

A Preliminary Methodology for the Comparative Analysis of Domestic Leased Lines Tariffs in the South Asian region

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1.0 Study in Context

The study has been undertaken in keeping with the proposed 2006 theme of the World Dialogue on Regulation for Network Economies (WDR), 'Sector and Regulatory Performance Indicators.' The definition of standardized benchmark indicators with their respective viable methodologies in the Asian context is required for an accurate comparative analysis of the regulatory and sector performance in ICTs.

Recognizing that this constitutes a participatory exercise among experts in the telecommunication industry standards and regulatory affairs, telecom authorities and statistical organizations as well as academics and interested individuals, this preliminary methodology framework document was commissioned to lay the groundwork to initiate and foster active discussion among the aforementioned participants on issues related to the proposed 2006 WDR theme.

With these guiding principles, this preliminary methodology on domestic leased line tariffs was formulated since national leased line tariffs is an important indicator of the potential of countries to foster broadband coverage and network expansion. LIRNEasia intends to test the methodology first in the South Asian region and then extend it to the rest of Asia.

1.1 Background

Businesses that generate a high volume of network traffic prefer to use leased lines¹ to take advantage of lower rates than what are available through the Public Switched Telephone Network (PSTN). Domestic or national leased lines provide connectivity within a national region. In the context of South Asia such circuits are commonly referred to as Domestic Leased Lines or Domestic Private Leased Circuits (DPLC).

Currently in South Asia, it is still the case that incumbent telecom operators are the sole provider of DPLCs. A mix of regulation, forcing the incumbent monopolist to provide leased line transmission connectivity (via the use of Reference Interconnection Offers), and introduction of competition is typically used to facilitate the entry of other operators and businesses providing products and value added services in the telecom sector. DPLC tariffs

¹ Refer to Annex 1 for an International Telecommunication Union (ITU) definition.



are important to other telecommunication operators for interconnection, to Internet Service Providers (ISPs) for providing internet access, and to large organizations, Business Process Outsourcing (BPO) companies and businesses providing valued added services. Hence access to DPLCs is a critical infrastructure requirement for new businesses and operators. Low-cost and reliable DPLCs are critical to the e-readiness of a country and to the creation of employment and wealth using ICTs. Leased lines are important for international trade, being covered not only by the telecom commitments under Protocol 4 of the General Agreement on Trade in Services (GATS), but also by the substantive treaties covering goods and services.



2.0 Methodology

The methodology has been derived from the OECD Telecommunication Basket Definitions document published by the Organization for Economic Co-operation and Development (OECD²) in 2000 (hereafter referred to as the OECD methodology).

The following reports also served as references in the formulation of the methodology.

- European Union's Recommendation on the Provision of Leased Lines in the European Union (Part 2 – Pricing Aspects of wholesale leased line part circuits), 29 March 2005, (C2005 951 Final)
- The Telecommunication Tariff (Thirty Sixth Amendment) Order, 2005 (3 of 2005) by the Telecom Regulatory Authority of India (TRAI) which proposes tariff ceilings for the provision of domestic leased circuits

The proposed methodology attempts to put to use the best practices of the OECD methodology. In addition it is essential to try to harmonize the methodologies to allow for accurate comparisons eventually of the domestic leased line sector in South Asia and the OECD countries.

2.1 Proposed Methodology

1. The national leased line basket shall include the following circuit types, where possible:
 - 64 Kbits/s digital circuits
 - 2 Mbits/s digital circuits
 - 8 Mbit/s digital circuits
 - 34 Mbits/s digital circuits
 - 155 Mbits/s digital circuits
2. Wholesale tariffs are considered.
3. Tariffs for some of these circuit types may not always be available i.e. are not published by the operator.
4. Tariffs are considered for the Significant Market Power (SMP) operators. In cases where multiple operators have SMP status for different regions within the country, the operator with the coverage of the largest area is considered.
5. Tariffs are reported in US Dollars. The average US dollar exchange rate for the previous year is used.
6. Results exclude VAT/GST and any discounts
7. Non-recurring charges (installation) are excluded from the basket. Also interconnection charges are not considered. Only annual charges are included.

