by virtue of their control over the local loop, which in some OECD countries is considered as an essential facility that cannot be economically replicated by alternative operators. This position of dominance has resulted from the many years during which incumbents had a monopoly in the provision of telecommunication infrastructure and voice telephony services. Despite liberalisation of telecommunication markets, it has proven extremely difficult in some OECD countries to reduce the bottleneck control of incumbents over the local loop and access to this loop. The market power of incumbents can vary in different geographic and service markets. Details of unbundling policies may therefore vary according to market conditions.

This paper focuses on the development of local loop unbundling in the OECD. It examines policies for unbundling, progress in achieving unbundling, and collocation and pricing policies for unbundling. Although LLU began as a policy to promote competition in local telephony, recently it has received attention because of its role in stimulating broadband development in a number of countries.

Progress in LLU in the majority of OECD countries has depended on:

- The extent to which incumbents have upgraded their facilities to offer xDSL and have opened up their local loops or collocation facilities.
- Progress in achieving consensus on collocation procedures and pricing.
- The availability of collocation space in some exchanges where a number of operators want space at the same time and procedures to allocate this space.
- The pace at which regulators have taken action to solve problems in applying LLU.
- The extent to which rebalancing of subscriber line prices has been undertaken in the past to ensure that there is no price squeeze on new entrants.

Progress in LLU is constrained by its technical complexity and at times the requirement for detailed involvement by regulators. To implement LLU, operators have to take a number of functional steps such as pre-ordering, ordering, cut-over, and fault reporting in tandem with the incumbents. In addition, determining prices for LLU has raised difficulties between incumbents and new entrants (access seekers). In this context, the regulator has to find a balance between the right of the incumbents to manage their own infrastructure and the desire of new entrants for access.

Progress in the implementation of LLU differs extensively across OECD countries. For example, the United States has the longest history of LLU, and the number of unbundled local loops that the incumbents reported providing to other carriers reached approximately 9.4 million or 5.5% of incumbent local exchange carrier (ILEC) total lines by December 2001.<sup>1</sup> In Japan, the number of unbundled local loops is approximately 4.2 million, equivalent to 8.25% of total lines by the end of February 2002. On the other hand, some OECD countries, such as Mexico, the Slovak Republic and Turkey have not taken initiatives for LLU implementation.

This paper concludes the following:

- The majority of countries consider that LLU has the potential to enhance local competition and assist in the development of competition for broadband services as well as in its diffusion. From this perspective, implementation of LLU is expected to benefit consumers by reducing not only local telephony but also broadband Internet access costs and accelerating the supply of new services.
- Continued regulatory intervention would be necessary where the implementation of LLU has not yet been successful because of the imbalance in negotiating power between the incumbents and new entrants.
- LLU requires operational co-ordination between the incumbent and new entrants regarding such processes as ordering, provisioning, billing, fault handling and service-level agreements. Agreement is also required in areas such as pricing, collocation and spectrum management on broadband local loops. Operational co-ordination and other agreements can be facilitated through self-regulatory frameworks or detailed intervention by regulators. The role of the regulator in arbitration remains essential.
- It is difficult to undertake appropriate monthly pricing benchmarks for LLU from this comparative study due to the limited available information. However, in some countries, such as Denmark and Sweden, relatively low monthly rental charges facilitated LLU implementation, whereas other countries, such as Ireland and the United Kingdom, have made slow progress due to relatively high charges for unbundled loops. A major element of success of unbundling is linked to the relationship between the price of the subscriber line to the end-user and the cost of unbundling for the new entrant. The former should necessarily be higher than the latter in order to allow new entrants to invest profitably in LLU. This involves the requirement to make an adequate rebalancing on the price of the subscriber line.
- LLU is not a panacea. LLU cannot address all the issues involved in relation to local market competition. Goals for a broadband society can be attained in many other ways. Primarily, the target technology for LLU would be asymmetric digital subscriber lines (ADSL) via the fixed telephone network. However, deployment of alternative technologies, such as wireless local loops, cable, fibre, satellite and Ethernet, is also important, and this may also help reduce the relative importance of LLU in the future.

## I. LOCAL LOOP UNBUNDLING IN OECD COUNTRIES

The local loop refers to the telecommunication circuit, usually pairs of copper wire, between the user's premises and the telecommunications operator's main distribution frame (MDF). Local loop unbundling (LLU), which will be defined in greater detail below, refers to the process in which incumbent carriers lease, wholly or in part, the local segment of their telecommunications network to competitors.

### 1.1. Overview of local loop unbundling

Incumbent telecommunication operators have built up their local telecommunication networks over a long period in a monopoly framework. Once competition was introduced for local telecommunication services, new entrants found it extremely difficult to replicate the local networks and compete with incumbents. These difficulties included access to rights of way, the costs of network construction relative to revenue growth, and the difficulty of enticing customers, especially residential customers, to change access and service providers:

- Incumbents during the monopoly era were considered as public utilities, and in many cases were government departments. As such they had little difficulty obtaining rights of way.
- As monopolies, most incumbents used extensive cross-subsidies between services which provided revenue flows to investment in local infrastructure. These cross-subsidies have in many cases not been completely eliminated so that local subscriber lines may still be priced under cost in a number of countries.
- Residential customers tend to be relatively static with respect to changing their fixed subscriber provider relative to taking service from new entrants for long distance.

The history of facilities-based competition, especially in the local access market, has shown how difficult it is to compete for customers in this market. In those OECD countries with the longest history of local competition, new entrants have captured a relatively small part of the subscriber base. In the United States new entrants have managed to attain a market share of 9.0% of the local subscriber market since 1984, in the United Kingdom the share of new entrants for residential lines since the end of the duopoly in 1984 is 19%<sup>2</sup>, and in Japan, where the market was in principle opened in 1985, the share of new entrants is 18.5%<sup>3</sup>.

Initially, the challenge to create local loop competition did not lead most regulators to use local loop unbundling as a policy option. Some regulators argued that unbundling would reduce incentives by new entrants to invest in network infrastructure and so would slow down the availability of alternate PSTN infrastructures and local competition.<sup>4</sup> Other regulators immediately implemented unbundling once local telecommunication markets were open to competition, but in some cases did not follow through with supporting policies (collocation, interconnection, price rebalancing) so that unbundling was insufficient by itself to create effective competition. These unbundled local loops could be used by new entrants to offer voice or other services.

The emergence of Internet services highlighted the importance of access to the local loop since Internet service providers (ISPs) have to depend on local network providers to access customers. With the emergence of high-speed Internet access (broadband) based on the public switched telecommunication network – mainly asymmetric digital subscriber line technology (ADSL) – the question of access to local network infrastructures has moved to the forefront of policy agendas. ADSL technology converts pairs of copper wire telephone lines into high-speed digital lines.

Although the main focus of LLU is the public switched telecommunication network, unbundling can be applied to fibre optic networks and a form of unbundling (shared access) could be applied to cable television networks. The issue of open access to CATV infrastructure to offer high-speed Internet is important but not supported by all regulators. This issue is not examined in this paper.

## 1.2 Typology of LLU

Local loop unbundling can be classified into three main types:

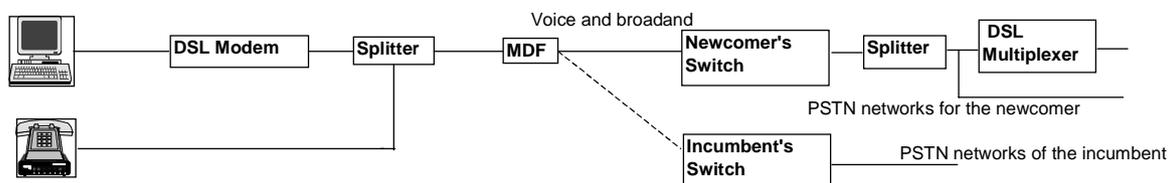
1. Full unbundling (or access to “raw copper”).
2. Line sharing or shared access.
3. Bitstream access.

The type of unbundling required by a new entrant will be a function of the services being offered and will be influenced by technical issues, such as MDF size and availability of collocation space. The application of LLU varies across countries. For example, in the US network unbundling includes sub-loops, switching, and operations support systems (OSS), whereas European countries basically focus on loops.

### *Full unbundling*

Full unbundling (sometimes referred to as access to raw copper) occurs when the copper pairs connecting a subscriber to the MDF are leased by a new entrant from the incumbent (Figure 1). The new entrant takes total control of the copper pairs and can provide subscribers with all services including voice. The new entrant can also enhance the copper pairs by adding ADSL technology. The incumbent still maintains ownership of the unbundled loop and is responsible for maintaining it.

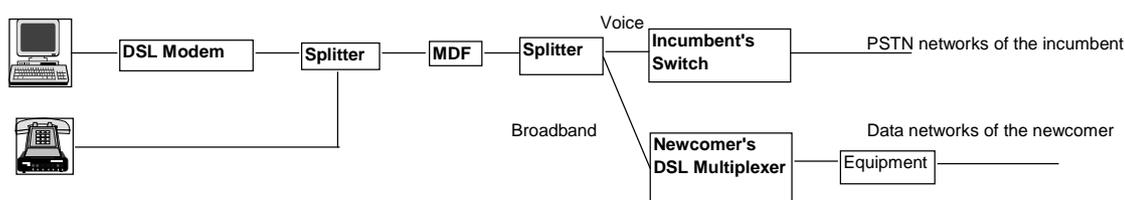
**Figure 1. Full unbundling**



***Line sharing (shared access)***

Line sharing allows the incumbent to maintain control of the copper pair and continue providing some services to a subscriber while allowing an access seeker to lease part of the copper pair spectrum and provide services to the same subscriber (Figure 2)<sup>5</sup>. Line sharing allows the incumbent to continue to provide telephone service while the competitor provides broadband (xDSL) services on the same copper pair. With line sharing, the competing supplier uses the non-voice frequency of the loop. Consumers can obtain broadband service from the most competitive provider without installing a second line.

A primary difficulty of line sharing has to do with technical interface problems. For example, implementation of ADSL with telephony and with ISDN uses different spectrum allocation so that different equipment may be necessary both for the splitter and for ADSL. In addition, line sharing may slow down the speed for digital access in general due to “frequency unbundling”. When high-speed data runs along adjacent telephone lines, the signal on one wire can bring noise into the next wire, interfering with the signal and resulting in slower data rates. This problem is known as “crosstalk”, which has to be technically overcome in order to expand ADSL access via line sharing.

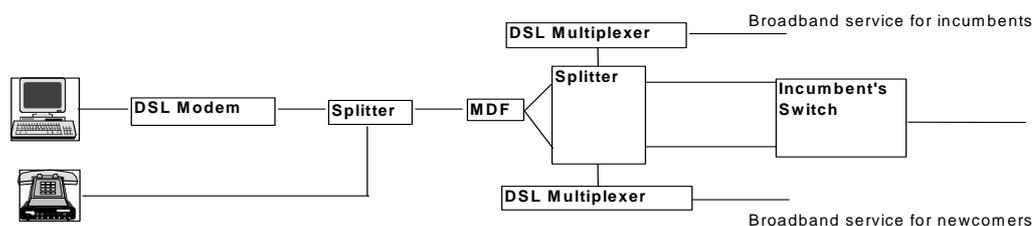
**Figure 2. Line sharing*****Bitstream (or wholesale) access***

Bitstream access provides ISPs with a wholesale xDSL product from the incumbent. With bitstream access, the incumbent maintains control over the subscriber’s line but allocates spectrum to an access seeker. The incumbent provides the ADSL technology and modems so that new entrants have no management control over the physical line and are not allowed to add other equipment. As seen in Figure 3, unlike full unbundling and line sharing, the access seekers can only supply the services that the incumbent designates. Accordingly, bitstream access reduces the level of competition compared with full unbundling and line sharing as there is no competition at the physical layer and there is no incentive for the incumbent to deploy new technology. For new entrants, a low level of service-based competition can be expected due to the fact that they can only obtain access to the system that the incumbent chooses to implement.

With bitstream access, spectrum management between operators is unnecessary because it is handled completely by the incumbent. It is partly for this reason that new entrants generally do not favour this method. This variant of LLU can be a good option, especially for ISPs. While bitstream access has been considered as a form of unbundling, there are some countries that do not view bitstream access as coming within the scope of unbundling policy.<sup>6</sup> There are also a number of countries that have not introduced this form of access at all.

Bitstream access can lead to line interference in specific situations depending on the xDSL technology used. For example, in the case of simultaneous use of xDSL technology by more than one operator, there may be difficulties in operating at the same time. In such a case it is difficult to identify the ultimate source of disturbances.

Figure 3. Bitstream access



### *Sub-loop unbundling*

This paper does not examine sub-loop unbundling. Sub-loop unbundling is a much more far-reaching and complicated regulatory measure than LLU. There is also insufficient experience in this area since only several countries apply sub-loop unbundling. It allows for the possibility to gain access to the incumbent's network on an unbundled basis closer to the customer than at the MDF, that is at a point between the customer's location and the incumbent's site.<sup>7</sup> For example, this arrangement can be used to supply very high bandwidth services that can only be transmitted at a short distance on copper pairs.<sup>8</sup> The United States has introduced sub-loop unbundling since September 1999. EU regulations also required sub-loop unbundling and started infringement proceedings against countries that had not yet fully complied with EU regulations (Ireland, Germany, France, Netherlands, and Portugal<sup>9</sup>). Austria, Belgium, Denmark, Greece, Italy, Japan, Luxembourg, Spain, Sweden, and UK also introduced sub-loop unbundling, but most other OECD countries have yet to implement such extensive unbundling requirements.

### 1.3 Technical limitations on LLU

The development of technical specifications to implement LLU is very complex. Since LLU requires a number of operations, it inevitably has some technical limitations, which might slow the speed of implementation. For example, a technical problem could arise when the incumbent extends fibre beyond the local exchange to the users' premises. In this case, the exchange area is usually converted to a digital carrier transmission (DLC) standard and the copper pair will terminate at the point between the local exchange and the users' premises (remote terminal) instead of on the MDF. The interface point between the fibre and the copper pairs will be located in an access junction or cabinet in the street. Such fibre-in-the-loop systems might expand if incumbents roll out more DLC systems to support their own broadband services. Since the xDSL modem must electronically match the digital interface at the remote terminal, new entrants will have difficulties to provide their own broadband services if the incumbent seeks to limit the equipment that can be placed at the terminal.

If the incumbent tries to roll out DLC technology in local loops after the deployment of competitors' xDSL services in the exchange area, the competitors will be obliged for technical reasons to reconfigure their network at the risk of making redundant investment.

Since xDSL services are influenced by the length of the copper loop from the premises of endusers to local exchanges, it is difficult to implement LLU in rural areas.

In addition, the incumbent has to face a number of technical difficulties which might slow down the process of implementation. For example, the incumbent might place upper limits on the number of local loops that it can technically unbundle in each local exchange per day in the process of disconnecting and reconnecting the lines.

However, it is important to note that these technical problems are not fundamental enough for incumbents to be serious sources of failure in switching lines for unbundling. Problems arising in practical implementation may be resolved by negotiating appropriate contracts. Above all, technical implementation problems are no more serious than in the case of interconnection.

#### **1.4 Implementation of LLU**

Even though incumbents earn revenue from LLU and their costs of implementing LLU should be recovered from new entrants, they have little incentive to voluntarily implement LLU. In principle, access to the local loop comprises the following services on the part of the incumbent<sup>10</sup>:

- Supply of preliminary information necessary for implementation of LLU.
- Completely unbundled access to the local loop, which includes delivery and maintenance of the copper pair and service guarantees.
- Collocation to allow new entrants to install their equipment on the incumbent's premises.
- Connection of collocated equipment to the networks of the access seekers.

One of regulators' difficult tasks is to find ways to motivate incumbents to implement LLU. Creating such an incentive is more difficult where the incumbent is already providing xDSL services.

Because of this, in some countries incumbents have been prohibited from providing xDSL services until the launch of LLU. For example, the Australian government ensured that the incumbent would not commercially launch its own ADSL offerings before providing LLU to competitors.<sup>11</sup> In Japan, the regulator required incumbents to implement LLU when they provided trial services for DSL so that competitors were able to provide such services in the same manner in August 1998, whereas LLU was commercially provided in December 1998. Another approach is to include a so-called "sunset" provision in LLU regulations, in which the period for regulations is limited. Canada and Netherlands took this approach, although the sunset provision was suspended in Canada. This policy is based on the idea that new entrants will need a certain amount of time to deploy their own infrastructure, and that after that period local loops would not be subject to unbundling due to the development of commercial local loop market.

In order to accelerate broadband access, some regulators have sought alternative solutions so as not to delay the implementation of xDSL services. For example, a regulator could request the incumbent to make a wholesale xDSL offer before launching its own xDSL retail offer. The provision of a wholesale derivative of the incumbent's xDSL offer was the solution adopted in the United Kingdom, France and Italy.

#### ***Steps for implementing LLU***

To implement LLU, the incumbent and new entrants are required to take several steps. First, new entrants must provide forecasts to the incumbent regarding the local exchange areas in which they wish to provide services using LLU, their estimates of initial and future collocation space, and the number of LLU lines during the forecast period. In itself this can be problematic since forecasts will often tend to be optimistic, which may result in incumbents committing excessive resources. At the same, time new entrants might hesitate to provide detailed forecasts in light of the fact that it could disclose their

commercially sensitive information. Nevertheless, it is important for new entrants to provide appropriate forecasts as a number of incumbents' sites are unlikely to accommodate all the entrants' requests at a given time through collocation. It should be noted that the obligation to provide forecasts must be counterbalanced by the incumbent's obligation to make necessary resources available in time. In other words, care must be taken to distribute the share of planning risks equally to both sides. In certain circumstances, regulators might have to intervene to enforce the adoption of service level agreements (SLAs).

Second, in response to pre-ordering information by the new entrants, the incumbents must inform new entrants of their network information as well as line qualification information and individual customer information. Network information, such as the number of loops per local exchange area, enables new entrants to plan their services using LLU. It will also help to give new entrants choices as to whether they wish to request LLU at a particular MDF without a formal enquiry process for collocation space and individual lines. Line qualification information, such as line types for particular services, will help new entrants to make an assessment of the potential availability of their services before making commitments to customers. The issue of making available individual customer information, such as billing names and addresses, can be contentious since the incumbent's customer database is often the only complete source of information. Incumbents are usually concerned that providing customer information to new entrants will result in the latter contacting customers to persuade them to change service provider. New entrants tend to think that the customer is entitled to authorise its new service provider to have access to that information. Currently, most OECD countries do not require that customer information be made available. The US is the exception.

Third, line qualification testing is required by incumbents to determine whether the local loop, mostly at the switch, is qualified for provision of xDSL services. An issue is whether the incumbent must test their loops on demand for each order from a new entrant. On-demand testing might slow the process of LLU, whereas comprehensive testing (pre-qualification) can be a burden for incumbents. However, it is expected that the development of xDSL services will spur the improvement of efficiency in testing with the emergence of new testing technologies.

Fourth, the new entrants request the incumbent to install and disconnect services for their users by sending an order form. Once the order is confirmed, the actual cut-over process to disconnect the loops from the incumbent's network and reconnect it to the new entrant's network takes place. This work should be undertaken by the incumbent. It is also often the case that the incumbent refuses to undertake the cut-over outside of business hours, which can have a negative impact on business users.

Fifth, new entrants, after notification from end users, are obliged to report faults resulting from LLU after its implementation to incumbents. A determination has to be made as to whether the faulty network element is the responsibility of the new entrant or the incumbent's unbundled network.

Because of the number of different steps involved in LLU, it is important that there is close co-operation between access seekers and incumbents. Because such co-operation is difficult to impose through regulation, self-regulatory frameworks, which encourage all market players to reach agreement on the different technical and commercial aspects of LLU, are important. In some cases, the extent of conflicting interests in LLU is too great to be able to rely on a voluntary regulatory mechanism in the market. Therefore, adequate arbitration mechanisms are also critical for implementation of LLU.

### *Collocation*

Collocation is one of the more important steps in implementing LLU. Incumbents are required to provide technical resources, and the connection of technical equipment to access seekers.

Basically, there are two ways to provide physical collocation. The most common type is caged collocation, which establishes a physically separate space from the rest of the incumbent's exchange by wire mesh or solid partition. Another type is co-mingling, or cageless collocation, in which the new entrant's equipment is placed together with that of the incumbent.

