Telecom Regulatory Authority of India

Notification

New Delhi, the 2nd June, 2005

No.312-7/2003-Eco. In exercise of the powers conferred upon it under sub-section (2) of section 11 read with section 11(1)(b)(i) of the Telecom Regulatory Authority of India Act, 1997, the Telecom Regulatory Authority of India (TRAI) hereby further amends the Telecommunication Tariff Order, 1999 as under, namely:

1. Short title, extent and commencement:
   (i) This Order shall be called "The Telecommunication Tariff (Thirty Eighth Amendment) Order, 2005" (5 of 2005).
   (ii) This Order shall come into force from the date of its publication in the Official Gazette.

2. The tariff and entries relating thereto in Annexure-5 to Schedule IV of the Telecommunication Tariff (Thirty Seventh Amendment) Order, 2005 (4 of 2005) shall stand deleted and substituted with the tariff and entries as specified in Annexure-5 to Schedule IV of this order.

3. The following entries shall substitute the entries relating to clause (3)(f) of Schedule IV of the Telecommunication Tariff (Thirty Seventh Amendment) Order, 2005 (4 of 2005):

(3)(f)	Circuits with Speed / Capacity of 64 Kbps up to but less than 2 Mbps provided on Managed Leased Line Network technology	For circuits of type Managed Leased Line Network technology for capacities of 64 Kbps, 128 Kbps and 256 Kbps the ceiling tariff is as specified in Annexure 5 to this Schedule. Tariff for capacities higher than 256 Kbps and below 2 Mbps are under forbearance. Furthermore, tariff for the Modem / Network Termination Unit is under forbearance, but must be provided on rental based on cost.

4. This Order contains at Annexure A an Explanatory Memorandum, which explains the reasons for this amendment to the Telecommunication Tariff Order, 1999.

By Order,

(M.Kannan)
Advisor (Economic)

Annexure 5 to Schedule IV

READY-RECKONER CEILING TARIFF (in Rs./Annum) FOR 64 Kbps, 128 Kbps and 256 Kbps MANAGED LEASED LINE NETWORK (MLLN)

DOMESTIC LEASED CIRCUITS

Distance (km)	Tariff for 64 Kbps Circuits	Tariff for 128 Kbps Circuits	Tariff for 256 Kbps Circuits
5	17,811	32060	55214
10	18,137	32647	56225
15	18,463	33234	57236
20	18,789	33821	58247
25	19,116	34408	59258
30	19,442	34995	60269
35	19,768	35582	61280
40	20,094	36169	62291
45	20,420	36756	63302
50	20,819	37473	64538
55	21,145	38060	65549
60	21,471	38647	66560
65	21,797	39234	67570
70	22,123	39822	68581
75	22,449	40409	69592
80	22,775	40996	70603
85	23,101	41583	71614
90	23,428	42170	72625
95	23,754	42757	73636
100	24,152	43474	74872
105	24,478	44061	75883
110	24,804	44648	76894
115	25,131	45235	77905
120	25,457	45822	78916
125	25,783	46409	79927
130	26,109	46996	80938
135	26,435	47583	81949
140	26,761	48170	82960
145	27,087	48757	83971
150	27,486	49475	85206
155	27,812	50062	86217
160	28,138	50649	87228
165	28,464	51236	88239
170	28,790	51823	89250
175	29,117	52410	90261

Distance (km)	Tariff for 64 Kbps circuits	Tariff for 128 Kbps Circuits	Tariff for 256 Kbps Circuits
180	29,443	52997	91272
185	29,769	53584	92283
190	30,095	54171	93294
195	30,421	54758	94305
200	30,820	55475	95541
205	31,146	56062	96552
210	31,472	56649	97563
215	31,798	57236	98574
220	32,124	57823	99585
225	32,450	58410	100596
230	32,776	58997	101607
235	33,102	59584	102618
240	33,429	60171	103629
245	33,755	60758	104640
250	34,153	61476	105875
255	34,479	62063	106886
260	34,805	62650	107897
265	35,132	63237	108908
270	35,458	63824	109919
275	35,784	64411	110930
280	36,110	64998	111941
285	36,436	65585	112952
290	36,762	66172	113963
295	37,088	66759	114974
300	37,487	67476	116209
305	37,813	68063	117220
310	38,139	68651	118231
315	38,465	69238	119242
320	38,791	69825	120253
325	39,118	70412	121264
330	39,444	70999	122275
335	39,770	71586	123286
340	40,096	72173	124297
345	40,422	72760	125308
350	40,821	73477	126544