² OECD is a forum of 30 developed countries who work together to address the economic, social and environmental challenges of interdependence and globalization.



8. Where applicable the local tail circuits³ shall be 2km long.
9. Data is collected for circuits over 6 distances

Distance	2km	20km	50km	100km	200km	500km
Local Tails	No	Yes	Yes	Yes	Yes	Yes

Circuits above 2km shall include two (2) local tail circuits (of 2km each) within the defined distance. This means that for example a 50Km circuit will have two (2) local tail circuits of 2km, and a main circuit of 46km. Some operators include the local tail circuits in the total price, some do not.

10. In countries of small geographic area, tariffs are not reported for the distances that exceed the maximum possible distance in that country.

2.2 Benchmarking

The benchmark price for a specific capacity and distance mix will be a determinant of the number of countries studied. The following table outlines the proposed methodology for choosing the benchmark.

Number of Countries	Benchmark
1-5	The lowest tariff is chosen as the benchmark
6-20	The 2 nd lowest tariff is chosen as the benchmark
21-40	The 3 rd lowest tariff is chosen as the benchmark

2.3 Notes on the Methodology

• Data Collection Issues

Not all operators publish their data. For example in Sri Lanka the major operators are reluctant to publish their tariff schedules for the provision of wholesale leased lines. In India and Pakistan the regulatory regimes have forced Significant Market Power (SMP) operators to publish their tariff schedules. Data collection could be more easily facilitated if at the very least, the individual regulatory authorities compel operators to provide their tariff schedules.

• Technology Standardization

There are no harmonized technical characteristics in the provision of leased lines in South Asia. With respect to the three countries that were studied, all seem to follow International Telecommunication Union (ITU) standards, but this information has not been verified. In this respect the EU countries have advanced significantly with their Open Network Provision (ONP) directive, which seeks to harmonize standards and technical specifications among member countries and specifies a minimum set of leased lines and their corresponding technical characteristics.

³ Refer to Annex 1 for a definition of Local Tail Circuit.



Furthermore, operators do not always distinguish between ordinary and special quality voice bandwidth or between structured and unstructured circuits⁴ which can render comparisons less meaningful. In India, it is possible to obtain leased lines in some areas with Managed Leased Line Network (MLLN) technology in capacities of x64 Kbit/s up to 2 Mbit/s. MLLN technology allows for time-dependant, bandwidth on demand. MLLN technology is in the early stages of adoption in India. Since India is the only South Asian country to offer this service currently, tariffs for this technology have not been included in the methodology. Once the provision of this technology has been standardized and more widely implemented, it should be accounted for in the methodology. Also the capacities mix can be further augmented by reporting tariffs for 45Mbit/s. Since it is not currently widely available it has been dropped from the methodology.

- **Varied Tariff Regimes**

The tariff regimes for leased lines vary from operator to operator and from country to country. The assumption is that the basic cost of transmission is the key cost driver. Hence collocation and interconnection prices, as well as discounts are not considered, even though they are highly relevant for competing operators.

- **The Distance Mix**

The mix of distances used for OECD methodology is applicable in the South Asian context as well, since both methodologies are applicable for countries of different geographic areas. It also renders this South Asian domestic leased line tariff indicator more comparable with OECD countries.

- **Units**

The reporting of tariffs is done in US Dollars. The OECD methodology also reports tariffs in US Dollars adjusted for PPP. From the value point of an external business wishing to purchase leased line capacity, what is important is the nominal value. Hence for this reason, US dollars adjusted for PPP are not used as a unit. The ITU Telecommunication Indicators Handbook reports tariffs in local currencies⁵. This makes comparisons more difficult and was not used.

- **Exchange Rates**

The average US Dollar conversion rate for the previous year is employed. Use of an average limits the effect of fluctuations of the US dollar on the reported tariff.

⁴ Refer to Annex 1 for more information on structured and unstructured circuits.