Caged collocation can provide greater security for new entrants within their own separated space as well as for the incumbent within the building. Effective collocation requires that new entrants have easy access to their equipment in the incumbents' switching offices. Co-mingling is cheaper in terms of collocation, but if the incumbent insists on caged collocation, care must be taken that the space should be provided on a basis which does not treat new entrants in a discriminatory way in terms of cost. Several OECD countries, such as Canada, Japan and the United Kingdom, are trying to persuade incumbents to provide co-mingling unless there are objective criteria against it relating to technical feasibility or the need to maintain network integrity. In Japan, for instance, articles of agreement concerning interconnection of NTT East and West prescribe detailed conditions in which incumbents can refuse to provide co-mingling. The incumbents are obliged to provide co-mingling to competitors unless they have special objective reasons.

In case of line sharing, two connections are needed at the distribution frame for each shared line, one for the loop to hand over and the other for the loop of low frequency portion. This requires a larger distribution frame to support the same number of end-users in comparison with the case of full unbundling. In addition, unlike full unbundling, splitters need to be installed, which might occupy additional space. Accordingly, collocation prices in line sharing could be higher than for full unbundling.

In some cases, alternative methods for collocation are used. For example, remote collocation is an option in which the equipment of new entrants is installed on premises near the incumbent's building. However, premises near the incumbent's buildings may not be easy to obtain and the required extension of the length of copper pairs may reduce quality. With virtual collocation, the new entrants' equipment is installed and maintained by the incumbent on its premises and new entrants do not have access to these premises.

Usually the pace of collocation at local exchanges is determined by the incumbents. Often this will lead to conflicting demands by different new entrants as to which exchanges they would like to be conditioned in rolling out collocation space. Incumbents sometimes claim that the forecasts of the number of exchanges new entrants want to access are exaggerated.

Once collocation space is identified, the incumbent and new entrants have to determine how to accommodate new entrants' equipment required for LLU. Incumbents may claim, rightly or wrongly, that their exchange space is limited, especially in the case of core business areas. In addition, they may attribute the delay of implementation of collocation to the necessity to undertake an assessment of additional floor loading. Thus, new entrants often complain about the time taken to deal with their requests. While collocation space is normally allocated on a "first come, first served" basis in most countries, some countries have made some effort to improve the system. For example, the UK government introduced a voting system called the "bow wave process", which will be described later.

## II. THE IMPACT OF LOCAL LOOP UNBUNDLING

### 2.1 Impact on prices

The issue of unbundling has brought to the forefront the requirement to rebalance subscriber prices and in particular fixed subscriber line charges so that they reflect costs. Subscriber line charges, in particular for residential services, were traditionally said to be priced below cost and were cross-subsidised through call charges. In the past, when countries decided to open their telecommunication markets to competition, most regulators began a deliberate policy of rebalancing charges toward cost. In some countries a target date was set for price rebalancing. In other cases, regulators using price caps left the schedule of rebalancing (within the constraint of price caps) to the incumbent. In many countries, however, regulators have been reluctant to raise subscriber prices for monthly charges given that these rates are politically sensitive. The result is that in some countries rebalancing of subscriber fixed charges has not yet been achieved. Rebalanced prices are important for new entrants wanting to take advantage of unbundling since without rebalanced prices new entrants with a business model focusing on low-value services can be caught in a price squeeze and may be unable to offer service at competitive prices. This is because regulators try to price unbundled local loops at cost. If subscriber line charges are set below cost then unbundled loop prices for new entrants will be higher than the retail price charged for residential subscriber lines. This means that new entrants will not be able to use fully unbundled local loops to offer analogue subscriber lines. For this reason, some countries have allowed for geographic deaveraging of unbundled loops. For line sharing, this poses less of a problem as long as there is non-discriminatory pricing between the incumbent and its ISP and the incumbent and new entrants for access to spectrum on copper loops.

Another price implication of local loop unbundling has to do with the geographic averaging of subscriber line charges. Prices for subscriber lines have in most OECD countries been geographically averaged, *i.e.*, residential subscribers pay the same for a line irrespective of where they live in a country even though the cost of providing these lines may differ, especially between urban and rural areas.<sup>12</sup> However, if unbundled loops are charged at cost, rather than at some average cost, the policy of geographic averaging of prices breaks down. Whether this occurs may be a policy or regulator decision. If geographic averaging is maintained in the pricing of unbundled local loops, new entrants may be faced with a price squeeze if they want to use full unbundled local loops to offer voice services unless subscriber line prices are also geographically averaged. As noted earlier, for line sharing geographic averaging of prices may not raise a problem for new entrants as long as there is non-discriminatory pricing by the incumbent for the prices of DSL-enabled lines. Incumbents may also raise other problems. For example, if they have to charge average prices for DSL they may suggest that new entrants are cream skimming by using LLU to supply services to the most profitable customers.

## 2.2 Costs of LLU

There are mainly three kinds of costs that incumbents may incur in implementing LLU, all of which need to be recovered in prices charged to new entrants:<sup>13</sup>

- One-off cost for line connections.
- Charges for the access to telecommunication facilities, *i.e.* monthly line rental charges.
- Collocation costs including the cost of renting space, site preparation, exchanging site surveys, power usage and security.

The monthly rental charge for loops is the basic charge that new entrants have to pay to the incumbent. The price is clearly different between full unbundling and line sharing. The price for line sharing is normally cheaper because the current provider of voice telephony services remains a supplier and thus the new entrant would not have to pay for the fully unbundled lines. In some cases, the price also differs between the use for provision of narrowband services and of broadband services, *i.e.* ADSL services, to reflect the difference in the cost for offering services. Rental charges often differ according to how many connections are being provided to a wholesale customer by the incumbent.

As noted earlier, most OECD countries use prices which are averaged across a country whereas some use de-averaged prices. For example, in Australia and Canada, LLU prices vary depending on the region.

A number of aspects need to be taken into account in calculating the appropriate price for LLU. In addition to the cost of capital and interest rate, one of the basic elements to consider is the depreciation period of the underlying installations (loops, ducts, manholes, buildings, etc.) New entrants tend to maintain that the basic infrastructure (copper loops) has a very long duration, which can be seen by the time the loops have already been buried. On the other hand, incumbents normally argue for short depreciation periods. First, they argue that the technical life is shorter than the one suggested by new entrants. Then they argue that given the fast change of technology, new technical improvements could make the underlying technical infrastructure (copper loops) obsolete in the near future and therefore a short depreciation period is rectified. Furthermore, costs such as maintaining the copper loop network have to be met.

The detailed methodology for calculating these costs is outside the scope of this paper. As for the calculation of interconnection charges, the methodology for cost calculation is usually based on forward-looking, long-run incremental costs (LRIC).

### III. BENCHMARKING OECD COUNTRIES

#### 3.1 Implementation of LLU

OECD countries differ in the extent to which LLU has been fully implemented. This makes it difficult to benchmark countries. By the end of April 2002, 23 OECD countries had introduced, or at least legislated, LLU. This number is a significant increase in comparison to 1999 when only 12 countries implemented or adopted LLU policies. There are currently only seven OECD countries that have not yet implemented LLU: the Czech Republic, Mexico, New Zealand, Poland, the Slovak Republic, Switzerland, and Turkey. Among these countries, the Czech Republic and the Slovak Republic are currently planning to introduce LLU following the establishment of EC unbundling regulations. In Poland, LLU will be introduced with the amendments of the Telecommunications Law, which will enter into force from October 2003. In New Zealand, the Telecommunications Act 2001 requires the Commerce Commission to report to the government within 24 months on whether the unbundled elements of NZ Telecom's local loop network should be a regulated service under the act. Mexico has no plans for full unbundling although the regulator has indicated that it may require line sharing for Internet access. Turkey still has a telecommunication monopoly but is considering introducing LLU after the termination of the monopoly in 2004. Although the Swiss regulator has been trying to introduce LLU, a court case initiated by the incumbent resulted in a March 2001 ruling by the Swiss Federal Court that Swisscom's local loops should not be opened to competition immediately because there was already competition in the local loop by virtue of new technologies. In December 2001, the President of Comcom declared that it did not expect LLU to arrive in Switzerland for five years, but in April 2002 the government indicated that it would try to introduce LLU by 2003 by revising the Telecommunication Service Ordinance.<sup>14</sup> In August 2002, the Federal Council decided in favour of a public consultation procedure on a partial revision of the telecommunications law and a decree on telecommunications services to introduce LLU.<sup>15</sup> In February 2003, it finally decided to introduce LLU as rapidly as possible at the decree level.

Some countries, such as Canada and the Netherlands, have viewed LLU as an interim measure to build up facility competition. In Canada, the initial policy for core urban areas was that LLU would be available only for a limited period of time (five years) whereas for higher cost areas (rural and smaller towns) LLU would be available for an indefinite period. In the Netherlands the early framework for the implementation of LLU in 1998 foresaw that the price for LLU would increase in increments over a five-year period, after which prices could be set by the incumbent on a commercial basis. The regulator, in its guidelines for MDF Access<sup>16</sup>, also made a provision for the incumbent to refuse to provide access in a specific exchange to the MDF if it could show that no capacity was available within that exchange. The initial framework of OPTA is being brought into line with EU regulations.

**Table 1. Status on implementation of LLU in all OECD countries [as of April 2002]**

Status regarding LLU	
<b>Australia</b>	LLU was mandated by the decision of the regulator ACCC in July 1999 with different pricing structures in different geographical areas. After publishing a draft report on LLU pricing in August 2000, the ACCC issued a final report in April 2002.
<b>Austria</b>	The use of unbundled local loops was made possible with the Austrian Telecommunications Act coming into force in January 1998. The incumbent Telekom Austria AG (TA), having significant market power (SMP), is subject to LLU. The current version of the reference unbundling offer (RUO) is of January 2002.
<b>Belgium</b>	LLU was introduced in October 2000 by the Belgian Council of Ministers. The incumbent Belgacom first issued a RUO in December 2000, which has been examined several times by the national regulatory authority (BIPT).
<b>Canada</b>	LLU was introduced by a decision of the regulator CRTC in 1997 with different unbundling requirements in rural and metropolitan areas. The requirement of unbundling loops in lower cost areas, <i>i.e.</i> large urban areas, was put in place for a period of five years starting from May 1997. A decision was made in 2001 subjecting local loops in urban areas to unbundling requirements on an indefinite basis.
<b>Czech Republic</b>	LLU has not been introduced yet. However, the government is currently planning to introduce LLU. The parliament approved an amendment of the telecommunications law to mandate LLU in June 2003.
<b>Denmark</b>	LLU was legally mandated in July 1998. The incumbent Tele Denmark published a revised standard RUO for full unbundling and new standard offer for line sharing in January 2001. With the alteration of the Danish Executive Order on Reference Offers in October 2001, it was mandated that Tele Denmark should publish a RUO on bitstream access. In a further revised RUO published in March 2002, access to sub-loops was provided.
<b>Finland</b>	LLU was mandated in June 1997 following a ruling by the Finnish government. Since then, incumbents have published RUOs in line with EC unbundling regulation. Amendments to the Telecommunications Market Act in January 2001 provided regulations on line sharing. Bitstream access is not mandatory, but is currently available.
<b>France</b>	LLU was mandated in January 2001 under Decree 2000-881 of September 2000. France Télécom has published its standard offer for local loop access and since June 2002 it has complied with the functional and tariff requirements of the ART Decision of April 2002.
<b>Germany</b>	LLU was mandated in the Ordinance on Special Network Access on the basis of German Telecommunications Act in 1996. The incumbent DT renewed its LLU Standard Offer in November 2001. Line sharing was mandated by the regulator RegTP in March 2001. As of January 2002, nearly 100 contracts had been concluded between DT and other operators for fully unbundled subscriber lines. Regarding line sharing, DT is currently carrying out contract negotiations with potential customers (QSC, Westend, Cyberways).
<b>Greece</b>	LLU was mandated by the regulator EETT in January 2001, although LLU was provided by the incumbent OTE on a case-by-case basis prior to this decision. In May 2001, the EETT approved the RUO of the incumbent.
<b>Hungary</b>	LLU was legally mandated by the new Communications Act in December 2001. However, LLU has not yet been introduced in practice.
<b>Iceland</b>	LLU was mandated in October 2001. However, the EC unbundling regulation has not been implemented. Even though the incumbent Iceland Telecom (Siminn) is not legally obliged to publish a RUO, it published a standard offer for LLU in October 2000.
<b>Ireland</b>	<p>Full LLU came into force in December 2000, although only seven fully unbundled loops have been taken up. The incumbent Eircom published an initial RUO in December 2000. This RUO has been modified a number of times by the regulator ODTR. In September 2001, Eircom announced a wholesale offer with the intention of launching wholesale and retail bitstream offers in October 2001. ODTR reviewed pricing and was forced to delay the launch as Eircom had not complied with their obligations to ensure cost orientation, and there were concerns over a possible margin squeeze. In April 2002, Eircom published a revised wholesale bitstream offer, which was approved by the ODTR. Retail service was launched in May 2002. As of May 2002, Eircom had 619 customers. Other developments during 2001–2002 include:</p> <ul style="list-style-type: none"> <li>- January – May 2001: Five documents including a direction to Eircom to reduce pricing (resulting in legal challenge), a decision on information to be provided, and a direction on service level agreements have been published.</li> <li>- September 2001 – January 2002: The Industry operational forum commenced to facilitate Esat requests for physical collocation in 40 exchanges. A first site is offered to Esat in December 2001. Currently 40 site offers have been made to Esat, and 12 sites are operational.</li> <li>- April 2002 – LRIC Industry Advisory Group was set up to advise on LRIC for access network.</li> <li>- April 2002 – Copper Loop Frequency Management Plan was published.</li> <li>- June 2002 – Access Reference Offer (ARO) was updated to include subloop unbundling.</li> </ul>

**Table 1. Status on implementation of LLU in all OECD countries [as of April 2002] (cont'd)**

<b>Status regarding LLU</b>	
<b>Italy</b>	LLU was mandated by an Italian Ministerial Decree in April 1998. In November 1998, an AGCOM decision started the implementation process (decision 1/98/CIR). In March 2000 (decision 2/00/CIR), AGCOM issued guidelines for the implementation of LLU and broadband DSL services. In December 2000, AGCOM defined the procedures for the selection and allocation of collocation spaces (decision 13/00/CIR). In May 2000, Telecom Italia published a reference offer for LLU. In December 2000, AGCOM verified Telecom Italia's 2000 offer and imposed some modifications (decision 14/00/CIR). In July 2001, AGCOM introduced new detailed guidelines and issued procedural rules to implement LLU (decision 15/01/CIR). In November 2001, AGCOM issued a decision on technical, economic and procedural aspects for line sharing and for sub-loop unbundling (decision 24/01/CIR). In February 2002, AGCOM imposed modifications on Telecom Italia's 2001 Reference Offer (decision 4/02/CIR).
<b>Japan</b>	LLU was mandated by the amendments of Telecommunications Business Law in June 1997. The amendments of Ministerial Decree for Telecommunications Business Law in September 2000 specified the details of LLU. Unbundling of fibre-optic facilities was also mandated by the Ministerial Decree in April 2001.
<b>Korea</b>	LLU was introduced by the amendment of Telecommunication Business Act in January 2001. The government (MIC) issued a public notification of LLU requirements and standards and full implementation of LLU, which led to the opening and sharing of KT's copper line and network.
<b>Luxembourg</b>	LLU was mandated in December 2000. The incumbent EPT issued a RUO in October 2001 and received approval from the regulator ILR.
<b>Mexico</b>	Basis for local service provision was established in 1999, but competition is stalled due to disputes on interconnection rules. LLU is not under active consideration.
<b>Netherlands</b>	LLU (MDF access) was mandated by the regulator OPTA at the end of 1997. The incumbent KPN issued a revised RUO in September 2001, which is currently under examination by the OPTA.
<b>New Zealand</b>	The implementation of LLU is under consideration. The government has included a requirement in the Telecommunications Act 2001 that the regulator must report to the government whether access to the unbundled elements of NZ Telecom's local loops should be regulated.
<b>Norway</b>	LLU was implemented by the incumbent Telenor in the absence of regulations in April 2000. The EC unbundling regulation came into force in October 2001. ARUO has been available since December 2000, which is currently under examination by the regulator NPTA.
<b>Poland</b>	Provisions on LLU will be introduced in the Telecommunications Law (Act of July 21 2000) by virtue of the amendments which will enter into force from October 2003. A related ordinance from the Minister of Infrastructure will also be issued during 2003.
<b>Portugal</b>	LLU was mandated by the regulator ANACOM in December 2000. Following a public consultation on competition in local access, launched in July 2000, ANACOM published in November 2000 a Deliberation on LLU which defined the following objectives: (i) the notified operator should present a draft Reference Offer until 30 November 2000, which should encompass, at least, the elements determined by ANACOM that generally reflect the Annex to the LLU Regulation; and (ii) efforts should be made to start LLU offering from 31 December 2000. A revised RUO was published in October 2002.
<b>Slovak Republic</b>	LLU has not been introduced but is under consideration.
<b>Spain</b>	LLU was mandated by Royal Decree in December 2000. Telefonica's first RUO was approved with a set of modifications by the Ministry of Science and Technology in December 2000. Since January 2001, the regulator CMT has implemented administrative proceedings for the revision of the RUO. Several interim measures were taken in 2001 to respond to market needs (e.g. collocation). All these have been consolidated in the new RUO adopted in May 2002. New prices were also approved by CMT with an average reduction of 25%.
<b>Sweden</b>	LLU was implemented by the incumbent Telia in March 2000. The prices for LLU are published in Telia's RUO, but have not been approved by the regulator PTS.
<b>Switzerland</b>	LLU has not been introduced yet. The Swiss Federal Court ruled in October 2001 that the incumbent Swisscom's local loops should not be opened to competition immediately. However, the government is planning to introduce LLU. In July 2002, the Federal Council decided to open a public consultation procedure for revision of the telecommunications law to introduce LLU. In February 2003, the Federal Council decided to introduce LLU as rapidly as possible at the decree level. It will introduce LLU obligations within the framework of the current revision of the Telecommunications Law.
<b>Turkey</b>	LLU has not been introduced.

**Table 1. Status on implementation of LLU in all OECD countries [as of April 2002] (cont'd)**

Status regarding LLU	
<b>UK</b>	LLU was mandated through a license condition of the incumbent BT in April 2000, which came into effect in August 2000. The regulator Oftel published guidelines on the application of the licence condition in September 2000. It has also published numerous documents including 14 formal actions concerning the prices that BT must charge and services that BT must offer.
<b>US</b>	LLU and transport were mandated by the Telecommunications Act in 1996. In November 1999, the regulator FCC issued rules on unbundling of network elements including sub-loops and dark fibre. In February 2003, the FCC concluded a review of its unbundling policies. Among other things, the FCC continued to require incumbents to provide unbundled access to copper local loops, but declined to unbundled broadband capacity over fibre-to-the-home and hybrid copper-fibre loops, and also declined to require line sharing. <sup>17</sup>

Source: OECD.

### 3.2 The deployment of LLU

While most countries introduced the three types of LLU, *i.e.* full unbundling, line sharing, and bitstream access, there are some cases in which line sharing or bitstream access were not implemented simultaneously with full unbundling or may not be fully in effect. For example, line sharing was not part of the German incumbent, DT's, LLU offer, and the German government did not require line sharing until March 2001.<sup>18</sup> In Canada, line sharing is not mandated by regulations but the incumbents have voluntarily implemented the service.

In Belgium, the problem with line sharing was complicated because the incumbents provided its ISP with line sharing but not new entrants. Such a "first mover advantage" has occurred in a number of countries giving the incumbent's unfair advantage in the offer of broadband services over competitors. Following several orders from the regulator, the incumbent Belgacom included line sharing in its reference offer for LLU. However, operators have complained because the incumbent's reference offer for LLU requires that an end user subscribe to a single PSTN or ISDN from the incumbent before it will provide line sharing to an access seeker who wants to serve that customer.

The majority of OECD countries have still not introduced bitstream access. In many of the countries that have introduced bitstream access, the regulatory framework is viewed by ISPs as insufficient. In France, for instance, bitstream access, offered by FT, is not generally considered by operators as a part of LLU but rather as an important transitory measure while they roll out their unbundled access and collocation. In Austria, bitstream access was made possible via an ADSL wholesale offer from the incumbent (so-called "ISPA contract"), in which prices and conditions were determined by an agreement between the Internet Service Providers Association of Austria (ISPA) and the incumbent. Similarly, the Swedish regulator does not regulate the price of bitstream access. The UK is one of the few OECD countries to have mandated bitstream access.