Distance (km)	Tariff for 64 Kbps circuits	Tariff for 128 Kbps circuits	Tariff for 256 Kbps circuits
355	41,147	74064	127555
360	41,473	74651	128566
365	41,799	75238	129577
370	42,125	75825	130588
375	42,451	76412	131599
380	42,777	76999	132610
385	43,103	77586	133621
390	43,430	78173	134632
395	43,756	78760	135643
400	44,154	79478	136878
405	44,480	80065	137889
410	44,807	80652	138900
415	45,133	81239	139911
420	45,459	81826	140922
425	45,785	82413	141933
430	46,111	83000	142944
435	46,437	83587	143955
440	46,763	84174	144966
445	47,089	84761	145977
450	47,488	85478	147213
455	47,814	86065	148224
460	48,140	86652	149235
465	48,466	87239	150246
470	48,792	87826	151257
475	49,119	88413	152268
480	49,445	89000	153278
485	49,771	89587	154289
490	50,097	90174	155300
495	50,423	90761	156311
500	50,822	91479	157547
>500	**51,000**	**91800**	**158100**

Annexure - A

Explanatory Memorandum

(I) Introduction and Background

1. The Authority had revised the cost based ceiling tariff for Domestic Leased Circuits (DLC) vide 36th Amendment to TTO dated 21.4.2005. Subsequently, Authority also notified separate ceiling tariff for 64 kbps Managed Leased Line Network (MLLN) Domestic Leased Circuits vide 37th Amendment of TTO dated 2nd May 2005. This tariff was notified as an interim measure on the grounds that MLLN required certain additional investment such as Versatile Multiplexers (VMUX) and Transit Stations, thus adding to the cost of service provision in comparison to the cost of provision for classical 64 kbps circuits.

2. In the explanatory memorandum to the 37th amendment of TTO, the Authority had indicated that the interim arrangement would be reviewed within one month. Meanwhile, relevant cost information from service providers was sought with a view to specifying a new ceiling tariff for 64 kbps using MLLN Technology. Accordingly, the Authority initiated the process of estimating cost based tariff for MLLN service based on the details of the cost of provision of services provided by the service providers, who offer such service. This notification is the outcome of that process.

(II) Summary of submissions made by service providers

3. The Authority called for detailed data from the service providers relating to cost elements required for providing leased line circuits of 64 kbps and multiples of the same below 2 Mbps using MLLN technology. Major operators submitted the information in respect of MLLN service, its special features, its advantages and variations from the classical 64 kbps circuits. The following paragraphs summarize the submissions made by various service providers.

4. Managed Leased Line Network (MLLN) system provides '*managed'* leased line connectivity. Bandwidth of a leased line on MLLN varies between 64 Kbps and Nx64 kbps up to a maximum of 2 Mbps (E-1 interface). It is an integrated, fully managed, digital network platform through which the service provider offers leased line services, mainly to business subscribers. A distinctive feature is that the service is backed by a flexible Network Management System (NMS) with powerful diagnostics and maintenance tools. MLLN can thus provide high-speed leased line connectivity with improved QoS (Quality of Service), high availability and reliability. The NMS also supports service provisioning, network optimization, planning and service monitoring. The system offers features such as end to end circuit creation and monitoring, circuit loop test and fault isolation, automatic re-routing of traffic in case of trunk failure, software programmability of NTUs, etc. The following features form part of the service providing benefit to customers through the MLLN technology.

i) 24 hours performance monitoring of the circuit.
ii) Circuit fault reports generated proactively.

iii) Point to Point and Point to Multi-Point bandwidth.
iv) The bandwidth can be increased on demand.
v) Low lead time for new circuit provisioning.
vi) Protection against the failure of the circuit.
vii) Long drive on single pair copper.
viii) Centrally managed from Network Management System.
ix) Higher level Service Level Agreement (SLA) can be offered to leased line customers due to performance monitoring.

5. While provision of services through this technology has a number of advantages including better quality and lower maintenance, additional costs are also involved. The nature of these costs is described in a later section. Discussions with industry sources reveal that for one operator the subscriber base for 64 Kbps leased circuits using classical method of delivery is about 60 percent. The rest i.e. 40 percent is delivered using MLLN technology. In certain cases, a hybrid delivery mechanism is used i.e. services are provided partly through the classic mode and partly through MLLN technology for the same sub-circuit. This is due to the fact that MLLN technology may not be available across all locations.

6. From the user groups, Internet Service Providers Association of India (ISPAI) has opposed the prescription of a separate tariff for MLLN on the grounds that MTNL and BSNL have been offering MLLN for more than 5 years and neither has reported this tariff as a separate service to TRAI. While welcoming provision of leased lines through MLLN, ISPAI however believes there should not be any extra cost burden on the users. ISPAI argues that MLLN is just another way of providing leased line services (rather than a different service) and hence does not deserve to be kept outside the ambit of the tariff ceiling specified by the Authority vide TTO (36th amendment) order dated 21st April 2005.