⁵ <http://www.itu.int/ITU-D/ict/publications/world/material/handbook.html#c42>



2.4 Performance of Leased Lines

The European Commission annually reports on performance in the supply of leased lines in the EU countries⁶, where the leased lines market is more developed than the South Asian region. It will be necessary for future comparative analysis of the competitiveness of the South Asian region to include this information as well. However at present the individual regulatory authorities in South Asia do not collect this information. While a study of these performance indicators is beyond the scope of this study, the indicators in use by the EU are outlined below. Annex 2 provides a sample of these EU performances indicators from the 2003 report.

- Delivery Periods for Ordinary Quality Voice Bandwidth Analogue Leased Lines
- Delivery Periods for Special Quality Voice Bandwidth Analogue Leased Lines
- Delivery Periods for 64 Kbit/s Digital Leased Lines
- Delivery Periods for 2 Mbit/s, 34 Mbit/s, 140 Mbit/s Digital Unstructured Leased Lines
- Delivery Periods for 2 Mbit/s, 34 Mbit/s, 140 Mbit/s Digital Structured Leased Lines
- Delivery Periods for 155 Mbit/s Digital Leased Lines
- Repair Times for Ordinary Quality Voice Bandwidth Analogue Leased Lines
- Repair Times for Special Quality Voice Bandwidth Analogue Leased Lines
- Repair Times for 64 Kbit/s Digital Leased Lines
- Repair Times for 2 Mbit/s, 34 Mbit/s, 140 Mbit/s Digital Unstructured Leased Lines
- Repair Times for 2 Mbit/s, 34 Mbit/s, 140 Mbit/s Digital Structured Leased Lines
- Repair Times for 155 Mbit/s Digital Leased Lines
- Service Availability for Ordinary and Special Quality Voice Bandwidth Analogue Leased Lines
- Service Availability for 64 Kbit/s Digital Leased Lines
- Service Availability for 2 Mbit/s Digital Unstructured Leased Lines
- Service Availability for 34 Mbit/s Digital Leased Lines
- Service Availability for 140 Mbit/s Digital Leased Lines
- Service Availability for 155 Mbit/s Digital Structured Leased Lines

⁶ http://europa.eu.int/information_society/policy/ecomm/implementation_enforcement/index_en.htm



3.0 South-Asian Case Studies

The proposed methodology has been initially applied to just three South Asian countries, namely India, Pakistan and Sri Lanka. These three countries were chosen since their telecommunications sector and specifically the domestic leased line market is more advanced than the rest of the countries in South Asia. The individual case studies present a brief outline of the regulatory framework in each country in the provision of domestic leased line. The main operators have also been identified. The latest available data on the cost of domestic leased lines are also presented.

3.1 India

Telecommunication liberalization in India was initiated in 1992. Since then the entire sector has been opened up to competition. However the state-owned Bharat Sanchar Nigam Ltd. (BSNL) is still the dominant provider of domestic leased line circuits outside Mumbai and New Delhi. Mahanagar Telephone Nigam Ltd. (MTNL), which provides leased circuits in the cities of Mumbai and New Delhi, is 55.6% owned by the government.

In June 2004, the Telecom Regulatory Authority of India (TRAI) initiated a consultation process for the revision of ceiling tariffs on domestic leased lines⁷. This process culminated in the 36th Amendment to the Telecommunication Tariff Order⁸ in April 2005, which set in place a revised tariff ceiling for the provision of domestic private leased lines. This was further revised to include tariff ceilings for the provision of leased lines under Managed Leased Line Network (MLLN) technology⁹.