Competitors in some countries focus on business users and do not pay much attention to residential users with respect to provision of services using LLU. This practice could correspond to normal market behaviour in light of the fact that the customer expense per line is much higher in the business sub-market, in particular SMEs. This would mainly be because business DSL products can appear to be very attractive to SMEs, when compared to available alternatives such as leased lines or ISDN. In Germany, for example, operators are said to have concentrated on business customers and those private customers that generate high traffic volumes. This could be an outcome of the high monthly rental charges requested by the incumbent.<sup>19</sup> French operators also seem to aim at the business sector. Even in Denmark, where the unbundling prices are fairly low, the main focus of operators is on business users.

Most European countries require unbundling only for local loops, whereas the US requires unbundling of other associated facilities. In Japan, in addition to local loops, there is also a requirement to unbundle splitters for DSL, routing transmission function, optical splitter and media converters for FTTH.

Table 2. Availability of unbundling by type

	Full LLU	Line sharing	Bitstream access	Sub-loop unbundling
Australia	√	√	√	x
Austria	√	√	√	√
			(price not regulated)	
Belgium	√	√	√	√
Canada	√	√	x	x
Czech	x	x	x	x
Denmark	√	√	√	√
Finland	√	√	√	x
France	√	√	√	√
				(full unbundling only)
Germany	√	√	√(1)	x
Greece	√	√	x	√
		(from January 2002)		
Hungary	√	√	x	x
Iceland	√	√	x	x
	(not yet legally)	(not yet legally)		
Ireland	√	√	√	√ (2)
Italy	√	√	√	√
Japan	√	√	x	√
Korea	√	√	√	x
Luxembourg	√	√	x	√
Mexico	x	x	x	x
Netherlands	√	√	x	x
New Zealand	x	x	x	x
Norway	√	√	√	√
				(only experimental)
Poland	x	x	x	x
Portugal	√	√	x(3)	√(4)
Slovak	x	x	x	x
Spain	√	√	√	√
Sweden	√	√	√	√
Switzerland	x	x	x	x
Turkey	x	x	x	x
United Kingdom	√	√	√	√
United States	√	x	x	√

Notes:

(1) Deutsche Telekom provides the whole range of bitstream access products. In addition, DT provides wholesale offer for IP platform operators and ISPs, which allows them to be accessed through DT DSL access lines.

(2) Only one offer has been made for sub-loop unbundling, which has not proven to create any significant demand.

(3) An wholesale ADSL offer is available through PT ADSL Network service, a service exclusively aimed at the 'Telecommunications Operators and Service Providers' market segment.

(4) Following ANACOM's decision in March 2002, which determined that PT Communicacoes should include the sub-loop unbundling offer in the RUO, PT Communicacoes published, in compliance, a revised RUO in May 2002, which includes conditions for the provision of sub-loop unbundling.

Source: OECD.

Table 3 shows that there is a great deal of difference in the progress of LLU across OECD countries as measured by the ratio of unbundled loops to total subscriber lines. The United States and Canada lead with 5.5% and 4% of local loops unbundled.<sup>20</sup> The US, with the longest history of LLU, increased the ratio of unbundled loops to total lines<sup>21</sup> from 1.2% in December 1997 to 7.2% in December 2001 (Table 4). In Denmark, the ratio of unbundled loops to local loops increased from 0.4% to 1% between 2000 and 2001 (Table 5). In Germany, the share of unbundled loops has grown from 0.27% to 1.2% for the past few years (Table 6), and in Japan, the ratio of unbundled local loops has grown from 0.0004% to 2.78% during 2000-2002 (Table 7). The detailed requirements in implementing LLU has meant that in many countries, despite the fact that legislation and regulatory requirements mandate LLU, the actual arrangements for implementation have slowed progress in actual unbundling. For example, in Ireland Eircom's Access Reference Offer, the line sharing manual and the collocation process were agreed to by industry in early

2002 after nearly two years of discussion. However, outstanding issues (the copper loop frequency management plan) are still delaying LLU implementation. In some countries the incumbent published a standard offer for unbundled access to the local loop before legislation had been implemented. This was the case in Iceland and in Norway.

There have been cases where the incumbent sought to give preferential treatment to its subsidiaries in the implementation of LLU. In Greece, for example, the incumbent OTE has not provided collocation spaces in its exchanges until recently whereas it has been providing them to its ISP subsidiary since 1996.

**Table 3. Deployment of local loop unbundling**  
[As of the end of 2001]

	Total local loops	Unbundled loops (1)	Unbundled ratio
Australia	11 504 000	N/A (2)	N/A
Austria	3 997 482	3 700	0.1%
Belgium	5 142 000	About 50	About 0.001%
Canada	19 987 000	802 000	4.0%
Czech		LLU has not been implemented	
Denmark	3 884 573 (3)	57 052	1.47%
Finland	2 850 000	42 500 (40 000 full unbundling and 2 500 line sharing)	1.5%
France	34 181 000	754	0.002%
Germany	52 280 000 (4)	623 624 (5)	1.2%
Greece	5 611 000	N/A	N/A
Hungary	3 800 000	0	0.0%
Iceland	190 000	N/A	N/A
Ireland	1 600 000	13 (6)	0.0008%
Italy (7)	26 502 000	6 900	0.026%
Japan	50 738 000	1 411 126	2.78%
Korea	21 832 000	N/A	N/A
Luxembourg	311 000	0	0.0%
Mexico		LLU has not been implemented	
Netherlands	9 610 000	6 650 (8)	0.07%
New Zealand		LLU has not been implemented	
Norway	3 146 000	N/A	N/A
Poland	9 533 000	0	0.0%
Portugal	4 370 000	20	0.0005%
Slovak		LLU has not been implemented	
Spain	17 748 000 (9)	103	0.0006%
Sweden	7 000 000	2 282 (2 023 full unbundling and 259 line sharing)	0.03%
Switzerland		LLU has not been implemented	
Turkey		LLU has not been implemented	
UK	29 000 000	160 (10)	0.0006%
US	172 629 000 (11)	9 461 000	5.5%

Notes:

(1) "Unbundled loops" include both full unbundling and line sharing, but not bitstream access.

(2) N/A means that data are not available.

(3) This figure includes both ISDN-s and ISDN-30 connections as well as switched customer connections. The number of pure PSTN line is 2 763 488.

(4) These are all telephone channels in Germany, including competitors. DT itself owns about 50 700 000 channels.

(5) These are lines and thus should be compared to the 39 721 000 lines in Germany. In this method, the unbundled ratio is 1.57%. By the end of September 2002, approximately 855 000 lines had been unbundled.

(6) Seven fully unbundled lines and six line sharing.

(7) As of June 2002, the number of unbundled loops is 45 000 and the unbundled ratio is 0.17%. See also Table 8.

(8) These are the lines operated by new entrants. The incumbent had in use 150 000 unbundled lines. If this figure is taken into account, the unbundled ratio would be 1.6%. As of July 2002, there are 200 000 unbundled lines for the incumbent and 19 000 for the new entrants, which is about 9% of the total number of unbundled lines.

(9) As of April 2002. Telefonica's Reference Unbundled Offer (RUO) includes the offer of the vacant loops (not yet activated for commercial services) and increases the number of total loops to 18 500 000.

(10) Current figures are around 1600 and the unbundled ratio would be around 0.006%. In the UK, unbundled loop numbers really started increasing from March 2002 as LLU operators began to push business services over unbundled local loops.

(11) The total set is ILEC local loops as CLECs are not required to unbundle their local loops.

Source: OECD.

**Table 4. Number of loops in the US  
(Thousands)**

	(a) Total lines	(b) Resold Lines	(c) Unbundled loops	(d) Total of (b) and (c)	(f) (d)/(a)
December 1997	159 008	1 743	133	1 876	1.2%
June 1998	161 810	2 448	244	2 692	1.7%
December 1998	164 614	3 062	361	3 423	2.1%
June 1999	167 177	3 583	685	4 268	2.6%
December 1999	187 294	4 494	1 493	5 987	3.2%
June 2000	188 171	5 098	3 312	8 409	4.5%
December 2000	188 346	5 388	5 274	10 662	5.7%
June 2001	186 825	4 417	7 922	12 340	6.6%
December 2001	186 111	4 021	9 461	13 482	7.2%

Source: FCC.

**Table 5. Number of unbundled loops in Denmark**

	Total local loops	Unbundled loops	Unbundled ratio	Reference
End of 2001	3 884 573	38 400	1.0%	Excluding TDC's bitstream access
End of 2000	3 835 017	16 867	0.4%	Excluding TDC's bitstream access
End of 1999	3 638 119	N/A	N/A	

Source: Statistics of the National Telecom Agency of Denmark.<sup>22</sup>

**Table 6. Number of unbundled loops in Germany**

	Total local loops	Unbundled loops	Unbundled ratio
2001	52 280 000	623 624	1.2%
2000	50 220 000	263 428	0.52%
1999	48 210 000	129 264	0.27%

Source: RegTP<sup>23</sup>.

**Table 7. Number of unbundled loops in Japan**

	Total local loops	Unbundled loops	Unbundled ratio
FY1999	55 446 000	211	0.0004%
FY2000	52 089 000	46 956	0.09%
FY2001	50 738 000	1 411 126	2.78%

Source: MPHPT.

The deployment of LLU depends crucially on the speed in which incumbents upgrade their MDFs. The available data (Table 8) indicate that in some markets the pace has been quite slow.

**Table 8. The number of provided MDFs for LLU  
(as of end 2001)**

	Total local MDFs	Provided MDFs	LLU availability	Note
<b>Australia</b>	N/A	80	N/A	
<b>Austria</b>	1 400	216	15.43%	Theoretically all MDFs are available for LLU.
<b>Belgium</b>	600	N/A	N/A	
<b>Canada</b>	N/A	N/A	N/A	
<b>Czech</b>				LLU has not been implemented.
<b>Denmark</b>	1 200	147	12.25%	Theoretically LLU should be available at all MDFs.
<b>Finland</b>	134	N/A	N/A	Practically almost all MDFs are available for LLU.
<b>France</b>	12 000	116	0.97%	
<b>Germany</b>	7 900	2 000	25.3%	Theoretically all MDFs should be available for LLU. The figure 25.3% means that almost 60% of all customers lines can be unbundled.
<b>Greece</b>	233	N/A	N/A	
<b>Hungary</b>	N/A	0	0%	
<b>Iceland</b>	N/A	17	N/A	
<b>Ireland</b>	128	12	9.4%	Currently 40 sites offers have been made to Esat, 12 of which are operational. Esat were on target to have 40 sites operational by the end of October 2002.
<b>Italy</b>	11 551	748	6.47%	The most representative indicator of LLU availability is the ratio between the actual demand of LLU (1040 MDFs requested by other licensed operators (OLOs) and the actual offer for LLU (748 MDFs provided by the incumbent at the date of 31 December 2001). In this case, the availability ratio would be 72%, representing the level of LLU offering in the country in response to OLOs' actual demand. It must be noted that as of June 2002 the MDFs provided by the incumbent in Italy has increased to 946 to which about 50% of Telecom Italia's subscribers are connected. These subscribers represent the actual addressable market through LLU. As a consequence it should be stressed that in terms of "offering" about 50% of Telecom Italia's customers have to be considered as already fully addressable by OLOs.
<b>Japan</b>	5 100 (*)	2 300	45%	(*) Except for 2 200 RT-BOX type buildings. All MDFs shall be available for LLU on request of competitors.
<b>Korea</b>	N/A	N/A	N/A	
<b>Luxembourg</b>	N/A	N/A	N/A	
<b>Mexico</b>				LLU has not been implemented.
<b>Netherlands</b>	550	300	60%	
<b>New Zealand</b>				LLU has not been implemented.
<b>Norway</b>	N/A	N/A	N/A	
<b>Poland</b>				LLU has not been implemented.
<b>Portugal</b>	180	14	8%	Theoretically all MDFs are available for LLU.
<b>Slovak</b>				LLU has not been implemented.
<b>Spain</b>	981	81	8.26%	
<b>Sweden</b>	250	123	49.2%	
<b>Switzerland</b>				LLU has not been implemented.
<b>Turkey</b>				LLU has not been implemented.
<b>UK</b>	5 600	119	2.13%	All MDFs are open to LLU operators. It is a commercial decision for them as to which exchange they build at.
<b>US</b>	N/A	N/A	N/A	

Note: N/A = data not available.

Source: OECD.

With respect to LLU regulations, the requirements imposed on incumbents differ across countries. Some countries have set guidelines for LLU. For example, the UK regulator Oftel has set service level commitments on the incumbent which it needs to meet, or face fines, in response to operators ordering unbundled local loops. In addition, the incumbent had to change its access network facilities agreement with operators to ensure that they obtain the necessary services for local loop unbundling. Other countries, such as Ireland, have put in place service level agreement frameworks that must be followed by the incumbents and made decisions on the type of information that incumbents must provide to competing operators. The Austrian and the German regulators have ruled that unbundling should be made available at any MDF requested by new entrants. In Australia, a self-regulatory process by the industry is encouraged.

### 3.3 Collocation

Issues associated with collocation have not yet been resolved to the satisfaction of all parties. In this regard, it is desirable that as many options of collocation as possible are provided for the purpose of facilitating the process. Remote or virtual collocation can be a solution to limited space problems in physical collocation.

Some countries promote certain types of collocation. In the UK, for example, the regulator concluded that the incumbent BT should meet any request for co-mingling unless there were objective criteria on the grounds of technical feasibility or the need to maintain network security. The rationale behind this decision is the idea that co-mingling could encourage a broader deployment of LLU-derived services because it could provide significant reductions in start-up costs. In Japan, the regulator has made it compulsory to implement co-mingling collocation in buildings of the incumbents NTT East and West.<sup>24</sup>

**Table 9. Types of collocation implemented**

	Caged collocation	Co-mingling	Remote collocation	Virtual collocation
<b>Australia</b>	√	√	x	x
<b>Austria</b>	√	x	√	x
<b>Belgium</b>	√	√	√	x
<b>Canada</b>	√	√	x	x
<b>Czech Republic</b>		LLU has not been implemented.		
<b>Denmark</b>	√	√	√	√
<b>Finland</b>	√	x	x	x
<b>France</b>	√	√	√	√
				(not used)
<b>Germany</b>	√	x	√	√
<b>Greece</b>	√	x	√	√
<b>Hungary</b>	√	x	x	x
<b>Iceland</b>	√	x	x	x
<b>Ireland</b>	√	√	√	√
				(not used)
<b>Italy</b>	√	x	√	√
<b>Japan</b>	x	√	x	x
<b>Korea</b>	√	√	x	x
<b>Luxembourg</b>	√	√	√	√
<b>Mexico</b>		LLU has not been implemented.		
<b>Netherlands</b>	√	x	√	x
<b>New Zealand</b>		LLU has not been implemented.		
<b>Norway</b>	√	√	x	x
<b>Poland</b>		LLU has not been implemented.		
<b>Portugal</b>	√	x	√	x
<b>Slovak Republic</b>		LLU has not been implemented.		
<b>Spain</b>	√	√	x	√

**Table 9. Types of collocation implemented (cont'd)**

	<b>Caged collocation</b>	<b>Co-mingling</b>	<b>Remote collocation</b>	<b>Virtual collocation</b>
<b>Sweden</b>	√	√	√ (not regulated)	x
<b>Switzerland</b>		LLU has not been implemented.		
<b>Turkey</b>		LLU has not been implemented.		
<b>UK</b>	√	√	√	√
<b>US</b>	√	√	√	x

Notes:

In Portugal, ANACOM issued a recommendation, approved by Deliberation of June 2001, considering that depending on the evolution of the supply conditions, and especially on the interest shown by the market, the reference unbundling offer should develop in order to contemplate virtual collocation offer, when feasible, in line with that laid down in the Regulation (CE). It would be the case, for example, if in certain infrastructure there were a lack of suitable conditions for the offer of physical or remote collocation. With regard to co-mingling, ANACOM issued a decision in November 2002, in which it stated that PT Comunicacoes should make co-mingling available whenever the market showed interest.

Source: OECD.

The period for provision of collocation spaces affects the speed of implementation of LLU. Some countries require incumbents to offer the space within a set period in order to avoid delays in implementation, but usually the time varies from site to site (see Table 10). Regulators should set guidelines to ensure that collocation space is made available within a reasonable time.

In Japan, for example, the regulator amended ministerial ordinances in September 2000 to make incumbents NTT East and West describe standard periods for collocation spaces in their Articles of Agreement concerning Interconnection. The articles give a detailed description of the standard periods (See Table 11).

### ***Prices for collocation***

It is not easy to compare the price of collocation space among OECD countries because in a number of countries the price is set by the incumbent on a case-by-case basis such as in France, Norway and Sweden (see Table 12). The price could also differ depending on whether the charge for the space includes other costs such as power and site surveys.

Nevertheless, if collocation prices are high, this will be a strong disincentive to access seekers to take advantage of LLU. New entrants often claim that the collocation costs for the conditioning or preparatory work undertaken by incumbents are often prohibitive.

Some OECD countries have made efforts to reduce collocation prices. In Spain, for example, initial collocation prices were said to be about 12 times higher than current prices. Originally, the incumbent Telefonica tried to charge USD 317 (EUR 367) for monthly rental per square meter. However, this price has been modified by the regulator since June 2001, and is currently USD 11 (EUR 13) in large cities.

**Table 10. The period within which collocation space needs to be made available after receipt of an order from competitors**

	<b>Set period</b>	<b>Reference</b>
<b>Australia</b>	No regulations	
<b>Austria</b>	- Indoor collocation: 10 weeks - Outdoor collocation: 8 weeks - Outdoor cabinet: 4 weeks - Up to 3 months for special cases	
<b>Belgium</b>	- 3.5 months (when the place where the collocation cages are installed does not exist) - 1.5 months (when the place is already available)	
<b>Canada</b>	No regulations	
<b>Czech</b>	LLU has not been implemented.	
<b>Denmark</b>	- 90 days	TeleDenmark has to reply the request from a competitor within 45 days. After receiving a possible answer, the competitor asks TeleDenmark to prepare an offer, which should be made within 45 days.
<b>Finland</b>	No regulations	The regulator recommended that operators give answers concerning free places within one week and prices within two weeks.
<b>France</b>	- 6 months (2 months for feasibility study and 4 months for preparation)	- 8 weeks (6 weeks for preparation and 3 weeks for feasibility study)
<b>Germany</b>	- 7 weeks (16 weeks, if structural engineering measures are necessary)	
<b>Greece</b>	No regulations	
<b>Hungary</b>	- 60 days (when construction work is needed)	Local loops must be unbundled within 10 days from drawing up the contract.
<b>Iceland</b>	No regulations	
<b>Ireland</b>	- 4 weeks for the shortest	According to the regulator, the time varies from site to site, which depends on what exactly is required at each site
<b>Italy</b>	- 90 working days (for new preparation) - 15 working days (for amendment)	
<b>Japan</b>	One month (for the response to the order from a new entrant)	Actual period for provision of space differs according to the work carried out by the new entrants.
<b>Korea</b>	One month (for the response to the order from a new entrant)	Actual period for provision of space differs according to the work carried out by the new entrants.
<b>Luxembourg</b>	No regulations	
<b>Mexico</b>	LLU has not been implemented.	
<b>Netherlands</b>	- 3 months (for physical collocation) - 1 month (for remote collocation)	
<b>New Zealand</b>	LLU has not been implemented.	
<b>Norway</b>	No regulations	
<b>Poland</b>	LLU has not been implemented.	
<b>Portugal</b>	- 80 working days (for supply of rooms) - 40 working days (for supply of modules in an existing room)	
<b>Slovak</b>	LLU has not been implemented.	
<b>Spain</b>	- 90 days (when the place where the collocation cages are installed already exists) - 112 days (when the place does not exist)	
<b>Sweden</b>	- 9 weeks (actual preparation time)	Time for the incumbent Telia's preparation of an offer is 15 days.
<b>Switzerland</b>	LLU has not been implemented.	
<b>Turkey</b>	LLU has not been implemented.	
<b>UK</b>	- 100 days (for new preparation. The incumbent faces service level payments unless it provides collocation facilities within 100 days of order. - 4 weeks (for amendment)	
<b>US</b>	- 90 days	

Source: OECD.