Analysis of the conflicting submissions

7. The ceiling tariff prescribed for 64 kbps in TTO 1999 was Rs.96,000 for the distance slab of > 500 kms. The Authority noted that during the last 5 to 6 years no discount to the tariff applicable in this lower capacity has been offered by the service providers as against high discounts seen in the market for capacities of 2 Mbps and above. The ceiling tariff fixed in 1999 had provided sufficient flexibility to offer leased circuits in capacities less than 2 Mbps using either of the two technologies available. Thus there could have been no requirement for the service providers to offer a separate tariff for MLLN technology based leased circuits in 64 kbps and N*64 kbps capacities. The Authority revised downwards its ceiling tariff for DLC in general vide 36th amendment to TTO.

8. As discussed in paras 13 through 15, for providing MLLN-based leased circuits a substantial amount of additional equipment which is also of a different nature than used in classical leased circuits is required, and the costs of these had not been taken into account in the Authority's latest revision of DLC pricing in the 36th amendment to TTO 1999. Therefore, the Authority is of the view that a separate higher ceiling for MLLN is justified in the current context. This cost based higher ceiling will not only encourage deployment of the more powerful MLLN technology by service providers, it will also improve efficiency of the businesses that subscribe to

this service. More importantly and in keeping with past practice, the Authority leaves the choice of service to the customers. Those wishing to subscribe to MLLN will be subject to a higher price ceiling compared to classical circuits. The tariff framework, however, allows the possibility of lower tariffs.

(III) Technical architecture of MLLN

Definitions of individual elements used in MLLN

9. Digital Cross Connect (DXC)

The Digital Cross Connect (DXC) is a device used in transmission network. It separates channels carry from other devices and rearranges them into new channels for output. A digital cross connection means that the connection is set up and released by the network operator (by using NMS computer), but not through subscriber signaling.

10. Versatile Multplexer (VMUX)

The Versatile Multplexer (VMUX) is used as the access Multiplexer. The equipment is used in access and consolidation levels in between DXC and NTUs.

11. Network Termination Units (NTU)

Network Termination Units or NTUs are G.703/V.35 / Ethernet interface transmission modems used for accessing the VMUX over the cable used as the transmission media. These are kept in the customer premises for leased line connectivity. There are two types of modems classified according to the operating speed i.e., 64/128 kbps (also called just 64 kbps) and N*64 kbps. The 64/128 kbps modem operates at 64 /128 kbps speed whereas an N*64 kbps modem can operate at speeds from 64 kbps up to 2 Mbps depending on the requirement of the subscriber.

12. Network Management System (NMS)

MLLN circuits are managed by a centralized NMS. The network manager is a set of interactive components for user interface and non-interactive components to perform background operation. To meet the customer demand, high capacity servers in NMS are provisioned for application, database, billing, firewall, web self-care etc. The NMS has to be duplicated i.e., one main site and one Disaster Recovery (DR) site to enable highest availability of the system. Data traffic from all network elements for connectivity with NMS are from the DXCs in the transit center.

Difference between MLLN and Classical method of leased circuit provisioning:

13. In classical method, Primary MUX (PMUX) is used to connect customer premises to the exchange / transmission center at both ends of the link. Please refer to Appendix I of Annexure A for a diagram. The customer provides two modems at each end, one between the PMUX and the local lead and one at the customer premise

end of the local lead. A similar arrangement is needed at both ends of the complete circuit, resulting in a total of four modems. For connecting the PMUXs, either a full 2 Mbps of higher bandwidth link is required between the PMUXs at both ends of the circuit.

14. In the case of MLLN, a network connecting VMUXs and DXCs through 2 Mbps or higher links is created in advance in a manner similar to the circuit switched network for voice communications. A diagram of the circuit can be viewed at Appendix II of Annexure A. For providing the circuit, modems (NTUs) are provided at both customer premise ends of the circuit and the link is created by giving a command from the slave terminals of the NMS at one of the stations. The link from the customer premise traverses the local lead between the NTU at the customer premise to the VMUX, which is located in a local exchange or point of presence (POP) of the service provider. The 64 kbps and N*64 kbps links are then aggregated into a higher bandwidth backhaul link which travels to the nearest Transit Center (typically a larger area exchange or regional exchange) where it enters into a DXC. From the DXC through which the link enters the Transit Center, the circuit is electronically linked to the appropriate next DXC that would carry forward to the circuit to its final destination.

15. The purpose of using a Transit Center is not only to connect to the NMS systems for higher quality of service, but it also allows the service provider to leverage economies of scale by aggregating and disaggregating traffic through such switching centers, much like a traditional telephone network. A MLLN leased circuit could traverse multiple such Transit Centers and go through the process of passing through multiple DXCs, depending on the distance traveled as well as the particular route. It is not always true that larger distances imply traversing more Transit Centers, especially since high usage routes, even if they are long distances, would not have a requirement for aggregating and disaggregating traffic repeatedly.