Table 1: DPLC costs in India (in USD¹⁰)

	2km	20km	50km	100km	200km	500km
64 Kbits/s	144	529	572	646	793	1,235
2 Mbit/s	376	917	2,047	3,899	7,603	18,714
8 Mbit/s	1,316	3,210	7,166	13,648	26,611	65,499
34 Mbit/s	2,406	5,870	13,104	24,955	48,659	119,771
155 Mbit/s	39,495	39,495	42,005	77,881	149,632	364,886

Notes on Data Collection

- BSNL is the SMP in most of the country and the tariffs in this report are from the latest BSNL DPLC costs as published on their website:
http://www.bsnl.co.in/service/leased_tariff_home.htm

⁷ Consultation Paper on Revision of Ceiling Tariff for Domestic Leased Circuits, June 22, 2004, <http://www.trai.gov.in/cpaper22.htm>

⁸ The Telecommunication Tariff (Thirty Sixth Amendment) Order, 2005 (3 of 2005). April 21, 2005, <http://www.trai.gov.in/order21apr05.pdf>

⁹ The Telecommunication Tariff (Thirty Seventh Amendment) Order, 2005 (4 of 2005). May 2, 2005, <http://www.trai.gov.in/torder2may05.pdf>

¹⁰ Based on average 2004 conversion rates. Source: <http://www.x-rates.com/d/INR/USD/hist2004.html>



3.2 Pakistan

The Telegraph and Telephone (T&T) Department was converted to Pakistan Telecommunication Corporation (PTC) on 15th December 1990. As of 1st January 1996, PTC was further reorganized into separate entities namely Pakistan Telecommunication Authority (PTA), the National Telecommunication Corporation (NTC), and the Frequency Allocation Board (FAB) and Pakistan Telecommunication Company Limited (PTCL).

Under Pakistan's WTO commitments and the Pakistan Telecommunication Corporation Act of 1991, the monopoly of incumbent telecommunications operator, PTCL ended in December 2002. Pakistan's WTO commitments also meant that as of January 2004, private leased circuits were open to competition.

Twelve new licenses have been currently issued for the provision of DPLCs. Of these, three intend to lay their own fiber optic cable. Currently two have already started laying cable. NTC has a mandate to provide telecommunication services to the Government of Pakistan, the armed services and related institutions on a non-exclusive basis. NTC is currently seeking approval to offer leased line circuits at PTCL equivalent rates. With the approval of the PTCL Reference Interconnection Offer (RIO) by the Pakistan Telecommunications Authority (PTA), a new tariff regime was introduced as of June 1st, 2005..

Table 2: Domestic Leased Line Costs in Pakistan (in USD¹¹)

	2km	20km	50km	100km	200km	500km
64 Kbit/s						
2 Mbit/s	1,598	3,474	3,474	6,948	11,526	26,461
8 Mbit/s			11,769	23,538	40,341	92,610
34 Mbit/s			40,351	80,702	137,616	317,536
155 Mbit/s			141,229	282,458	484,089	1,111,377

Notes on Data Collection

- With the accordance of the status of Significant Market Power (SMP) in leased lines and national interconnection, PTCL is obligated to publish its approved ROI. The rates are currently published on PTCL's website (<http://www.ptcl.com.pk/domestic.html>).
- Information on 64 Kbit/s leased circuits was not available.
- ISPs are also considered bulk buyers of leased line services. The tariff regime provided to ISPs is different from the above tariff charge and include International Private Leased Circuit (IPCL) cost plus the wholesale DPCL cost.

¹¹ Based on average 2004 conversion rates. Source: <http://www.x-rates.com/d/PKR/USD/hist2004.html>



3.1 Sri Lanka

Sri Lanka's telecom sector was liberalized in 1991. Sri Lanka Telecom Ltd. (SLTL), which was a state-owned entity was partially privatized in 1997 and then subject to an IPO in 2002/2003. Japan's Nippon Telegraph and Telephone (NTT) owns 35.2% of the company. Many in the industry believe that SLTL is currently the only operator among the three fixed and four mobile operators allowed to lay fiber links.

MTT Networks was licensed to establish a digital microwave and fiber optic network. They have a USD 20 million network and their license allows them to establish communication infrastructure facilities to provide voice, data and video communication services and Internet access and related application and e-commerce enabling services. MTT Network is a wholesale backbone provider. As a result of abortive negotiations with the government railways for the right to lay fiber along rail tracks, MTT is currently limited to digital microwave.