**Table 11. Standard periods for collocation in Japan**

	Installation work by competitors			Installation work by NTT East and West		
	Only in communications buildings		Other cases	Only in communications buildings		Other cases
	No need for a study (*)	Need for a study (*)		Interconnection at MDF	Other than interconnection at MDF	
1. POI survey~ Response	2 weeks	1 month	1 and a half months	1 month		1 and a half months
2. Application for establishment of POI ~ Initiation of construction	1 month (**, ***)			2 months		
3. Initiation of construction ~ Finish of construction				1 month	1 and a half months	3 months

Notes:

\*: A study on Installation or modification of peripheral facilities used in conjunction with installing equipment.

\*\* : One and a half months when applicant for interconnection demand installation or modification of raised floor.

\*\*\*: Two weeks in cases of additional installation of equipment or wiring in the place in which equipment has already been installed.

**Table 12. Monthly rental prices for collocation space  
USD (as of end 2001)**

	Physical	Remote
<b>Australia</b>	N/A	N/A
<b>Austria</b>	According to market rate (actual expense)	As the collocation room is operated by the access seeker, the price is part of a private legal contract with the landlord.
<b>Belgium</b>	N/A	N/A
<b>Canada</b>	N/A	N/A
<b>Czech</b>	LLU has not been implemented.	
<b>Denmark</b>	185.45/618.16 (a)	37.09/9.27/49.45/12.36 (g)
<b>Finland</b>	In case of Elisa, including VAT Caged on floor: 354-408 Caged on wall: 147-169 Cageless with electricity: 126-145 Cageless without electricity: 53-72	-
<b>France</b>	According to cost estimates per site. For example, in case of rack space in five largest cities; 113.06.	According to cost estimates per site
<b>Germany</b>	Different monthly charges apply to different local exchanges.	Different monthly charges apply to different local exchanges.
<b>Greece</b>	60.86/50.72/39.05/27.39/13.95 (b)	The price is set by the incumbent on a case-by-case basis.
<b>Hungary</b>	N/A	N/A
<b>Iceland</b>	148.16/212.98 (c)	N/A
<b>Ireland</b>	Prices are set on the basis of pre-ordering charges, site preparation charges, occupancy charges, and attendance service charges.	-
<b>Italy</b>	Prices are set by the incumbent according to the location of the MDF site on the basis of parameters published by Telecom Italia in its RIO (and subject to AGCOM evaluation).	The price is set by the incumbent on a case-by-case basis.
<b>Japan</b>	26.28 (d)	-
<b>Korea</b>	N/A	N/A
<b>Luxembourg</b>	53.58/42.86/38.63 (e)	
<b>Mexico</b>	LLU has not been implemented.	
<b>Netherlands</b>	The price structure contains one-off costs for the construction of collocation spaces and recurring costs for power use and rent per square meter.	The price structure contains one-off costs for the construction of collocation spaces and recurring costs for power use and rent per square meter.
<b>New Zealand</b>	LLU has not been implemented.	
<b>Norway</b>	The price is set by the incumbent on a case-by-case basis.	The price is set by the incumbent on a case-by-case basis.

**Table 12. Monthly rental prices for collocation space (cont'd)**  
**USD (as of end 2001)**

	Physical	Remote
<b>Poland</b>		LLU has not been implemented.
<b>Portugal</b>	445.09/443.26 (f)	
<b>Slovak</b>		LLU has not been implemented.
<b>Spain</b>	11.23 (From January 2003, the rental price will be 10.65)	-
<b>Sweden</b>	Every case is calculated individually.	
<b>Switzerland</b>		LLU has not been implemented.
<b>Turkey</b>		LLU has not been implemented.
<b>U.K.</b>	The quarterly charge for collocation space set by the incumbent will be dependent on the market rate for the location of the exchange, the area occupied by the operator, the equipment to be installed in the room, etc.	The quarterly charge for collocation space set by the incumbent will be dependent on the market rate for the location of the exchange, the area occupied by the operator, the equipment to be installed in the room, etc.
<b>U.S.</b>	N/A	N/A

(a) Examination of the feasibility of collocation in connection with establishment of transmission equipment cabin/quotation. These are prices for "mini hostel and hostel". The examination fee is refunded if an agreement is concluded on the basis of a quotation.

(b) Area A/B/C/D/E.

(c) 60cm x 60cm cabin/80cm x 80cm cabin.

(d) National average per 1 m<sup>2</sup>, USD 1=JPY 119.775.

(e) Metropolitan/urban/rural areas.

(f) Monthly rental of a 5 m<sup>2</sup> caged module/monthly rental of a 5 m<sup>2</sup> module (excluding VAT).

(g) Initial fee including transport and administration in case of supervised access at one week's notice / fee per commenced 15 minutes at the central office in case of supervised access at one week's notice / initial fee in case of supervised access without notice / fee per commenced 15 minutes in case of supervised access without notice.

(h) N/A = data not available. USD 1=EUR 1.1572.

Source: OECD.

### ***Best practice for collocation***

New entrants need collocation space at a core of exchanges for initial launch of LLU. Yet, collocation space may be limited in a given exchange so that it is important to have rules on allocating scarce space. In most OECD countries, space is allocated on a "first come, first served" basis.

If the incumbent's exchange space is conditioned for collocation beforehand, the time required for implementing collocation could be reduced. However, it is highly unlikely that all the incumbent's local exchanges are conditioned from the outset because not every exchange will support LLU. Thus, it is necessary to strike a balance between the competing demands of several new entrants in order to determine the initial order of incumbent's exchanges for collocation conditioning. There are different ways of doing this. In France, for example, the regulator sets milestones for the conditioning of local exchanges after consultation with the incumbent.<sup>25</sup> The UK regulator developed a voting system known as the "Bow Wave Process" (see Box 1), which aims at ensuring fair allocation of space within each exchange.<sup>26</sup> It was designed to manage the initial high demand by operators for collocation space, and ended in February 2001 after initial demand for LLU subsided. Currently, the UK operates on a "business as usual" basis, whereby operators can order collocation space at any exchange at any time. The Portuguese regulator previously ruled that collocation is only permitted in local exchange sites and that the incumbent should offer a minimum space of five square meters for collocation.<sup>27</sup> In Japan, a rule was introduced that set maximum available capacity to competitors when the carriers meet the conditions of efficiency for using spaces in May 2002. Equality between incumbents and competitors is also ensured in case of installing equipment such as DSLAMs.

**Box 1. Bow Wave Process in the United Kingdom**

In the initial phase, each operator participating in the process submitted a short-term forecast, which included a maximum of 1 500 prioritised requests for collocation in BT's exchange sites (advanced capacity orders). Operators specified the amount of space they required within each requested exchange. Operators also made it clear whether they were willing to trade allocated spaces with other operators in the event of a tie on priorities. The information was submitted to an electoral reform society (ERS) which managed the single transferable vote (STV) process. The STV process ascertained the overall priority ranking of exchange sites as well as operators' requests on the basis of the number of operators which requested collocation space.

ERS made a list of the top 500 exchange sites with the highest priority requested by operators, of which 140 were to be "reserve sites" in the event that there were problems in proceeding with the top 360. ERS sent a list of those sites to BT and then individually notified the operators of the sites which were in the overall top 500 ranking.

Operators placed initial survey requests with BT for sites where they were allocated collocation space which fell within the overall top 60 sites. Then BT surveyed these top 60 sites to identify and allocate power and space available. BT allocated collocation space to operators in the top 60 sites according to the details on the short-term forecast form and on the basis of operators' stated priorities until all available collocation space was full. Any sites where priority ties existed in an exchange were notified to ERS. Tied operators had two days to trade space. If they were unable to resolve the site allocation, the agreed procedure provided that ERS would invite operators to throw a die to decide which operator would receive the allocation. The completed initial surveys were then returned to operators who returned them to BT signed as accepted or rejected.

BT conducted a full survey which included the cost of constructing the collocation hostel product for the top 60 sites. Operators then returned the signed full surveys to BT. If operators agreed to go ahead with ordering the collocation space, this became their formal commitment to pay for the construction of the hostel. BT proceeded to build the hostels in the top 60 exchanges. The rest of the sites in the top 360 followed the same process as the first 60.

A second round of the "Bow Wave Process" was run starting with a new set of prioritised requests for space being made by operators to ERS. Further rounds of the process will only be run if it is considered that there are still demand management constraints on operators' requests for collocation space.

In Australia, where the main new entrant largely decided the rollout of collocation space, the parties, through a process of commercial negotiation, have so far resolved issues of collocation. Thus, the regulator ACCC has not had a role in regulating such factors as number, price or timing of collocation space provided. Nevertheless, the ACCC has a programme of informal monitoring of collocation spaces at local exchanges through the Record Keeping Rules (RKR). The RKRs require the incumbent Telstra to provide information on provisioning, fault reporting, rectification time process and so forth in order to ensure that Telstra is providing its competitors with prompt access to its local loops.

**Box 2. Collocation space allocation system in Australia**

In order to shorten construction time for collocation space, the main new entrant proposes to the incumbent that it would build the collocation space, including sufficient space for other entrants, by itself. Although the incumbent undertakes some basic work to identify space that is suitable for collocation, the main new entrant selects the exchanges it wants to use. The new entrant is supposed to use only the incumbent's own contractors so that the incumbent will not be concerned over work quality. It also negotiates a separate construction contract with the contractors, which gives the new entrant the right to make a determination on the details of construction including costs.

The main new entrant is obliged to bear the construction cost for collocation spaces. However, it can collect some contribution from subsequent new entrants. As it were, the main new entrants "buy" the power of control over construction of collocation space by being a main contributor instead of the incumbent.

The incumbent Telstra does not require new entrants to cage their equipment, which can be located in racks in common space within the exchange, nor does it require special security requirements for new entrants to access collocation space.

### 3.4 Pricing

It is difficult to compare the price of unbundling among OECD countries because the coverage of prices differs from country to country. For example, the price could differ depending on whether the line

rental fees include administrative and refurbishment costs. In addition, the monthly rental price often differs according to whether the line is existing (active) or new (non-active). Recognising these complexities, the price for LLU that each regulator or incumbent publishes can be used as a benchmark to compare relative price performance between countries.

The monthly rental charges paid by operators to the incumbent for copper pairs often depend on what type of service is offered, and the rental charge for providing broadband service is normally higher than that for voice telephony service. In Belgium, for example, the monthly rate for the raw copper loop to be used for the transmission of signals within the voice frequency band is EUR 11.33 whereas the rate for a loop used to connect ADSL equipment is EUR 13.29. In some countries, such as Australia and Canada, the price differs according to geographic areas. Normally, the price in less populated areas is higher than in urban areas. In Australia, for instance, the monthly rental charge for full unbundling is USD 12.89 in large cities in contrast with USD 22.29 in rural and remote areas on average. In the US, different cost regulations (and costs) between states have resulted in different prices for LLU across the country.

As shown in Table 13, the difference in prices between OECD countries is relatively large. In Denmark, where the price for full LLU is the lowest among the OECD countries, the monthly rental fee for full unbundling is EUR 8.28. On the other hand, in Netherlands, the monthly rental fee is EUR 13.50. The monthly rental fee for line sharing also varies to a great extent ranging from about USD 1.4-3.6 in Belgium, Denmark, France, and Japan to more than USD 13 in Norway. These differences result largely from different approaches in calculating costs in the contrast between historical cost and LRIC approaches.

The one-off connection costs per line often depend on whether or not the loop is already actively used to provide telecommunications services, and mostly the charge for 'active' is cheaper than that of 'non-active.' The example of Italy clearly represents this trend, in which the one-off cost for full unbundling where loop continuity exists is EUR 81.86 whereas the case in which loop continuity needs to be established is EUR 97.66.

The monthly rental charge for line sharing is not normally more than 50% of the full LLU. This is the case in most OECD countries. In Austria, for example, the monthly rate of EUR 5.45 for line sharing is just 50% of the rate for full unbundling of EUR 10.90.

In order to check for a price/margin squeeze, the price for LLU and the access prices (monthly rental fees) for the products delivered over a copper line have to be compared. If only the cheapest residential access prices are compared to the price of LLU, then most countries would have a severe margin squeeze problem. This is because the cheap residential line rental is often politically mandated and is therefore below cost. It is therefore necessary to compare LLU prices with a weighted average of the monthly subscriber charges.

The price squeeze normally occurs when residential retail price is set below the cost whereas LLU price or wholesale price for unbundled loops remains comparatively high. In this case, new entrants can gain little margin for the services using unbundled loops. As both prices are beyond competitors' control, it is required for regulators to avoid inviting this phenomenon. Pricing rules should promote fair and non-discriminatory competition ensuring that there is no margin squeeze between prices of wholesale and retail services.

**Table 13. Monthly prices for LLU and retail price for PSTN line rental (USD)  
as of April 2002**

	Full LLU	Line sharing	One-off connection cost	Residential retail price
<b>Australia (lowest)</b>	6.98 (f1)	N/A	N/A	9.07 (r1)
<b>Australia (highest)</b>	31.68 (f1-b)	N/A	N/A	11.76 (r1)
<b>Austria</b>	9.42	4.71	94.20/47.10 (c1)	12.05 (r2)
<b>Belgium</b>	9.79/11.48 (f2)	2.78	68.00/71.02 (c2)	13.50
<b>Canada (lowest)</b>	3.91 (f3)	--	N/A	14.73 (r3)
<b>Canada (highest)</b>	33.54 (f3-b)	--	N/A	14.73 (r3)
<b>Czech</b>		LLU has not been implemented.		
<b>Denmark</b>	7.16	3.58	39.14/154.29 (c3)	10.46
<b>Finland</b>	10.37/12.96 (f4)	6.48-9.51 (s1)	86.42-276.53/25.92-216.04 (c4)	10.16
<b>France</b>	9.07	2.51	93.27/231.46 (c5)	10.85
<b>Germany</b>	10.78	4.12	101.22/136.23 (c6)	9.45
<b>Greece</b>	9.92	5.95	106.62/122.61 (c7)	7.10
<b>Hungary</b>	11.41	11.20	N/A	8.62
<b>Iceland</b>	8.72-14.03 (f5)	2.88/5.31 (s2)	34.01	N/A
<b>Ireland</b>	14.53	7.78	105.01/106.65 (c8)	13.02
<b>Italy</b>	9.32/10.89 (f6)	3.75	70.74/84.39 (c9)/81.54 (c10)	11.78 (r4)
<b>Japan</b>	16.14	1.44 (s3)	N/A	17.53
<b>Korea</b>	7.18	4.76	N/A	N/A
<b>Luxembourg</b>	11.46/13.65 (f7)	6.52	78.75/116.69 (c11)	10.28
<b>Mexico</b>		LLU has not been implemented.		
<b>Netherlands</b>	11.67 (f8)	4.84 (s4)	68.26/77.06 (c12)	13.39
<b>New Zealand</b>		LLU has not been implemented.		
<b>Norway</b>	10.79/18.12 (f9)	13.49	130.60	--
<b>Poland</b>		LLU has not been implemented.		
<b>Portugal</b>	10.34/11.91 (f10)	6.76/6.84 (s5)	71.55/129.45 (c13)	10.16
<b>Slovak</b>		LLU has not been implemented.		
<b>Spain</b>	9.70	4.12 (s6)	17.28	10.09
<b>Sweden</b>	10.02	4.75	142.59 (c14)	9.51
<b>Switzerland</b>		LLU has not been implemented.		
<b>Turkey</b>		LLU has not been implemented.		
<b>U.K.</b>	13.97	6.05	120.56	12.62
<b>U.S. (Montana)</b>	23.72 (f11)	--	N/A	N/A
<b>U.S. (Ohio)</b>	7.01 (f11-b)	--	N/A	N/A

**Notes:**

(f1) In built-up areas. USD 1=AUD 1.86254. All exchange rates used in this paper are those of April 2002, and are subject to change. Hence special care must be taken in ranking OECD countries.

(f1-b) In case of rural areas.

(f2) For PSTN and ISDN/for ADSL.

(f3) In case of MTS, Band A.

(f3-b) In case of TCBC, Band G. USD1=CAD 1.5448.

(f4) For PSTN and ISDN/for broadband. These are average prices.

(f5) Up to 64 kbps: 10.09/up to 2 Mbps: 13.43/up to 8 Mbps: 16.23.

(f6) For PSTN and ISDN/for ADSL.

(f7) For voice telephony/for broadband.

(f8) Excluding a broadband service charges of EUR 4.54, which has not been authorised by OPTA.

(f9) For PSTN/for broadband.

(f10) For PSTN and ISDN/for broadband use.

(f11) Montana is one of the highest states in the US. This is a geographical average.

(f11-b) Ohio is one of the lowest states in the US. This is a geographical average.

(s1) Without splitter/with splitter. These are average prices.

(s2) Up to 2 Mbps/up to 8 Mbps.

(s3) USD 1=JPY 119.775.

(s4) Excluding a broadband service charges of EUR 4.54, which has not been authorised by OPTA.

(s5) For PSTN/for ISDN

(s6) From January 2003, the monthly price for line sharing will be USD 3.02.

(c1) New lines/exiting lines.

(c2) Active for PSTN/non-active for PSTN.

(c3) For full unbundling/for line sharing

(c4) For full unbundling/for line sharing.

(c5) Where loop continuity exists/where loop continuity needs to be established.

(c6) Line transfer/new line. USD 60.9 for most frequently required options, simple transfer of a two-wire copper pair without work at the customer end/USD 145 for most expensive one-off connection with work at the customer end.

(c7) Full LLU/line sharing.

(c8) Full LLU/line sharing.

(c9) Active pair/inactive pair. For full unbundling.

(c10) For line sharing

(c11) To active loops/to non-active loops.

(c12) For full unbundling/for line sharing

(c13) For full unbundling/for PSTN line sharing.

(c14) Copper access S300, S600, A1100, V12.

(r1) In case of Telstra's price for residential users.

(r2) Excluding VAT

(r3) National average, CAD 22.75.

(r4) Including VAT. Until June 2002.

Source: OECD.

With increasing scrutiny of prices by regulators as well as technological progress, prices have decreased over the past few years. In Canada, for example, monthly rental charges for local loops were reduced about 30% on average during 1998 to 2001. In the UK, regulator Oftel cut the monthly line sharing charge and one-off connection charge drastically in October 2001 and issued a statement for further reduction in January 2002. In France, France Telecom reduced its monthly prices for full unbundling from EUR 14.18 to EUR 10.50 (26%) and for line sharing from EUR 6.1 to EUR 2.9 (53%) in April 2002. Germany also set the monthly price of line sharing at EUR 4.77 in March 2002. In Japan, the establishment of interconnection rules by the regulator led to the reduction of charges for LLU provided by incumbents. The charge for line sharing has decreased from USD 1.56 in FY2000 to USD 1.44 in FY2001 and that for full unbundling from USD 17.18 in FY2001 to USD 16.14 in FY2002.

**Table 14. Monthly rental charge (average) for copper pairs in Canada**

	(a) Type A loops	(b) Type B loops	Average of (a) and (b)
In 1998	USD 22.04 (EUR 25.50)	USD 17.41 (EUR 20.15)	USD 19.91 (EUR 22.83)
In 2001	USD 15.16 (EUR 17.54)	USD 13.14 (EUR 15.21)	USD 14.15 (EUR 16.38)

Source: CRTC.

**Table 15. Line sharing charges in the UK**

	Monthly rental	One-off connection
April 2001	USD 7.9 (GBP 5.7)	USD 174.6 (GBP 127)
October 2001	USD 6 (GBP 4.4)	USD 160.7 (GBP 117)

Source: Oftel.

Note: These charges are set as an annual rental fee.

**Table 16. Monthly rental charge for LLU in Japan**

	Full unbundling	Line sharing
FY2000	USD 17.18	USD 1.56
FY2001	USD 16.14	USD 1.44

Source: MPHPT (USD 1=JPY 119.775).

As mentioned earlier, the extent of government involvement in LLU implementation differs among OECD countries. Most regulators approve wholesale prices for unbundled loops in the form of reference offers from the incumbent. However, there are differences among countries in terms of regulatory intervention in setting prices for LLU. In France, France Telecom's reference offer for LLU does not necessarily have to be approved by the regulator ART, although ART verifies that prices are cost-oriented and has issued decisions to request changes in the offer. In Finland, LLU prices are not determined by the regulator. In Denmark, LLU prices are set through negotiations between Tele Denmark and an organisation of competitors. Table 17 provides an overview of the role of regulators in price setting.

Table 17. LLU price regulation

	Regulatory approval for line rental charges	Regulatory approval for collocation charges
<b>Australia</b>	Yes	No
<b>Austria</b>	Yes	Yes (*)
<b>Belgium</b>	Yes	Yes
<b>Canada</b>	Yes	Yes
<b>Czech</b>	LLU has not been implemented.	
<b>Denmark</b>	Yes	Yes
<b>Finland</b>	No	No
<b>France</b>	No	No
<b>Germany</b>	Yes	Yes
<b>Greece</b>	Yes	No
<b>Hungary</b>	Yes	Yes
<b>Iceland</b>	Yes	Yes
<b>Ireland</b>	Yes	Yes
<b>Italy</b>	Yes	Yes
<b>Japan</b>	Yes	Yes
<b>Korea</b>	Yes	No
<b>Luxembourg</b>	Yes	Yes
<b>Mexico</b>	LLU has not been implemented.	
<b>Netherlands</b>	Yes	Yes (except for the monthly rent of square meters)
<b>New Zealand</b>	LLU has not been implemented.	
<b>Norway</b>	No	No
<b>Poland</b>	LLU has not been implemented.	
<b>Portugal</b>	Yes	Yes
<b>Czech</b>	LLU has not been implemented.	
<b>Spain</b>	Yes	Yes
<b>Sweden</b>	Yes	No
<b>Switzerland</b>	LLU has not been implemented.	
<b>Turkey</b>	LLU has not been implemented.	
<b>UK</b>	Yes	Yes
<b>US</b>	Yes (state government with FCC guidance)	Yes (state government with FCC guidance)

\* The prices have to follow the market rate, according to a published index.

Source: OECD.

## APPENDIX

### Australia

Australia introduced LLU in a relatively short timeframe and with little controversy. In July 1999, the Australian Competition and Consumer Commission (ACCC) decided to regulate the supply of LLU services, which would enable new entrants to use incumbent Telstra's copper lines for the purpose of deploying xDSL technologies. Access seekers are entitled to provide the service on such terms and conditions as are agreed with an access provider. If they fail to reach the agreement, the ACCC can arbitrate either by imposing an access undertaking already accepted by the Commission or through an arbitration process. Despite these basic frameworks, the ACCC recognised a number of technical as well as operational issues that need to be resolved, and noted that the work at the industry level was vital to the successful implementation of LLU services. Therefore, it can be analysed that the basic stance of the ACCC was to encourage access providers and access seekers to set out the terms and conditions without excessive regulatory intervention.

Since the implementation of LLU, there has been concern that Telstra might deploy its own retail and wholesale ADSL services before making its copper lines available to competitors. In the course of this process, Telstra gave the ACCC written assurance in March 2000 that it would not launch its own commercial retail services for ADSL until the arrangements for wholesale and LLU services were substantially in place.<sup>28</sup> For the moment, new entrants seem to have focused on business customers in using the LLU services.

Line sharing was mandated as a service that the Australian incumbent, Telstra, was required to provide competitors access to from August 2002. Line sharing is regarded as an important step forward in the development of a competitive broadband services market, ensuring that new technologies and services are not driven by monopoly control of the local network. Line sharing is expected to advantage specialised broadband operators by allowing them to focus on providing competitive and innovative high-speed data services without needing to take on the added responsibility and cost of providing voice services.

With regard to collocation, almost all the issues have been solved on a bilateral level between new entrants and the incumbent. In order to eschew excessive regulatory intervention, Telstra ensured that all exchanges across Australia were available for LLU. Telstra does not require new entrants to cage their equipment or to use separate entrance to a local exchange. Equipment can be located in racks in the common space within the exchange.

The ACCC has accepted that LLU pricing should be based on the total service long-run incremental cost (TSLRIC) approach determined to recover the efficient costs of a forward-looking network. It is a prominent feature in Australia that the monthly charges vary according to the geographical location of the LLU. The location is delineated on the basis of teledensity in the following ways.

- Band 1: CBD areas of Sydney, Melbourne, Brisbane, Adelaide and Perth.
- Band 2: Urban areas of capital cities, metropolitan regions and large provincial centres (including other CBD areas not already included in Band 1).
- Band 3: Semi-urban areas including outer metropolitan and smaller provincial towns.
- Band 4: Rural and remote areas.

The charges also differ depending on whether LLU is offered at remote switching units (RSU) or at remote integrated multiplexers (RIM). Following the announcement of proposed charges by Telstra, the ACCC expressed its concern about Telstra's pricing approach. The ACCC's preliminary view was that Telstra's charges exceeded those derived by the costing work of the Commission. In this context, the ACCC presented preliminary average LLU cost estimates as shown in the following table.

**Table 18. ACCC estimates of LLU cost (USD)**

	Annual network	Annual LLU specific	Annual total	Monthly total
<b>Band 1</b>	59.6	73.6	133.2	11.3
<b>Band 2</b>	119.2	73.6	192.7	16.1
<b>Band 3</b>	161.1	73.6	234.6	19.3
<b>Band 3</b>	251.3	73.6	324.8	26.8
<b>Average</b>	158.4	73.6	231.9	19.3

Source: ACCC.

In April 2002, ACCC issued final LLU prices together with access pricing principles. The monthly charge of Telstra's LLU services should be between USD 6.98 (AUD 13) and USD 18.79 (AUD 35) (on average USD 12.89) in the more built-up areas. In rural areas, where no LLU services have been sought by competitors, the price is between USD 12.89 (AUD 24) and USD 31.68 (AUD 59) (on average USD 22.29). Thus, geographically averaged price would be USD 17.59 (AUD 19.3) per month. In the meantime, Telstra's monthly retail line rental prices for residential users vary from USD 9.07 (AUD 16.9) to USD 11.76 (AUD 21.9) depending on the package option that the customer chooses.

## Austria

Austria is an early starter in LLU, allowing for the possibility of LLU in August 1997. Its Telecommunications Act 1997 allowed for LLU from the very beginning of liberalisation. Any SMP operator (*i.e.* Telekom Austria AG) is obliged to offer access to its unbundled network elements, *i.e.* the local loop under non-discriminatory and cost-oriented terms. In combination with the Act, the Interconnection Ordinance (*Zusammenschaltungsverordnung - ZVO*) stipulates that the regulatory authority has to make a decision on a case-by-case basis as to whether a specific element is to be offered on an unbundled basis taking into account the development of competition in the local area.

In spite of the legislative effort, LLU did not progress for a while due to long negotiations between the incumbent Telekom Austria AG (TA) and its competitors. In July 1999, having settled the dispute between TA and new competitors concerning LLU, the Austrian regulator clarified the rules under which alternative network operators are to use unbundled local loops. With a further decision in July 2000, ISPs also gained access to unbundled local loops. Since March 1999, the SMP operator TA has offered on a private law basis a wholesale bitstream contract, which can also be used by ISPs. As TA's reference offer for LLU (RUO) did not include line sharing, the regulator urged TA to modify its offer before May 2001.

Currently, both full unbundling and line sharing are available as regulated LLU services. Bitstream access is implemented via incumbent's ADSL wholesale "ISPA Contract" offer, which is a private agreement between the Internet Service Providers Association of Austria (ISPA) and the incumbent. This offer had to be introduced following pressure from the regulator in March 2000 after the provision of ADSL Internet access services was introduced in November 1999.

According to the EC unbundling regulation (2887/2000/EC) of January 2001, public telecommunications network operators with significant market power shall provide unbundled access to their local loops and associated facilities. In order to take account of this regulation, in March 2001 the regulator passed new orders concerning access to the last mile. In spite of the existing Telecommunications Act prior to the enactment of the EC regulation<sup>29</sup>, the new unbundling orders were necessary because the preceding associated orders expired on 30 September 2000. Among about 4 million local loops, *i.e.* 3 043 759 PSTN, 677 143 ISDN, and 276 580 Multi-ISDN networks, there were 3 700 unbundled loops and 350 ordered loops as of December 2001.

With regard to collocation, the regulator requires collocation at any local exchanges. TA is required to agree with an alternative solution if physical collocation is not technically possible. As of the end of 2001, 220 collocation spaces have been provided to new entrants.

With regard to the price of LLU, it is based on current valuation of assets. However, it was also viewed as necessary to keep geographically averaged prices so that LLU charges remain the same throughout the country. The most significant item newly adopted in the decision was the reduction of monthly charges for LLU from EUR 12.35 to EUR 10.90 as from 1 January 2002. These prices applied to copper pair regardless of the region in the country. Monthly charges for line sharing are 50% of full unbundling charge, *i.e.* EUR 5.45. One-off payment is 200% of line transfer charge applicable for full unbundling, which is EUR 109.01 excluding tax. The price of bitstream access is not fixed by the regulator.<sup>30</sup> The decision also prescribed penalties in case TA fails to meet the deadlines for unbundling, space limits in the assignment of collocation rooms, and unbundling of parts of the local loop (sub-loop). The following chart shows the summary of unbundling pricing.

**Table 19. Full unbundling and sub-loop unbundling monthly prices in Austria**

		EUR
<b>A</b>	Copper pair of up to 144 Kbps	10.90
<b>B</b>	Copper pair of high bit rates	10.90
<b>C</b>	Copper pair of sub-loop	8.43

Source: OECD.

*Note:* These are the most common charges for parts of the unbundled local loops. The charges include the monthly costs for the unbundled local loops (depreciation), the cost of capital involved and the service maintenance of the respective local loop. Monthly prices for line sharing are 50% of full unbundling charge (EUR 5.45 for the full loop).

## Belgium

LLU was legislated in October 2000 by the new law which allowed all operators to gain access to the incumbent Belgacom's local loops from January 2001. Although Belgacom issued the first reference offer in December 2000, the national regulatory authority (BIPT) stated that it did not comply with the EC unbundling regulation and required amendments to include line sharing and sub-loop unbundling in the coverage of LLU. Especially, it has been problematic that ADSL is the only type of xDSL permitted in line sharing in spite of several sequences of amendments of reference offer by Belgacom. A reference offer for

bitstream access also exists, but the BIPT issued a binding opinion amending the offer following a number of complaints from new entrants.

With regard to the price, monthly charges for full unbundling are EUR 11.33 for type 1 loop, *i.e.* the basic loop to be used from the transmission of signals within the voice frequency band, and EUR 13.29 for type 2 loop, *i.e.* the loop to be used to connect ADSL equipment. The monthly charge for line sharing is EUR 3.22 (if active), which is relatively inexpensive compared to other OECD countries. Collocation prices have not been approved by the BIPT.

## Canada

It is noteworthy that Canadian approach to LLU is in line with long-term facility-based competition policy. In August 1996, the Canadian Radio-television and Telecommunications Commission (CRTC) issued Telecom Public Notice 96-28 to oversee the process of identifying the requirements to facilitate local telephone competition. Subsequently, Telecom Decision CRTC 97-8, issued in May 1997, reaffirmed this idea and clarified that a competitive local exchange carrier (CLEC) may request the incumbent local exchange carrier (ILEC) to provide various unbundled facilities to be used as part of the CLEC's network arrangement.

The CRTC considers a network or service element to be unbundled as essential ones that is monopolised, required by a CLEC as input to provide services, and cannot be economically duplicated. Facilities that meet this definition shall be subject to mandatory LLU. This definition reflected the CRTC's view that ILECs should not be required to make available facilities for which there are alternative networks or which CLECs can reasonably deploy their own infrastructure. In other words, the CRTC considered it inappropriate to define essential facility as an infrastructure provided by the incumbent in order to avoid identifying facilities with availability of alternative provision as essential. Accordingly, the definition will make it possible for facility-based operators to complement their own infrastructure, instead of replacing it, with LLU. The CRTC specified central office codes, subscriber listings, and local loops in certain geographical bands as essential facilities. While the CRTC mandated in all geographical areas, it limited mandatory LLU in high-density areas (Bands A and B) to five years. The idea behind this policy was that the provision of LLU in high-density areas would run the risk of hampering facility-based competition during an extended period of time whereas LLU in low-density areas could promote infrastructure competition in the long run.

While full unbundling has been implemented, line sharing has not been legally mandated. The CLECs have voluntarily opened the above-voice bandwidth to sharing with wholesale DSL competitors. According to the regulator, there are currently 19 987 000 local loops in Canada, of which 802 000 loops were provided to CLECs. These figures indicate that 18% of competitor lines were accounted for by unbundled local loops.<sup>31</sup> A large part of these CLECs' lines are for business use.

With regard to the pricing issues, the CRTC adopted an "actual" incremental cost model, rather than a hypothetical TELRIC model, with a mark-up of 25% in order to cover shared and common costs. It considered that the prices based on actual cost would ensure that facility-based competition could not be hampered due to the availability of low cost for LLU. The CRTC claimed that the resulting tariff rate would not be very different from the one based on the LRIC method.

It has been suggested that LLU price in high-density areas formulated by the CRTC might prove to be uneconomical, which could spur the development of alternative technologies.<sup>32</sup> The CRTC also established a rule that the cost for LLU varies according to loop length and densities within each band. In Telecom Decision 2001-238-2 of August 2001, the CRTC set the LLU price as follows: average monthly rate is USD 15.16 (EUR 17.54) for type A loops and USD 13.14 for type B loops, and thus USD 14.15 for both loops.<sup>33</sup>

**Table 20. Monthly LLU rates for type A loops in Canada  
USD**

	<b>Band A</b>	<b>Band B</b>	<b>Band C</b>	<b>Band D</b>	<b>Band E</b>	<b>Band F</b>	<b>Band G</b>	<b>Average</b>
<b>BELL CANADA</b>	5.85	8.30	9.77	11.23	18.17	18.57	31.10	14.71
<b>ISLANDTEL</b>	N/A	8.38	8.38	N/A	19.43	20.49	N/A	14.17
<b>MTT</b>	7.39	N/A	9.68	N/A	17.28	16.34	N/A	12.67
<b>MTS</b>	3.91	8.80	11.35	15.99	28.75	N/A	28.86	16.28
<b>NBTEL</b>	N/A	8.10	9.51	N/A	16.22	10.64	N/A	11.12
<b>NEWTEL</b>	N/A	11.98	11.35	N/A	17.23	17.80	25.92	16.86
<b>TCI</b>	5.69	9.25	11.31	10.53	19.03	15.74	18.58	12.88
<b>TCBC</b>	5.49	11.52	13.59	11.77	32.39	25.17	33.54	19.07
<b>SASKTEL</b>	6.53	10.76	15.06	N/A	29.75	25.03	25.04	18.70
<b>Average</b>	5.81	9.64	11.11	12.38	22.03	18.72	27.17	<b>15.16</b>

Source: CRTC.

**Table 21. Monthly LLU rates for type B loops in Canada  
USD**

	<b>Band A</b>	<b>Band B</b>	<b>Band C</b>	<b>Band D</b>	<b>Band E</b>	<b>Band F</b>	<b>Band G</b>	<b>Average</b>
<b>BELL CANADA</b>	6.61	13.81	22.18	16.09	18.95	20.93	N/A	16.43
<b>ISLANDTEL</b>	N/A	8.38	8.38	N/A	19.43	20.49	N/A	14.17
<b>MTT</b>	7.39	N/A	9.68	N/A	17.28	16.34	N/A	12.67
<b>MTS</b>	3.91	10.74	N/A	N/A	N/A	N/A	N/A	7.32
<b>NBTEL</b>	N/A	8.10	N/A	N/A	N/A	N/A	N/A	8.10
<b>NEWTEL</b>	N/A	12.25	13.56	N/A	N/A	N/A	N/A	12.90
<b>TCI</b>	5.69	9.25	11.31	10.53	19.03	15.74	N/A	11.92
<b>TCBC</b>	5.49	12.22	13.59	11.77	32.39	25.17	33.54	19.17
<b>SASKTEL</b>	6.97	14.39	15.70	N/A	N/A	25.03	N/A	15.52
<b>Average</b>	6.01	11.14	13.49	12.80	21.42	20.62	33.54	<b>13.14</b>

Source: CRTC.

## Czech Republic

The Czech Telecommunications Act 2000 has no specific provision to mandate LLU. The government is currently planning to introduce LLU, and the Czech parliament approved an amendment to the telecommunications law to mandate LLU in June 2003.

## Denmark

LLU was mandated in July 1998. Danish telecommunications law stipulates that operators with significant market power must provide interconnection at all geographical positions where it is feasible to do so. By applying this provision to LLU, the incumbent TDC, former Tele Denmark, is required unbundling not only local loops but also all sub-elements such as sub-loops at all exchanges. Line sharing has been available since January 2001.

Denmark achieved relatively high performance in LLU. Since LLU implementation, several template agreements between TDC and new entrants had been published by January 2001, including those on copper pairs, line sharing, and collocation.<sup>34</sup> There were more than 38 000 unbundled lines providing ADSL at the end 2001. This figure corresponds to over a quarter of their DSL lines, whereas the percentage ranges between 4% to zero in most other EU countries.

With regard to collocation, physical and distant collocations, including co-mingling, are available. Virtual collocation is offered as an alternative to physical and remote collocation. If it is not possible to meet a new entrant's request for physical or remote collocation, free transmission will be offered to the new entrant from the interconnection point to the new entrant's premises.

LLU prices are set in negotiation between the incumbent and an organisation of competitors referring to the charge of telephone line rental. Monthly charges for full unbundling are EUR 8.28 and EUR 4.14 for line sharing, which are among the lowest rates in EU countries. They are also much more inexpensive in comparison with the monthly residential retail price of EUR 12.1.

## EC

In December 2000, the European Parliament and the Council adopted a regulation (2887/2000) on unbundled access to the local loop, which came into force in January 2001.

The objective of the EU Regulation on unbundled access to the local loop is to facilitate market entry and to develop competition in particular for high-speed internet access. Notified SMP (significant market power) operators must offer fully unbundled access when the entire line is rented to a new entrant, as well as shared access where the new entrant only rents the high frequency part suitable for high-speed internet. Notified operators must publish a reference unbundling offer (RUO) suited to market needs, which must therefore be sufficiently detailed to allow operators to choose only the network elements and facilities they require. Notified operators must meet reasonable requests for unbundling and apply transparent, fair and non-discriminatory conditions, meaning that they must provide other operators with facilities equivalent to those provided to themselves and their subsidiaries. The tariffs charged for unbundled access must be cost-oriented.

In its 7th Implementation Report published in November 2001 the Commission noted that progress in implementing the regulation was unsatisfactory. The Commission then took action against five member states where a RUO was unavailable for shared access. The situation was quickly remedied, and there is now a reference offer in all member states covering both full unbundling and shared access.

In March 2002, however, the Commission took action against four member states where the RUO was not sufficiently detailed, specifically insofar as there was no possibility to access the local sub-loop, the street cabinet near to a customer's premises necessary for the possible provision of VDSL or HDSL services. Again, action was taken in the member states to remedy this failing.

Nevertheless, progress in unbundling was still slow through 2002, and has clearly been affected by the downturn in the telecommunications market and the difficulty for operators in attaining capital financing for investment purposes. By October 2002, there were just over 1 million unbundled lines in the EU (out of a total of nearly 187 million subscriber lines), mostly fully unbundled lines (1 050 740) and a small number of shared access lines (27 700). Given that there were 600 000 unbundled lines in October 2001, the pace of unbundling is slowly picking up.<sup>35</sup>

## Finland

Finland has had competition in the local loop for a number of years. Because of this historical structure of the Finnish telecommunications market, *i.e.* a large number of local operators and several national operators for long-distance traffic, the LLU implementation process in Finland is different from other European countries. A principle regulatory decision from the regulatory authority in June 1997 as

well as the Telecommunications Act mandated LLU. Under this decision, the right to access the incumbents' local loops is granted to anybody, not limited to competitors.

Operators have negotiated and come to commercial agreements on the access to the local loops, and the content of the agreements has not been subject to an extensive review by the regulator. This caused a number of complaints from new entrants, especially about LLU pricing. In most cases, collocation is not in place but the access seekers usually deploy their own networks close to the local operators' premises, which enables unbundled access. Although LLU had been limited to full unbundling before, line sharing has been legally provided since January 2001. There is no specific regulation that requires incumbents to offer bitstream access, but there are about 2000 bitstream access lines in use as of November 2002.

As of the end of June 2001, more than 40 000 loops were fully unbundled and 2 500 were provided for line sharing, about 15 000 of which are used by alternative operators for ADSL services.

With regard to the price, it is based on current valuation assets and must be cost-oriented. Price for line sharing cannot normally be more than 50% of the price for full unbundling by law. Monthly charges for full unbundling are EUR 12 for PSTN/ISDN services and EUR 15 for broadband services, whereas line sharing charges are EUR 7.5 without splitter and EUR 11 with splitter. One-off connection fees are between EUR 100 and 320 in case of full unbundling and between EUR 30 and 250 in case of line sharing. Yet, these are subject to the commercial agreements and thus are likely to vary. By comparison, the monthly residential retail price for PSTN is EUR 12.