Suntel and LankaBell who provide fixed wireless telephony throughout the country, also provide tail circuits within the Colombo region via digital microwave, in addition to MTT. SLT provides tail circuits via copper/fiber links.

Operators are not required to publish their tariffs and were reluctant to report their latest tariffs. The following estimates were obtained for some capacities from users. These estimates are inclusive of discounts and do not necessarily represent list tariffs.

Table 3: DPLC costs in Sri Lanka (in USD¹²)

	2km	20km	50km	100km	200km	500km
64 Kbits/s						
2 Mbit/s	543			7,901		
8 Mbit/s						
34 Mbit/s						
155 Mbit/s						

¹² Based on average 2004 conversion rates. Source: <http://www.x-rates.com/d/SLR/USD/hist2004.html>



4.0 Conclusions

The application of this preliminary methodology to the three South Asian countries clearly highlights the differences in the domestic leased line tariffs. Tariffs in Pakistan for 2 Mbit/s and 8 Mbit/s circuits are almost 1.5 times the equivalent rate in India for distances more than 20Km, while tariffs for 34 Mbit/s and 155 Mbit/s circuits are nearly 3 times the equivalent cost in India for distances greater than 20Km. Furthermore, from the limited information collected in Sri Lanka it seems that tariffs are almost double their equivalent cost in India for a 2Mbit/s of 100Km. The difficulty in obtaining the latest tariff schedules in Sri Lanka, clearly underline the need to formulate standardized mechanisms for the collection and reporting of what should essentially be public information.

It is hoped that this preliminary methodology and its initial application to three South Asia countries with high telecom sector growth will generate an active dialogue on the issues related to the formulation of regulatory and sector performance indicators. This participatory process will help formulate a more rigid final methodology which can be applied to all Asian countries.



5.0 References

European Commission Recommendation on the Provision of Leased Lines in the European Union, Part 2 – Pricing aspects of wholesale leased line part circuits, 29 March 2005, http://europa.eu.int/information_society/policy/ecomm/doc/info_centre/documentation/recomm_guidelines/leased_lines/recomm_ll_part2_en.pdf

European Commission Report on Performance in the Supply of Leased Lines in 2003, 17 December 2004, http://europa.eu.int/information_society/policy/ecomm/doc/implementation_enforcement/leasedlines/report%202003.pdf

OECD Telecommunications Basket Definitions (2000), <http://www.oecd.org/dataoecd/52/33/1914445.pdf>

Pakistan Telecommunication Company Ltd. Reference Interconnection Offer, 1 June 2005, http://www.ptcl.com.pk/news/april_2004/apr_20_2004.html

The Telecommunication Tariff (Thirty Sixty Amendment) Order, 2005 (3 of 2005), TRAI, <http://www.trai.gov.in/order21apr05.pdf>



Annex 1 – Telecommunication Guide

Leased Line or Leased Circuit: International Telecommunications Union (ITU) defines Leased Lines or Leased Circuits as follows: “Leased circuits refer to a two-way link for the exclusive use of a subscriber regardless of the way it is used by the subscriber (e.g., switched subscriber or non-switched, or voice or data). Leased circuits also referred to as leased lines, can be either national or international in scope. In reporting this indicator, only the number of lines should be included, not the number of network termination points.” (<http://www.itu.int/ITU-D/ict/publications/world/material/handbook.html#c22>)

Local Tail Circuit: This is the leased line from the customer’s premises to Point of Presence (PoP) or Point of Interconnection (PoI) to the network operator from whom the customer obtains leased line capacity. This tail circuit may be provided by a third party operator. The tail circuit is also referred to sometimes as a terminating segment, partial circuit, tail end, local end or local leased circuit. In instances where this tail circuit consists of copper links, it is usually known as a local loop. Liberalization of these tail circuits, which are commonly provided by the incumbent telecommunications operator, is often necessary (by placing the duty of non-discrimination on operators with SMP status in local tail circuits) to encourage new entrants to the leased line market without the need to build their own tail circuits.