## France

The Posts and Telecommunications Code (decree) regarding access to the local loop was established in September 2000 and stated that LLU should be possible as of January 2001. The regulator, *Autorité de régulation des télécommunications* (ART) adopted the guidelines, which clarified cost-oriented pricing principles as well as the calculation method for LRIC. Although guidelines are not binding, they provide direction on ART's approach to the implementation of the decree.

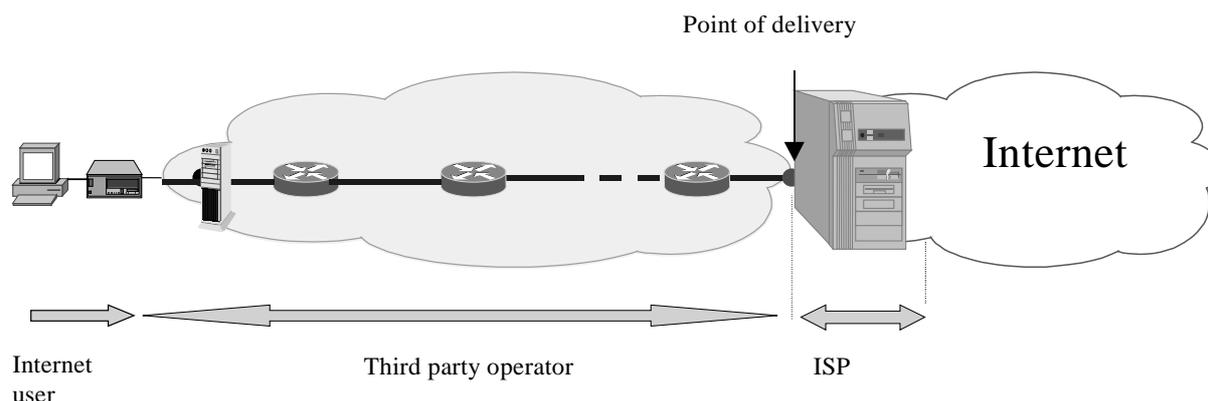
LLU allows third-party operators to obtain full control over subscriber lines. It is therefore one way to introduce ADSL for high-speed access over a conventional telephone network using existing infrastructure and providing full geographical coverage in France. It is for this reason that the French national regulatory authority requires the incumbent to provide a standard offer, thereby promoting competition between infrastructures to ensure permanent competition between service providers.

The decisions and opinions issued by the authority are aimed at achieving sustainable development through effective competition, which will thereby ensure lower prices, encourage innovation and diversify the supply base. By encouraging competition between operators, the ART allows competing access providers to develop their activities without necessarily having to rely upon a sole carrier and local loop operator. This approach encourages infrastructure-based competition which will provide a sustainable basis for competition between service providers.

Unbundling is one possible way to achieve this. Operators lease either the raw copper pair from France Télécom or bandwidth for the carriage of Internet traffic alone, without voice data, through shared access to the local loop. They install their own ADSL traffic routing equipment in France Télécom exchanges and ensure the collection and carriage of traffic up to the Internet service provider's point of presence. The operator therefore has full, end-to-end control over ADSL traffic. The role of France Télécom is limited solely to providing a leased access line. This solution allows competition in both the collection and carriage of data. Internet service providers can differentiate not only between tariffs and levels of service quality, but also between services (use of xDSL technologies other than ADSL such as

HDSL and VDSL). In view of the number of sites required to cover the whole of France (12 000 exchanges in all), unbundling will be introduced first in the most densely populated parts of the country (at least in the short term). In addition, the Authority also considers it necessary for traffic collection offers to be provided at intermediate levels within the France Télécom network. Specifications for these offers, known as "option 3" (bitstream access), are currently being drawn up.

The following diagram represents access to and collection of DSL traffic by a third party operator under local loop unbundling, known as 'option 1'



Wanadoo currently has almost 90% of the market for the supply of ADSL to the general public, while France Télécom has almost 100% of the market for collection of ADSL traffic. This is primarily due to the fact that, unlike Wanadoo and France Télécom, ISPs and competing operators find it hard to break into the ADSL market, and particularly the public consumer market, under economically viable conditions. In view of this, the ART introduced a number of robust measures in April 2002, the main one being full unbundling, to ensure effective competition in the ADSL market.

With regard to the decisions taken by the Authority which modify the standard offer, the following should be noted:

- The cost of full unbundling has fallen by almost 30%, and the cost of line sharing (high frequency portion of the loop) has more than halved and now includes a traffic filtering service (separation of telephone traffic from Internet traffic).
- In terms of operating conditions, the decision by the Authority is evidence that progress has been made with regard to not only collocation<sup>36</sup> costs for operators in France Télécom sites but also ordering and delivery procedures for unbundled loops.
- With regard to collocation, the decision obliges France Télécom to offer all operators, at sites where to date no firm order has been received from an operator for specifically designated collocation room, the option of installing equipment in existing France Télécom equipment rooms in which space is available.
- With regard to the ordering and delivery of unbundled loops, the decision sets out the conditions for application of the principle of non-discrimination between incumbent and third-party operators by making it mandatory for France Télécom, firstly, to determine and publish the average waiting times for processing orders, and secondly to refrain from charging operators for

certain expenses in situations which cannot be accurately forecast and controlled at this initial stage in the unbundling process.

All of these modifications, which France Télécom has included in its standard offer, are designed to lend genuine impetus to the unbundling process in a larger number of areas in the country and to pave the way to its extension to residential customers.

The terms and conditions applicable to collocation are as follows:

- Installation costs: EUR 4 000.
- Monthly rent excluding electricity: EUR 350.
- Accessible 24 hours a day, 7 days a week.

The ancillary initial costs of operators have been calculated on a monthly basis as follows:

- Between EUR 1.00 to EUR 1.50 a month per access line for transfer cables.
- EUR 2.25 a month per access line for filters.

The regulatory authority has thereby sharply reduced the deployment costs for alternative operators as part of a strategy towards lowering entry barriers to facilitate subsequent deployment, particularly in provincial towns. These costs now account for no more than a nominal share of the internal costs of operators, particularly in view of the current cost of around EUR 100 000 for a DSLAM. Furthermore, given the 400-800 customer capacity of a DSLAM, the monthly rental cost seems also reasonable compared with the price charged for the supply of services to residential (EUR 40 a month) or professional customers (from EUR 100 to EUR 400 a month).

LLU tariffs have been slashed and are now one of the lowest in Europe. This reduction was aimed at improvement in the economic balances of new entrants, particularly with regard to the residential market.

- Full access: EUR 10.50.
- Shared access: EUR 0.65, *i.e.* a 90% reduction in the rental price to which EUR 2.25 should be added for filter rental.

It is unclear whether these tariffs are sufficient to allow operators, given their current investment capacity, to launch a massive attack on the residential market. However, it would not seem feasible to set recurrent tariffs at a lower rate in view of the fact that use of the high frequency portion of the copper pair is practically free.

The regulator also started to take steps to ensure sufficiently guaranteed levels of service for the professional market. For example, a guaranteed reconnection time (GRT) will also be introduced 24 hours a day, seven days a week. The pricing structure and levels of the GRT are identical to those in France Télécom's professional offers. Moreover, the ART will publish performance indicators and monitor the operational processes relating to LLU ordering and delivery. The monitoring of these indicators may lead to the introduction of a service level contract by the end of 2002.

The problem lies in the current economic situation. It is not easy for operators to make the investments needed to develop their activities, which is harming public perceptions of unbundling.

Unbundling is making a slow start in a market in which only Colt has effectively commercialised lines, and even then exclusively to medium and large accounts. In addition, problems still remain with 25% of copper pair deliveries. With regard to the future, the regulatory authorities plans to introduce contracts for SLAs (service level agreements) by autumn 2002 which will be included in the standard offer.

## Germany

Germany was one of the earliest countries to take the initiative in LLU, through which it went from being one of Europe's more expensive telecommunications nations to one of the cheapest. LLU obligation was first legislated in its national telecommunications law in combination with network access ordinance (NZV) in 1996. By this step, the incumbent, Deutsche Telekom (DT), is obliged to offer unbundled access to all parts of its telecommunication networks including subscriber loops. The dispute based on this legislation was that DT wished to offer the unbundled local loops in combination with a multiplexing unit (V5-Multiplexer). The new entrants opposed this idea because it might limit their capabilities to design their offer as the V5-Multiplexer includes switching functionality which they did not demand from DT. After a number of processes, DT had to modify its offer and provide access for new entrants at the MDF in its premises as well as collocation to avoid abuse of its dominant position.

LLU was officially implemented when the telecommunications markets were opened to competition in January 1998. New entrants are permitted to lease subscriber lines from DT to provide voice and data services. In line with the EU regulations of December 2000, the German Federal Administrative Court also confirmed in April 2001 that the obligation for DT to LLU is lawful. In March 2001, the regulator RegTP's Ruling Chamber established conditions for line sharing. The ruling mandates DT to offer line sharing on a non-discriminatory basis, and commercial line sharing began in September 2001.

According to a report released by the regulator RegTP, approximately 623 624 loops had been ordered by the end of 2001, which represents about 1.57% of the total loops.<sup>37</sup> By the end of September 2002, approximately 855 000 loops had been unbundled.

DT is obliged to provide collocation space upon requests from new entrants. Physical collocation is preferred than remote collocation. Virtual collocation is required if physical collocation is not available. When the remote collocation is offered due to lack of space in exchange buildings, the costs tend to be lower. It should also be noted that DT prohibits two new entrants interconnecting their equipment located within its collocation space. By the end of 2001, more than 2 000 of DT's 7 900 MDFs had collocation facilities in place.<sup>38</sup> The new entrants pay for square meter steps for the collocation space they require. Prices of collocation space vary from town to town, and they are EUR 10 per square meter on average (between EUR 5 and up to EUR 41 per square meter space).

RegTP also ruled that DT must make access network products available for resale purposes. This rule mandated DT to submit an offer to the complainant within three months and subsequently for the two parties to come to an agreement by themselves as far as possible. The RegTP did not set any price about it in order to give the two parties maximum scope to reach a settlement.<sup>39</sup>

The price of LLU is set based on a forward-looking LRIC model that considers real interest rate and the depreciation period for the copper cable regardless of the geographical location. On this basis, the price set by DT is subject to *ex-ante* approval by the RegTP. DT often argues that the price should be higher than the monthly rental to the customer. After the long investigation by the regulator, the price for the twisted copper pair was first set in February 1999 as EUR 12.99 per month, which was higher than the monthly rental (EUR 11.49) of an analogue access line that DT charged its customers, but lower than the price for ISDN access lines.

Starting in April 2001, the price has been lowered by 5% to EUR 12.48, which is supposed to be applicable until the end of March 2003. This is almost close to the average of EU countries but is still about 9% more than the line rental charge which has to be paid to DT by the end users. The lowering of this cost was primarily derives from the development of the LRIC model and from the changed figures for some of the structural parameters.<sup>40</sup> The RegTP also set monthly price for line sharing as EUR 4.77 in March 2002. The one-off charges for LLU set in April 2002 are EUR 125.35 per new line with installation work and EUR 81.12 without installation work or EUR 91.65 per line transfer with installation work and EUR 70.56 without installation work.

## Greece

In May 2001 EETT (the National Regulatory Authority for the Telecommunications and Postal Services sectors) approved the Reference Unbundling Offer (RUO) for full unbundled access to the incumbent's (OTE) local loop. The EETT resorted to a public consultation on a number of issues pertinent to shared access to the local loop, prior to approving OTE's Reference Unbundling Offer. In December 2001 the EETT approved the RUO of OTE for shared access to its local loop.

In December 2001 EETT approved the RUO of OTE for shared access to its local loop. The EETT had some official contacts with interested parties and OTE for the implementation of LLU and the existing problems in this implementation. It appears that there are obstacles to the proper provision to interested beneficiaries of unbundled local loops by OTE. Therefore, EETT called OTE to a hearing in August 2002. The case is still pending.

Actually, OTE has signed two contracts for LLU services with two new entrants. An additional two new entrants have signed memoranda of understanding with OTE. Currently, OTE does not offer either retail or wholesale (bitstream) ADSL services. There is no legal obstacle for OTE to offer it to the interested companies.

With regard to collocation, a variety of options are available including physical, remote and virtual collocation. The price for collocation space differs according to the areas. The following chart shows the prices.

**Table 22. Monthly charges for collocation space in Greece**

	EUR	USD
<b>Area A</b>	70.43	60.86
<b>Area B</b>	58.69	50.72
<b>Area C</b>	45.19	39.05
<b>Area D</b>	31.69	27.38
<b>Area E</b>	16.14	13.95

Source: EETT.

With regard to LLU prices, the one-off connection fee is EUR 123.38 for an unbundled line and EUR 141.89 for line sharing. Monthly charges are EUR 11.48 for full unbundling and EUR 6.89 for line sharing, whereas the monthly retail price is EUR 8.22.

## Hungary

Hungary has become the first country in the Central European region to carry out LLU, which was legislated in the new Communications Act in December 2001 when the incumbent Matav's monopoly expired. However, LLU has not been implemented and none of the local loops have been ordered for LLU.

Once implemented, Matav will be the first operator to provide LLU in Hungary, with small regional local telecommunications operators not required to provide access until Hungary's European Union accession. However, the Hungarian regulator, the HIF, has rejected Matav's first offer, submitted in October 2001, detailing how it plans to provide access to the local loops because it failed to comply with some EU regulations, which could lead to disputes with competitors when contracts come to be signed. The HIF also said that Matav failed to provide data required by law, making it impossible to verify prices.

While no collocation spaces have so far been provided, local loops must be unbundled within 10 days from drawing up the contract. If there is no subscriber belonging to the same sorter, the deadline will become 60 days. If construction work is also needed, the 60-day deadline counts from the day when construction license enters into force. The monthly rate for full unbundling is EUR 13.2 and for line sharing is EUR 12.96, whereas bitstream access is not quoted in the reference offer. In comparison, monthly residential retail price is EUR 9.77, which is cheaper than LLU prices and can be a source of price squeeze.

## Iceland

Although the government has not implemented the EC unbundling regulation, the incumbent Iceland Telecom has published a standard offer for LLU, which came into force in October 2001. This offer includes a price list as well as rules on the rental of unbundled loops. The following table shows the monthly rental rate for full unbundling and line sharing. One-off connection fee is EUR 39.36 for first full unbundling, and EUR 27.22 for any additional line to the same customer.

**Table 23. Monthly rental access rates in Iceland**

	Rate (EUR)
Full unbundling (up to 64 Kbps)	10.09
Full unbundling (up to 2 Mbps)	13.43
Full unbundling (up to 8 Mbps)	16.23
Line sharing (up to 2 Mbps)	3.33
Line sharing (up to 8 Mbps)	6.14

Source: Squire Sanders.

## Ireland

In March 1999, the Office of the Director of Telecommunications Regulations (ODTR) launched a consultation with regard to LLU, and the result has been issued as a report in April 2000. In this report, LLU has been regarded as an important local access mechanism based on the belief that the development of competition is best served by ensuring that all feasible means of enhancing competition in local access should be developed. On the basis of this report, the ODTR published notices and decisions on LLU in December 2000 and the initial reference offer was published by the incumbent Eircom in January 2001. Full unbundling and line sharing were included in the reference offer. Bitstream access was supposed to have been made available by April 2001, but it was delayed. Bitstream retail service was launched in May 2002. In April 2002, the wholesale bitstream offer by eircom was approved by the ODTR.

With regard to the price, the ODTR initially considered that historical cost accounting approach would be suitable, but it is currently taking into consideration LRIC model. The ODTR set charges in its decision in April 2001, but these were modified for the period of April 2002 to March 2003 in April 2002. Monthly charges for full unbundling are EUR 16.81 and EUR 9.00 for line sharing whereas one-off costs

per line is EUR 121.52 in case of full LLU and EUR 123.41 in case of line sharing. The monthly retail price is EUR 13.87.

**Table 24. LLU price listing in Ireland (EUR)**

	Full unbundling	Line sharing
Line rental	16.81	9.00
Connection order with successful completion	121.52	123.41
Connection order failing validation	17.38	17.60
Disconnection charge	49.58	75.00
Line testing	49.18	18.09
Fault clearance	117.31	117.31

Source: ODTR.

## Italy

The history of LLU in Italy dates back to an obligation to unbundle as set forth in the Italian Ministerial Decree on interconnection since April 1998. The government, in line with market players, made an intensive discussion to implement LLU, and finally LLU was first introduced in January 2001. In May 2001, the first reference offer was presented by the incumbent Telecom Italia (TI). With 35 companies registering their interest to offer local services in Italy, telecom operators have been providing the related services available to the public. The regulator Network and Infrastructure Committee (AGCOM), drew up a list of the first 500 places to launch the commercial phase of the service, starting with main cities like Milan, Rome and Turin. The service is being extended to other locations gradually until it covers the entire nation. Following the July decision of the AGCOM that introduced a number of amendments to the TI's reference offer, TI published a new reference offer in September 2001. While line sharing was not part of the offer, the regulator Network and Infrastructure Committee (AGCOM) adopted a decision in November 2001 mandating TI to include line sharing and sub-loop unbundling into the offer.

With regard to collocation, physical (caged), remote, and virtual collocations are available, although physical collocation is the preferred option. The provision of LLU can be rejected by TI where neither physical nor virtual collocation can be offered unless new entrants have a site adjacent to TI's remote site. As of August 2001, 150 sites have reportedly been made available by TI to competitors.<sup>41</sup>

With regard to the price, monthly charges for full unbundling are EUR 10.79 for PSTN and ISDN services and EUR 12.60 for ADSL services, whereas the monthly residential retail price is EUR 13.63 (including VAT). The one-off connection fee is EUR 81.86 for an active pair and EUR 97.66 for a non-active pair.

**Table 25. LLU prices in Italy, 2002**

	Price (EUR)
Monthly rate for full unbundling for ISDN and PSTN	10.79
Monthly rate for full unbundling for ADSL	12.60
One-off cost for ISDN, PSTN, ADSL (active pair)	81.86
One-off cost for ISDN, PSTN, ADSL (inactive pair)	97.66

Source: AGCOM.

## Japan

LLU was first legislated by the amendments to the Telecommunications Business Law in June 1997. The regulator required incumbent NTT East and West to enable trial MDF-interconnection (LLU) with line sharing and full unbundling in August 1998. As a consequence, new entrants started to provide DSL services in December 1999. Unbundling rules for subscriber lines were established following amendments to the ministerial ordinance in September 2000. While full unbundling, line sharing and sub-loop unbundling are currently available, bitstream access has not been implemented. The regulator required incumbent NTT East and West to implement LLU of optical fibres, and then, unbundle FTTH (Fibre To The Home) services in December 2000. Unbundling rules for optical fibre were established following the amendments of ministerial ordinance in April 2001.

The Japanese regulator obliges co-mingling collocation for buildings of NTT East and West. As LLU was implemented in September 2000, additional rules were established as below, following the amendments to ministerial ordinances.

1. Information disclosure on available spaces for collocation, MDF, power receiving/generating equipment.
2. Procedure of demand for survey and its response.
3. Procedure of competitors' own work for installation and maintenance.
4. Procedure of competitors' entry to installation site of equipment.
5. Procedure of competitors' attendance at communications buildings.
6. Standard period from application to its response (one month<sup>42</sup>) and standard period to start work for installation (one month<sup>43</sup>).
7. Charges for collocation spaces, etc.

Spaces for collocation have been allocated on a "first come, first served" basis. Yet in order to allocate scarce collocation spaces more efficiently, a rule was introduced setting the maximum available capacity to competitors when the carriers meet efficiency conditions for use of space in May 2002. Moreover, equality among NTT East and West and competitors is secured in case of installing equipment such as DSLAM.

The ratio of unbundled local loops (4 183 886) relative to the total number of local loops (50 738 000) is 8.25%, high relative to most OECD countries.

The incumbents, NTT East and West, provide line sharing to competitors at the low charge amounting to USD 1.40 (JPY 168), and full unbundling at USD 15.27 (JPY 1 829). The optical subscriber line charge is USD 43.52 (JPY 5 213) (monthly amount per line), and optical intra-office transmission line charge is USD 0.03 (JPY 3.972) (monthly amount, per meter, per line). Collocation is provided at relatively low charges compared to other OECD countries at USD 26.28 (JPY 3 148) (monthly amount, national average, per 1 m<sup>2</sup>) as of the end of FY2001.

**Table 26. Access charge for LLU in Japan**

	Full unbundling	Line sharing	Dark fiber	
			Optical subscriber line charge	Optical intra-office
FY2001	17.22	1.56	-	-
FY2002	16.14	1.44	43.56 (1)	0.03 (2)
FY2003	15.27	1.40	43.52 (1)	0.03 (2)

(1) Monthly amount, per line. (2) Monthly amount, per meter, per line. USD 1=JPY 119.775.  
Source: MPHPT.

**Table 27. Cost for collocation space in Japan (USD)**

	Monthly charge (1)
End of FY2000	26.35
End of FY2001	26.28
End of FY2002	NTT East Area 27.19
	NTT West Area 22.18

(1) National average, per 1square meter, USD 1=JPY 1 119.775  
Source: MPHPT.

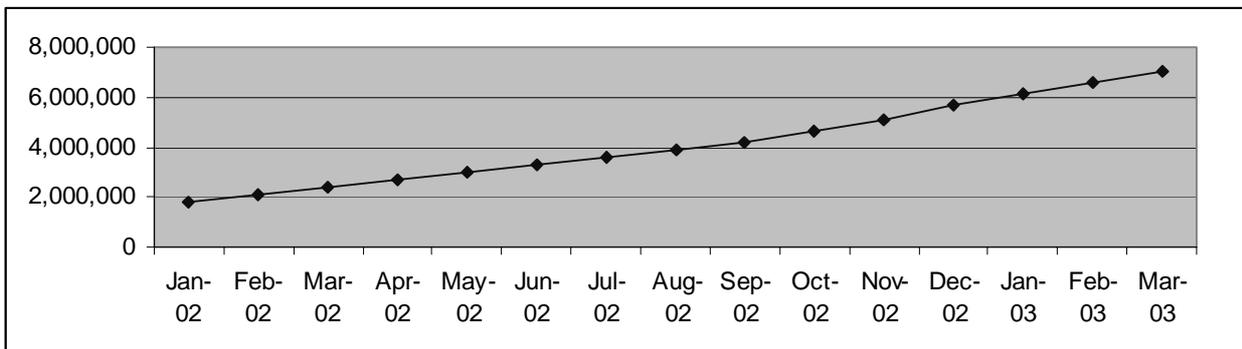
**Table 28. Total number and share of subscribers of DSL services in Japan**

	Total subscribers	NTT East and West		Competitors	
		Subscribers	Share	Subscribers	Share
End of FY2000	70 655	23 699	33.5%	46 956	66.5%
End of FY2001	2 378 795	967 669	40.7%	1 411 126	59.3%
End of February 2003	6 589 867	2 405 981	36.5%	4 183 886	63.5%

Source: MPHPT.

Price competition among carriers has resulted in the world's lowest price level for DSL services ranging from USD 17 (JPY 2 000) to USD 25 (JPY 3 000). This has resulted in the total number of users of DSL services increasing about 34 times from approximately 70 000 at the end of FY 2000 to approximately 2 380 000 at the end of FY 2001 and had increased near to 6 600 000 by the end of February 2003. The share of subscribers for DSL services is less than 40% for the incumbents NTT East and West and competing carriers have more than 60% of the total. FTTH service is also provided at relatively low prices from around USD 25 (JPY 3 000) to around USD 58 (JPY 7 000). The total number of users of FTTH service increased from about 3 400 at the end of September 2001 to 263 144 by the end of February 2003.

**Figure 4. Transition of subscribers of DSL services in Japan**



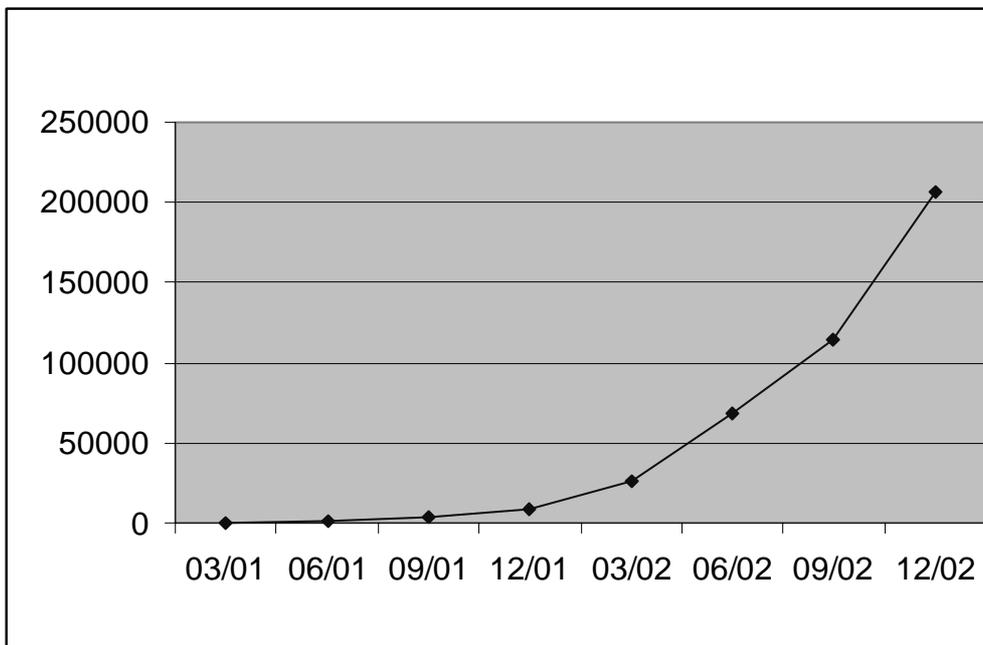
Source: MPHPT.

**Table 29. Transition of subscribers of FTTH services in Japan**

Subscribers	
End of September 2001	about 3 400
End of February 2003	263 144

Source: MPHPT.

**Figure 5. Transition of subscribers of FTTH services in Japan**



Source: MPHPT.

## Korea

Despite its high performance in broadband services, Korea is one of the late starters in LLU. The Ministry of Information and Communication (MIC) amended the Telecommunication Basic Act so as to secure the legal ground for LLU in January 2001. Through the establishment of a special task force on LLU to study foreign cases and hold public hearings, the MIC prepared detailed measures to mandate LLU in November 2001. In April 2002, the MIC issued a public notification (decree) of LLU requirements, standards and full implementation, which led to the opening and sharing of KT's copper line network and the broadband network of the ISPs.

Based on the LRIC method, the monthly flat fee for sharing the loop was calculated at KRW 12 200 (USD 9.52) per subscriber line and a 5-25% discount rate was applied depending on the payment ability of the user company. In 2002, the fee was set at KRW 9 200 (USD 7.18) with a 25% discount rate applied, and with the introduction of number portability, the discount rate will be discontinued. Separate charges for the provision of the facility are KRW 6 100 (USD 4.76) as a monthly fee, is 50% of the monthly flat fee for the full package provision.

## Luxembourg

LLU was introduced in December 2000. The first reference offer was published at the end of April 2001 for full unbundling by the incumbent *Enterprise des Postes et Télécommunications* (EPT), which received approval from the regulator, the Luxembourg Institute of Regulation. The reference offer for line sharing was published in October 2001. In the same month, Cegcom signed a contract with EPT for LLU. This offer opened a variety of collocation possibilities, including physical, remote and virtual options.

Monthly charges for full unbundling are EUR 13.26 for PSTN and EUR 15.79 for broadband, whereas the monthly retail price is EUR 11.9. The one-off connection charge for full unbundling is EUR 91.13 for active loops and EUR 135.03 for non-active loops.

## Mexico

In 1999, the basis for local service provision was established but competition was stalled due to ineffective interconnection rules and the lack of regulatory power to curb the incumbent's monopoly position. In this context, LLU terms have been considered but not yet implemented. Currently, discussions are under way among industry participants to introduce line sharing for the supply of xDSL services.

## Netherlands

In March 1999, the Commission of the Independent Post and Telecommunications Authority (OPTA) issued its "Guidelines on Access to the Unbundled Local Loop", which enabled new entrants to gain access to the incumbent KPN network at the level of the MDF. Fully unbundled access first became available in June 2000. However, OPTA was not empowered to require a reference unbundling offer (RUO) before the implementation of the EC unbundling regulation.

KPN have had the obligation to offer LLU (being a form of special access) on every reasonable request and in a non-discriminatory manner. The obligation to publish a RUO came with the EC unbundling regulation. OPTA ruled on the regulation in June 2001.

OPTA published collocation guidelines at the end of 2000. It also ruled on the collocation prices ensuring that KPN must provide evidence of the cost of collocation elements. Although virtual collocation is not available, both physical and remote collocations have been introduced.

There was no decision on price at first. In due course, guidelines on how the charges should be calculated were established, in which OPTA decided on a five-year plan to give directions regarding the basis for calculation, *e.g.* interest rates. In this context, the OPTA decided that the charge of 1999 was to be calculated on the basis of historical costs with creation of cost allocation system (EDC model, retail minus of a sliding scale of pricing over five years) by KPN. While this model was originally developed for interconnection, the OPTA decided to adhere to the cost allocation methodology for LLU as incorporated in the EDC model. It considered that the charges paid by competitors for LLU should be the same as the charges that KPN pays for the use of that part of local connection from end users.<sup>44</sup>

In October 1999, a provisional decision on LLU price was taken at EUR 10.19 per month with an increase over the next five years. Currently, the monthly charge is EUR 13.50 for full unbundling and EUR 5.60 for line sharing (excluding a surcharge of EUR 4.54, which has not been authorised by the OPTA), whereas monthly retail prices are EUR 15.5. One-off connection costs are EUR 79.01 for full unbundling and EUR 89.19 for line sharing. These prices could be commercially negotiated after five years, provided that the market is competitive enough for the OPTA to step back. For the moment, this situation is not likely according to OPTA.

## **New Zealand**

The government has included a requirement in the Telecommunications Act 2001 that the regulator (the Commerce Commission) must report to the government by December 2003 on whether the following services should be designated (*i.e.* regulated).<sup>45</sup>

- Access to the unbundled elements of Telecom's local loop network.
- Access to the unbundled elements of, and interconnection with, Telecom's fixed public data network.

## **Norway**

The Ministry of Transport and Communications concluded in a 1999 white paper that LLU was not essential in the short term because of possibilities of further development of existing and alternative infrastructure. LLU began in a movement toward a proposed merger of the incumbent, Telenor, with Telia of Sweden. In reviewing the merger proposal, the EC imposed a requirement to provide LLU in Norway and Sweden in 1999. Although the merger did not go through, Telenor decided to offer LLU from April 2000 irrespective of the absence of government regulations. The regulator NPTA is currently reviewing Telenor's reference offer for LLU.

With regard to prices, the regulator NPTA is not empowered to approve the charges proposed by Telenor, but is looking into whether they are cost-oriented. Prices differ according to the product variants, and, for example, the monthly rental fee for full unbundling for PSTN services is EUR 12.49. The monthly rental charge for line sharing to provide ADSL services is EUR 15.61. The one-off connection fee for full unbundling for PSTN services is EUR 151.13. The collocation space rental charges are set by the incumbent on a case-by-case basis, which are different from location to location.

## **Poland**

The telecommunications law did not directly stipulate LLU because the government viewed collocation provisions as providing LLU. However, LLU is to be introduced in the Telecommunications Law (Act of 21 July 2000) by amendments which will enter into force from October 2003. The provision of LLU should be supported by an ordinance from the Minister of Infrastructure on details providing this service, which will be issued during 2003.

## **Portugal**

LLU was mandated by the resolution of the regulator ANACOM in December 2000. Following a public consultation on competition in local access, launched in July 2000, in November 2000 ANACOM published a deliberation on LLU, which defined the following objectives: *i*) the notified operator should present a draft reference offer by November 2000, which should encompass, at least, the elements determined by ANACOM that generally reflect the annex to the LLU regulation; and *ii*) efforts should be made to begin offering LLU from December 2000. The first reference offer was published in March 2001. After several ameliorations, a revised RUO was published in October 2002. Bitstream access is not a part of the reference offer. Nevertheless, a service exclusively aimed at the “Telecommunications Operators and Service Providers” market segment (wholesale offer), is made available through PT ADSL network service. As of the third quarter of 2001, there were 20 unbundled lines.

Collocation was limited to a specially prepared operator’s room. However, ANACOM issued a recommendation, approved by the Deliberation of June 2001, considering that depending on the evolution of the supply conditions, and especially on the interest shown by the market, the Reference Unbundling Offer should develop in order to contemplate virtual collocation offer, when feasible, in line with that laid down in the Regulation (CE). It would be the case, for example, if in certain infrastructure there were a lack of suitable conditions for the offer of physical or remote collocation. With regard to co-mingling, ANACOM issued a draft decision in September 2002, in which it stated that PT Comunicacoes should make co-mingling available whenever the market showed interest. According to ANACOM’s Deliberation of March 2002, in accordance with the determination of November 2001, PT Comunicacoes should alter the RUO, explicitly including the definition of procedures and terms for the access to the totality of the MDFs to its network, including the ones regarding the exchange remote units. ANACOM also determined through its decision of November 2002 that the minimum space offered by the incumbent would be 2 m<sup>2</sup> for collocation.

Monthly charges for full unbundling is EUR 11.96 for providing narrowband services and EUR 13.78 for providing broadband services, whereas the monthly retail prices is EUR 11.76. The monthly prices for line sharing are EUR 7.82 for PSTN and EUR 7.92 for ISDN. One-off connection fees are EUR 82.80 in case of full unbundling, EUR 149.80 in case of line sharing for PSTN use and EUR 173.75 in case of line sharing for ISDN use.

## **Slovak Republic**

The government is currently considering LLU. The detailed time schedule has not been set yet.

## **Spain**

Previously, only bitstream access had been available in relation to promoting local competition. However, since LLU was legislated and mandated by royal decree in December 2000, LLU has

theoretically been made available at all MDFs. The incumbent, Telefonica de Espana (TESAU), published its reference offer in the same month and it was modified in January 2001 following the order from the Secretary of State for Telecommunications and the Information Society. In an effort to make its local services fully accessible to competition, the incumbent Telefonica has opened 81 of its exchanges, which will give access to 1.5 million users. With regard to collocation, caged and distant collocation was initially available. Since June 2001, however, TESAU has also been required to provide cageless collocation with an established *ex-ante* pricing. Virtual collocation is made available on commercial terms with a special agreement.

The prices for LLU have been set by the *Commission del Mercado de las Telecomunicaciones* (CMT). As of May 2002, monthly charges for full unbundling were EUR 12.62, and EUR 3.49-4.77 for line sharing, whereas the monthly retail price is EUR 11.68. The one-off connection fee is EUR 20.00 for both full unbundling and line sharing.

## **Sweden**

LLU was implemented in 1998 ahead of EU regulations. The incumbent, Telia, has offered LLU and collocation since March 2000. Line sharing and bitstream access have become available since March 2001. Sub-loop unbundling has become a part of the offer by Telia since November 2001. There are 2282 unbundled loops (2 023 fully unbundled and 259 shared access) among approximately 7 million local loops.

With regard to collocation, both physical and remote collocations are parts of the offer. The incumbent is supposed to respond to requests from competitors within 15 working days and provide collocation spaces within nine weeks. According to the incumbent, there are 123 sites that were collocated as of October 2001.

With regard to the price, monthly charges for full unbundling are EUR 11.6, and EUR 5.5 for line sharing. While these prices have not been approved by the regulator, they are one of the lowest rates in EU countries.

## **Switzerland**

Switzerland has not introduced LLU. Even though the Swiss Telecommunications Act does not cover LLU specifically, some competitive operators interpreted some of the rules in a manner that every form of competition in the local loop should be promoted and that LLU is a part of this form of competition. This idea was in turn opposed by the incumbent, Swisscom, and thus the regulatory authority initiated a consultation to get a view of the telecommunications industry on LLU. In a precedent-setting decision, the regulator, the Commission of the Communication (ComCom), stated that it would not demand that Swisscom unbundle loops after the federal court decided that the legal basis to impose unbundling of the local loop was not sufficient. Swisscom welcomed this decision and argued that it did not have a monopoly in the local loop because of cable television and other technologies.

However, the government indicated in April 2002 that it would seek to introduce LLU by revising the decree concerning telecommunication services or if necessary the telecommunications law. In July 2002, the Federal Council decided to open a public consultation procedure for revision of the telecommunications law to introduce LLU. In February 2003, the Federal Council decided to introduce LLU as rapidly as possible at the decree level. It will introduce LLU obligations within the framework of the current revision of the Telecommunications Law.

## Turkey

There are no legal provisions mandating LLU in the present monopoly structure. However, the regulator, the Telecommunications Authority, plans to introduce regulations on LLU in line with the EU regime in the new licensing regulation.

## United Kingdom

The UK is the earliest starter of telecommunication market liberalisation in the European countries, which commenced in 1984. Since then, licensing to competitors was thought to be the primary way of local network competition and thus the idea of LLU was rejected before. The regulator, Oftel, previously concluded that direct connection to the incumbent BT access network (LLU) would adversely affect the development of competition and would not be in the interests of the UK consumer. However, with the rise of LLU discussion in the European Union, the UK has changed the policy over time and tried to promote LLU in an extensive manner.

In November 1999, Oftel issued a statement that required incumbent British Telecom (BT) to make its local loop available to other operators. This requirement would be through a licence condition to the BT. The statement also clarified that LLU should be available at cost-based prices, on the basis of LRIC plus a mark-up to cover common costs, which Oftel would determine. In December 2000, OFTEL mandated line sharing and set wholesale prices for LLU. Bitstream access is available via xDSL wholesale services for resale. Oftel's basic strategy is "to strike the right balance between too little and too much regulation, ensuring that consumer needs for services are met in the short term whilst delivering a framework that is conducive to the development of competition at all levels of the broadband supply chain."<sup>46</sup>

In April 2000, a new condition was inserted into BT's licence that set out the collocation products BT must offer. In August 2000, Oftel brought into force the licence condition that requires BT to provide collocation facilities to other operators. At the same time, this condition also clarified what kind of elements BT is required to provide for the implementation of LLU as follows:

- Local loop.
- Such internal tie circuits<sup>47</sup> as may be reasonably necessary for the operator to use the local loop.
- Such ancillary services as may be reasonably necessary for the operator to use the local loop or internal tie circuit.

New entrants must first enter into a contract with BT before they order collocation facilities under the conditions set by the BT. In addition, BT requires new entrants to carry out a site survey for each BT facility where they wish to locate the equipment. These conditions ensure that only those who are genuinely interested in offering services are given information about BT's local exchanges. While the numbers of unbundled local loops (about 1600 among 29 000 000 total loops as of November 2002) only really started increasing from March 2002, this looks set to continue as co-mingling facilities are delivered and further requests for collocation and loops are made.

The total number of remote collocation sites handed over to new entrants is 53, with five more in build as of November 2002. The total number of physical collocation (caged collocation) sites is 91, with a further 21 in development. In June 2001, OFTEL published a draft direction to mandate BT to offer cageless collocation (co-mingling). This draft is unsatisfactory for new entrants because it allows BT to refuse a request for co-mingling if there are objective criteria on the grounds of technical feasibility or the

need to maintain network security. Oftel subsequently issued a Final Direction on co-mingling in October 2001. The operators have been discussing among themselves and with BT the details of what equipment racks should be provided and prices were published for these in July 2002. BT has received orders for co-mingling and is currently carrying out build work to meet these requirements. Any refusal of a co-mingling request by BT will be looked at by Oftel to ensure that it is reasonable and that alternative equipment sites are not available elsewhere in the exchange. As of July 2002, no refusal has been seen. Co-mingling is currently well under way, with 144 contract offers made by BT to new entrants, 56 build requests and seven facilities now completed.

The price for collocation space is set by BT on the basis of the market rate for the location of the exchange, the area occupied by the operator, the equipment to be installed in the room and so forth. Some prices for co-mingling have been investigated and prices, as a result, dropped. Other elements are still under investigation by Oftel.

**Table 30. Principal prices for collocation in the UK**

	EUR
Physical collocation / Initial survey	343.16
Physical collocation / Full survey	8693.41
Physical collocation/ Full survey for Co-mingling	4650
Remote collocation / Initial survey	1468.08
Physical collocation / Order rejection	725

Source: Squire Sanders.