Managed Leased Lines Network (MLLN): MLLN technology allows for the provision of high-speed leased line data connections with higher Quality of Service (QoS) and reliability than what can be provided via traditional leased line circuits. MLLN can deliver time-dependant bandwidth on demand. Currently, the bandwidth available via MLLN technology in India varies between 64Kbit/s and Nx64 Kbit/s up to a maximum of 2Mbit/s. MLLN technology allows the client the flexibility of negotiable bandwidth during different times of the day.

Open Network Provision (ONP) Directive: The ONP Directive was initiated by the European Commission to standardize the conditions for open and efficient access to and use of public telecommunications networks and where applicable, public telecommunication services. The set of conditions include standardized technical interfaces, conditions of use and tariff principles of the network or service to which they are applied. The general principles of ONP are contained in the Council Directive 90/387/EEC, the “ONP Framework Directive”. These principles are applied to a number of areas of telecommunications, including leased lines. Leased Lines are specifically covered by the ONP Leased Line Directive 92/44/EEC.

Structured vs. Unstructured Circuits: This terminology is more common in the context of the OECD countries. Structured circuits allow for transmission of multiple channels within a circuit such that each channel can go to a different location. An unstructured circuit requires that whole circuit be sent to one specific destination. As such, the classification of leased line of specific capacity as “structured” or “unstructured” depends on the network interfaces that govern the transmission of network traffic through that leased line.



Annex 2 – European Commission Report on Performance in the Supply of Leased Lines in 2003¹³

The Report on Performance in the Supply of Leased Lines is a annual publication released by European Commission pursuant to the European Union (EU) Council Directive 92/44/EEC on the application of EU's Open Network Provision (ONP) to Leased Lines. Included below are brief definitions of the indicators in use. Sample data from the 2003 report has also been included below.

Delivery Periods

This is defined as the number of days it takes from a formal request for a leased line to actual delivery.

Statistics reported for Delivery Periods of each leased line type:

- Typical Delivery Period (Days) for all leased lines.
- Typical Delivery Period (Days) for national leased lines.
- Typical Delivery Period (Days) for Intra-community leased lines if available.

Table A2.1: Delivery Periods for 34 Mbit/s Digital Structured Leased Lines

The data for Belgium and France are given below as a sample. The original table includes the rest of the EU countries.

	Typical Delivery Periods (days) All	Typical Delivery Periods (days) National	Typical Delivery Periods (days) Intra-Comm.
Belgium		39.2	No Orders
France		49	

Repair Times

For each type of leased line the following repair-times related data is reported:

- The class or quality of maintenance where different levels of maintenance are offered
- Typical repair times in hours for all leased lines.
- Typical repair times in hours for national leased lines, if data is available.
- Typical repair times in hours for intra-community leased lines if available.

¹³http://europa.eu.int/information_society/policy/ecommm/doc/implementation_enforcement/leasedlines/report%202003.pdf



Table A2.2: Repair Times for 64 Kbit/s Digital Leased Lines

The data for Germany and France are given below as a sample. The original table includes the rest of the EU countries

	Maintenance Quality Class	Typical Repair Time (hours) All	Typical Repair Time (hours) National	Typical Repair Time (hours) Intra-Comm.
Germany	Standard		11:15:00	
Germany	Express		7:32:00	
France			3:04:00	

Service Availability

This is defined as mean long-term recorded unavailability ratio (%) which is:

$$\frac{\text{Total recorded unavailable time (hours) for all leased lines of the same type}}{\text{Duration of monitoring period (hours) x No. of leased lines}} \times 100$$

Table A2.3: Service Availability for 2 Mbit/s Digital Leased Lines

Figures for Belgium and France are included below as a sample. The original table contains figures on the rest of the EU countries.

	Mean Long-term Recorded Unavailability Ratio (%) 2 Mbit/s Digital Unstructured	Mean Long-term Recorded Unavailability Ratio (%) 2 Mbit/s Digital Structured
Belgium	0.01721	0.0362
France	0.018	0.018