With regard to the LLU price, Oftel set the following basic principles<sup>48</sup>:

- The price of the loop will be cost-oriented and set on the basis of reasonably and necessarily incurred long-run incremental cost (LRIC).
- Charges for other necessary inputs such as tie cables should also be on the basis of reasonably and necessarily incurred long-run incremental cost (LRIC).
- BT should be able to recover the costs incurred in setting up order handling processes, as well as the costs incurred as a result of dealing with operators and maintaining the service.
- The starting charge will be geographically averaged, but BT may request geographically de-averaged prices, if this can be shown to be justified by differences in the underlying costs.

In February 2002, Oftel decided rental and connection charges for local loops as follows.

**Table 31. Rental and connection charges for full unbundling (GBP)**

Type of connection	Annual rental	Connection charge	Disconnection charge
Line transfer	122	88	29
Spare pair	122	265	10
New line (minor network intervention)	122	409	10
New line (major network intervention)	122	583	10
New line (small network build for 50 man hours)	122	1 948	10

Source: OFTEL<sup>49</sup>.

**Table 32. Rental and connection charges for line sharing (GBP)**

Annual rental charge	53
Connection charge per loop	117
Disconnection charge per loop	36
Right when tested (RWT) charge	29
Conversion charge per loop	0

Source: OFTEL<sup>50</sup>.

## United States

The United States has the longest history regarding LLU. However, the development process of LLU is fairly different from that of European countries because of the structure of telecommunications market. The Telecommunications Act of 1996 requires certain incumbent local carriers to provide network elements on an unbundled basis. The Act provided CLECs with freedom of choice between establishing their own infrastructure, supplying services via unbundled network elements, or reselling the incumbent's services. The FCC is charged with determining the list of required elements, applying criteria set forth in the Act. As described below, this list has included both local copper and associated facilities. In February 2003, the FCC concluded a triennial review of its unbundling policies. The Act also addresses unbundling in the context of the Regional Bell Operating Companies (RBOCs) entry into long distance service. The RBOCs, who had previously been prohibited from entering the long distance market, may do so provided that the FCC finds that they have opened their local markets to competition and continue to do so. To demonstrate that the market has been opened, the RBOCs must meet a checklist of 14 points: this list includes the provision of unbundled elements.

The Act treated the local loops as bottleneck facilities controlled by the incumbent, and is structured to introduce competition in this bottleneck while preserving effective competition in the long distance market. While some criticise US unbundling policy as imposing overly stringent obligations on incumbents and as delaying competitive benefits to consumers, it is true that this "incentive-based approach" taken by the US has greatly increased local competition.

With regard to the specific network elements to be unbundled, the US has accumulated extensive discussion in accordance with the intent of the Telecommunications Act. Indeed, the FCC clarified which elements are to be offered on an unbundled basis in its several orders. Having defined the loop as a transmission facility between the distribution frame in an incumbent's office and the demarcation point at the customer premises, the FCC in February 2003 decided that incumbents must provide unbundled access to the following seven elements:

- Loops. Incumbent LECs must provide unbundled access to mass market copper loops and copper subloops. Incumbent LECs may not retire any copper loops or subloops without first receiving approval from the relevant state commission. With respect to enterprise market loops, there are no unbundling requirements for optical carrier level transport circuits; dark fibre, DS3 and DS1 capacity transport are to be unbundled subject to state review. Also, there is no unbundling requirement for new build/greenfield fibre-to-the-home loops or hybrid loops.
- Sub-loops. Incumbent LECs must offer unbundled access to subloops necessary for access to wiring at or near a multiunit customer premises, including the inside wire sub-loop, regardless of the capacity level or type of loop the requesting carrier will provision to its customer.
- Network interface services.

- Local circuit switching. For mass market customers, the FCC set out specific criteria that states shall apply to determine, on a granular basis, whether economic and operational impairment exists in a particular market for switching. State Commissions must complete such proceedings within nine months. Upon a state finding of no impairment, the FCC sets forth a three-year period for carriers to transition off of unbundled switching. For business customers served by high-capacity loops such as DS-1, switching will no longer be unbundled based on a presumptive finding of no impairment. Under this framework, states will have 90 days to rebut the national finding.
- Dedicated and shared transport, defined as only those transmission facilities connecting incumbent LEC switches or wire centres.
- Signalling and call-related databases. Incumbent LEC's are only required to offer unbundled access to their signalling network when a carrier is purchasing unbundled switching.
- Operations support systems. Incumbent LEC's must offer unbundled access to their operations support systems for qualifying services

In February 2003, the FCC concluded that the high-frequency portion of the loop (HFPL) is not an unbundled network element. The FCC found that access to the entire stand-alone copper loop is sufficient to allow companies to provide broadband service. During the following three-year period, competitive LECs must transfer their existing customer base served via the HFPL to new arrangements. New customers may be acquired only during the first year of this transition. In addition, during each year of the transition, the price for the high-frequency portion of the loop will increase incrementally towards the cost of a loop in the relevant market. These rules reverse the FCC's earlier December 1999 decision that obliged incumbents to provide line sharing even where they are not providing the voice service.<sup>51</sup>

ILECs must offer unbundled access to portions of the loop at any accessible point, such as the network interface device, the minimum point of entry to the customer premises, and the feeder distribution interface. If parties are unable to reach an agreement about the technical feasibility of sub-loop unbundling at a specific point, ILECs will have the burden to demonstrate the lack of feasibility.<sup>52</sup>

As a result of local market competition, CLECs had about 19.7 million (or 10.2% of all) switched access lines in service at the end of December 2001. Out of incumbent local exchange carriers' 173 000 000 end-user lines, 9 461 000 or 5.5% of these lines are unbundled as of December 2001.

Meanwhile, collocation has basically been regulated in a manner to give CLECs more flexibility than in European countries. The rules on collocation have undergone substantial revision since the introduction of LLU. The FCC makes it clear that CLECs are allowed to collocate any kind of equipment that serves the purpose of non-discriminatory interconnection or non-discriminatory access to unbundled elements. This policy allows CLECs to collocate switching equipment that had previously been a matter of dispute. The FCC also required ILECs to provide cross-connects between the equipment of two CLECs collocated in ILECs' premises. The types of collocation have also been extended, requiring ILECs to enable both caged and cageless collocation for CLECs. In case of the space deficiency, ILECs are required to permit collocation in adjacent facilities. If the CLEC is denied access and disputes the reasoning, the state commissions will have to decide the issue.

The 1996 Act required the prices for unbundled elements to be cost oriented and non-discriminatory. In line with this, the FCC concluded that the relevant cost standard is total elements long-run incremental costs (TELRIC), a form of forward-looking, long-run average incremental cost. In its decisions, the FCC noted that TELRIC should include a reasonable allocation of common costs and a reasonable return on capital. The FCC further noted that, in calculating depreciation expense, regulators should attempt to estimate economic depreciation. By insisting on this cost-oriented principle, the FCC rejects opportunity

cost concept while noting that it would discourage competition and would provide no mechanism for forcing retail prices to their competitive level. While the applicability of TELRIC was contested in US courts in May 2002, the US Supreme Court upheld the FCC's authority to choose TELRIC as a cost standard.

In February 2003, the FCC clarified its TELRIC rules. First, the FCC clarified that the risk-adjusted cost of capital used in calculating UNE prices should reflect the risks associated with a competitive market. The FCC also reiterated its earlier finding from the *Local Competition Order* that the cost of capital may be different for different UNEs. Second, the FCC declined to mandate the use of any particular set of asset lives for depreciation, but clarified that the use of an accelerated depreciation mechanism may present a more accurate method of calculating economic depreciation.

In the face of these basic requirements for LLU set by the FCC, the state-level public utility commissions are responsible for overseeing its detailed implementation. Therefore, state public utility commissions will have ultimate authority to determine pricing issues, *i.e.*, how much CLECs will have to compensate ILECs for sharing local loops located within their respective states. They are also empowered to arbitrate disputes between operators on the prices of unbundled network elements. In the state of Montana, for example, the monthly price for unbundled loops was set at the rate of USD 23.72 on average as of July 2002, although the rate differs according to zones. In the case of the state of Ohio, the monthly price for unbundled loops was set at the rate of USD 7.01 on average as of July 2002. The Florida Commission set a monthly rate for two-wire loops, which varies depending on operators, at USD 17 for Bellsouth, USD 15 for United/Centel, and USD 20 for Verizon.

Since January 2002, a number of states have started to reduce the prices of unbundled network elements. The national average of monthly LLU price has fallen by 5.3%, from USD 14.18 to USD 13.43 while the basic monthly UNP-P<sup>53</sup> price has decreased by 7.8%, from USD 18.95 to USD 17.48.<sup>54</sup>

There are now several open proceedings underway at the FCC related to LLU policies. One proposal seeks to establish a core set of national performance measures and standards for evaluating incumbent local exchange carriers' (ILEC's) performance in provisioning wholesale facilities and services to competitors. The proposed measures aim to create greater certainty in the market about ILEC's provision of interconnection, collocation, and access to unbundled networks; reduce costs by streamlining regulatory requirements; and establish specific enforcement policies. (Notice of Proposed Rulemaking, 8 November 2001, FCC 01-331)

Another proposal examines the framework under which incumbent local exchange carriers must make unbundled network elements available to competing carriers. This proposal includes a request for comment on whether a more targeted approach toward defining elements would be appropriate. (Notice of Proposed Rulemaking, 12 December 2001, FCC 01-361)

A third proposal examines, among other things, whether dominant carrier safeguards or other regulatory requirements should govern ILEC's provision of broadband service. (Notice of Proposed Rulemaking, 12 December 2001, FCC 01-360)

A fourth proposal suggests that wireline broadband Internet access services – whether provided over a third party's facilities or self-provisioned facilities – are information services, with a telecommunications component, rather than telecommunications services. The classification of wireline broadband Internet access service will have an effect on what regulations apply to that service (Notice of Proposed Rulemaking, 14 February 2002, FCC 02-42).

## NOTES

<sup>1</sup> FCC at [http://www.fcc.gov/Bureaus/Common\\_Carrier/Reports/FCC-State\\_Link/IAD/lcom0702.pdf](http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/lcom0702.pdf). Of the total number of unbundled loops, 3.2 million are without switching.

<sup>2</sup> This is based on the 4.7 million cable lines, compared to the 20 million lines provided by the two incumbents, BT and Kingston. This compares to the 12% (about 1.24 million out of 10.37 million) of business lines provided by new entrants in the UK.

<sup>3</sup> In Japan's case, the rate is measured not by the number of lines but by the traffic share of local call services.

<sup>4</sup> There is a tendency by some to view facility-based competition and service-based competition as alternatives. The two forms of building competition are complementary and both should be encouraged.

<sup>5</sup> Strictly speaking, line sharing can allow new entrants to maintain control of the copper pair. If the splitter and the DSL multiplexer are operated by the access seeker, the latter controls the copper pair, not the incumbent.

<sup>6</sup> While most new entrants in the OECD may not favour bitstream access, it was mandated in the UK in response to a reference by new entrants.

<sup>7</sup> For sub-loop unbundling the connection points are the primary connection points, or the street level cabinets near end user sites.

<sup>8</sup> New technologies such as very high-speed digital subscriber lines (VDSL) use an optical fibre to deliver the high-speed services to the street cabinet near the customer's premises and VDSL to send them along the copper pair to the consumer's premises.

<sup>9</sup> Among these five countries, Ireland was the first to comply with the EU regulations. The ODTR issued directives to Eircom to publish prices by May 2002 and these took effect in June 2002. In Portugal, ANACOM decided in March 2002 that PT Comunicacoes should alter the RUO within 20 days including the definition of procedures and terms as well as prices for the access to sub-loop unbundling. In this framework, *PT Comunicacoes* published in May 2002 the revised RUO which includes conditions for the provision of sub-loop unbundling.

<sup>10</sup> See ART, Recommendations from the *Autorité de régulation des télécommunications* for access to the local loop and its operational implementation, 30 October 2000, <http://www.art-telecom.fr/publications/ligndir9-eng.htm>

<sup>11</sup> See <http://www.accc.gov.au/media/mr2000/mr-46-00.htm>

<sup>12</sup> The incumbent also has an incentive to say costs are low in competitive areas and high where there are no competitors -- so will they overcharge users in rural areas if deaveraging is put into place.

<sup>13</sup> In addition to these costs, costs for backhaul network, marketing and sales are required.

<sup>14</sup> See Tarifica, <http://www.tarifica.com/news/newsstories.asp?archive=yes#2>

<sup>15</sup> See <http://www.bakom.ch/en/medieninfo/medienmitteilungen/uvek/artikel/00720/index.html>

<sup>16</sup> OPTA, Guidelines on Access to the Unbundled Local Loop ("MDF access"), 16 March 1999.

<sup>17</sup> As of the time of this report's publication, these FCC rules have not yet become effective.

<sup>18</sup> According to the current LLU regulation, Deutsche Telekom provides offers for line sharing and for access to the unbundled sub-loop.

- 19 Squire Sanders, Legal Study on Part II of the Local Loop Sectoral Inquiry,  
[http://europa.eu.int/comm/competition/antitrust/others/sector\\_inquiries/local\\_loop/](http://europa.eu.int/comm/competition/antitrust/others/sector_inquiries/local_loop/).
- 20 With regard to this figure (United States), the total set is based on ILEC local loops because CLECs are not  
 required to unbundle their local loops.
- 21 Including CLEC local loops.
- 22 See <http://www.tst.dk/uk/publications/statistics.htm>
- 23 See [http://www.regtp.de/en/reg\\_tele/start/fs\\_05.html](http://www.regtp.de/en/reg_tele/start/fs_05.html), [http://www.regtp.de/en/schriften/start/fs\\_08.html](http://www.regtp.de/en/schriften/start/fs_08.html).
- 24 Additional rules have been established following the amendments of ministerial ordinance: 1. Information  
 disclosure on available spaces for collocation, MDF, power receiving/generating equipment. 2. Procedure  
 of demand for survey and its response. 3. Procedure of competitors' own work for installation and  
 maintenance. 4. Procedure of competitors' entry to installation site of equipment. 5. Procedure of  
 competitors' attendance at communications building. 6. Standard period from application to its response  
 (one month/two weeks when it can be responded with power and airconditioning facilities which have  
 already been installed) and standard period to start installation work (one month. two weeks when  
 installation for additional equipment is needed at the site where relevant equipment has already been  
 installed/one and a half months when installation for raised floor is needed).
- 25 FT was required to roll out its exchanges in two initial stages. First, it had to deploy exchanges in the  
 10 largest cities by January 2001, followed by the next 20 largest cities by February 2001, and for the rest  
 by March 2001. However, there was no roll-out of LLU as of June 2001.
- 26 Oftel, Statement and Determination on local loop unbundling "Bow Wave Process",  
<http://www.oftel.gov.uk/publications/broadband/llu/allo1100.htm>
- 27 This situation changed after ANACOM's deliberation of March and November 2002. According to  
 ANACOM's Deliberation of March 2002, in accordance with the determination of November 2001, PT  
 Comunicacoes would alter the RUO, explicitly including the definition of procedures and terms for the  
 access to the totality of the MDFs of its network, including those regarding the exchange remote units.  
 ANACOM also determined through its decision, approved by Deliberation of November 2002 that the  
 minimum space offered by the incumbent would be two square meters for collocation.
- 28 Gilbert and Tobin, Operational Implications of Local Loop Unbundling and the Need for Technical Co-  
 ordination, Report undertaken for the European Commission, September 2001at  
[http://europa.eu.int/information\\_society/topics/telecoms/regulatory/studies/documents/2001\\_ull\\_study\\_fina](http://europa.eu.int/information_society/topics/telecoms/regulatory/studies/documents/2001_ull_study_fina)  
 l.pdf, p.137.
- 29 Refer to section 37 of the Austrian Telecommunications Act; decision of Telekom Control Kommission, Z  
 1/99, dated 2 July 1999; also see related reports in CTLR 1999.
- 30 In March 2000, TA and ISPA (Austrian ISP Association) agreed on an ADSL wholesale offer contract.
- 31 See CRTC, Status of Competition in Canadian Telecommunications Markets,  
<http://www.crtc.gc.ca/ENG/publications/reports/PolicyMonitoring/2001/gic2001-09.htm>.
- 32 Thomas Kiessling, "The Impact of Regulation on Facility-based Competition in Telecommunications: A  
 Comparative Analysis of Recent Developments in North and European Union",  
[http://www.tik.ee.ethz.ch/~m3i/related-work/cm/Cost-Regulation-in-Telecoms-Kiess\\_Mar99.pdf](http://www.tik.ee.ethz.ch/~m3i/related-work/cm/Cost-Regulation-in-Telecoms-Kiess_Mar99.pdf).
- 33 According to the CRTC, unbundled type A loops provide an analogue transmission facility which extends  
 from the central office loop termination (COLT) or point of termination (POT) to the customer network  
 interface (CUST-NI) and which is intended to facilitate the transmission of voice grade signals of  
 approximately 3 kHz usable bandwidth. Unbundled Type B loops provide an analogue transmission facility  
 which extends from the COLT or POT to the CUST-NI and are intended to facilitate the transmission of  
 ISDN BRA signals, viz. A maximum of 2 B + 1 D channels.
- 34 The first reference offer for full unbundling and collocation was made in April 1999, and for line sharing in  
 January 2001.

- 35 The 8<sup>th</sup> Implementation Report is available at  
[http://www.europa.eu.int/information\\_society/topics/telecoms/implementation/annual\\_report/8threport/index\\_en.htm](http://www.europa.eu.int/information_society/topics/telecoms/implementation/annual_report/8threport/index_en.htm)
- 36 Installation of operators' equipment in France Télécom buildings.
- 37 RegTP, Annual Report 2001, [http://www.regtp.de/en/reg\\_tele/start/fs\\_05.html](http://www.regtp.de/en/reg_tele/start/fs_05.html)
- 38 RegTP, Annual Report 2001, [http://www.regtp.de/en/reg\\_tele/start/fs\\_05.html](http://www.regtp.de/en/reg_tele/start/fs_05.html)
- 39 Natalie Lubben, Jorg Karenfort and Christian Sommer, “Moving Forward with Deliberate Speed?”,  
<http://www.christiansommer.de/corpfmag.pdf>
- 40 Press release, <http://www.regtp.de/en/aktuelles/02110/01/>
- 41 Squire Sanders, Legal Study on Part II of the Local Loop Sectoral Inquiry,  
[http://europa.eu.int/comm/competition/antitrust/others/sector\\_inquiries/local\\_loop/](http://europa.eu.int/comm/competition/antitrust/others/sector_inquiries/local_loop/)
- 42 Two weeks to respond with power and air conditioning facilities, etc, which have already been installed.
- 43 Two weeks when installation for additional equipment is needed at the site where relevant equipment has  
already been installed. One and a half months when installation for raised floor is needed.
- 44 OPTA, “Guidelines on Access to the Unbundled Local Loop”, <http://www.opta.nl/download/mdfeng.pdf>
- 45 In December 2001, the New Zealand government put in place a new telecommunications regulatory regime  
under which the provision of a telecommunication service to other telecommunication service providers  
can be designated. In particular a dispute over the supply of a designated service can be resolved by  
reference to the regulator who can make an enforceable determination of the terms and conditions of  
supply, including the price. The regime provides for the designation of further telecommunications  
services where provision would promote competition in telecommunications markets for the long-term  
benefit of end-users.
- 46 Oftel, Direction on Local Loop Unbundling – review of the charges for metallic path facilities and internal  
tie circuits, <http://www.oftel.gov.uk/publications/broadband/llu/llu0302.htm>
- 47 Internal tie circuits mean a link by means of a metallic path circuit contained in an MDF site.
- 48 See Oftel, “Access to Bandwidth: Shared Access to the Local Loop”,  
<http://www.oftel.gov.uk/publications/broadband/llu/shac1200.htm>
- 49 See <http://www.oftel.gov.uk/publications/broadband/llu/llup0202.htm>
- 50 See <http://www.oftel.gov.uk/publications/broadband/llu/shac1001.htm#direc>
- 51 FCC, Memorandum Opinion and Order, July 20 2001, FCC 01-208, p. D-26.
- 52 See FCC News, 15 September 1999,  
[http://www.fcc.gov/Bureaus/Common\\_Carrier/News\\_Releases/1999/nrcc9066.html](http://www.fcc.gov/Bureaus/Common_Carrier/News_Releases/1999/nrcc9066.html)
- 53 “UNE-P” stands for “UNE Platform”, the minimum elements necessary to provide local services to retail  
customers.
- 54 Billy Jack Gregg, “A Survey of Unbundled Network Element Prices in the United States”,  
<http://www.nrri.ohio-state.edu/programs/telcom/pdf/Total0702.pdf>