(IV) Methodology for arriving at tariffs

Normation process

16. Since the data submitted by operators varied significantly, the Authority relied on its earlier practice of normation. To normate the cost of inputs for all components required to build a MLLN based leased circuit, the second lowest value for each individual cost item was used. This is identical to the process followed by the Authority in 36th amendment of the TTO issued on 21st April 2005.

17. As discussed in the explanatory memorandum of the 36th amendment, while specifying a particular tariff, it is important to balance the twin (and conflicting) objectives of creating incentives for investment (and efficiency) while promoting downstream competition. To have taken the lowest cost for each component in building 64 kbps and N*64 kbps circuits at this stage would not have achieved the first objective of the Authority. Likewise, choosing the third lowest cost would provide too much buffer and would be unlikely to promote efficiency in operations. The normated (i.e. the Second lowest value for each individual equipment) cost data

of additional equipments required for provision of MLLN based leased circuit services is given in Appendix III of Annexure-A.

18. Based on the data, the Authority calculated the additional cost required for providing leased circuit through MLLN technology employing the above mentioned normation process. The cost calculations in respect of the additional equipments required in MLLN based service, are given in Appendix IV of Annexure-A. Since one of the points of differentiation of MLLN circuits from classical circuits is the usage of Transit Centers, the Authority had to examine how many Transit Centers would be traversed by each MLLN-based leased circuit. Discussions with operators suggest that while local links will typically involve only transit through one center, there are many links that would transit through 2 or more. Further, it is understood that the majority of circuits would transit through two Transit Centers, therefore utilizing four DXC ports, two in each transit center. This was therefore the value used by the Authority to calculate the applicable costs. The cost calculations for deriving the cost of Transit Center in respect of 64 kbps are given in Appendix V of Annexure-A.

Capacity utilization

19. Capacity utilization in general has been broken into two parts for evaluation of tariffs of MLLN-based circuits. As was done in the 36th amendment, when pricing the individual circuits, i.e. 64 kbps, the capacity utilization and provision of redundancy of the higher order system, i.e. E-1 has to be considered. Provision for this is necessary since for full cost recovery the capital expenditure employed in building these networks and the related equipment has to be recovered across the capacity that is sold.

20. If we consider the network architecture for classical leased circuits and MLLN based leased circuits as given in Appendix I and II of Annexure A, it is evident that while in the classical arrangement the utilization of PMUX, E-1s etc. were considered, in the MLLN case, one has to consider the utilization factor of VMUXs, DXCs, E-1s, etc. As discussed earlier, one of the advantages of using Transit Centers is to leverage economies of scale by aggregating capacity. However, the Authority has conservatively determined the capacity utilization of the E-1 and STM-1 links connecting the various parts of MLLN-based 64 kbps and N*64 kbps circuits to be equivalent to the capacity utilization of classical circuits, i.e. 50%, even though MLLN technology has been deployed at the moment in higher demand areas. However, capacity utilization of VMUX and DXC equipment has been considered separately in deciding the tariff of MLLN circuits because the utilization factors are different for different operators as per their submissions. Thus based on the feedback from operators, and the way the equipment is deployed and used, the current level of capacity utilization of these elements are 25%.

21. It should be noted that capacity utilization does not apply to the operational expenditure portion of expenses since opex is already derived based on the full capital expenditure amount. Similarly, since network redundancy is the provisioning of multiple links on different routes (route diversity) to avoid disruption of data and processes of end-user enterprises, the provision for redundancy applies only to the capital expenditure on items in variable costs category.

License fee

22. The license fee has been loaded on the cost base for calculating the tariff for leased circuit provided on MLLN circuit at the same rate as has been used for pricing the domestic circuit vide 36th amendment i.e. 10%.

Return on capital employed

23. The annual return to an operator above and beyond the opex cost in this exercise has been considered at the same value as has been considered while fixing the domestic leased circuit price vide 36th amendment of TTO. A Weighted Average Cost of Capital (WACC) of 13.93% has been adopted in addition to depreciation.

(V) Tariffs for MLLN circuit

24. Based on the data and information submitted by various operators and also based on their detailed comments, the Authority is of the view that, at this stage there can be differential prices for the two types of circuits, i.e. those which are provided on classical system and those on MLLN system. Moreover, the networks provided on MLLN system require additional equipment and hence this justifies a differential tariff regime. The circuit provided through MLLN guarantees a higher rate of quality. Hence, the domestic leased line circuit provided through MLLN technology must be priced at a different level taking into account the incremental costs involved in providing such a circuit.

25. The Authority has noted that one of the cost components of providing the leased circuit is the modem cost. Different operators in their submissions have given different prices of the modem. Some of the operators are of the view that the modem cannot be left to the consumer to be procured, as it is system specific. Taking into account all the submissions made by operators the Authority has decided to keep the cost of NTU / CPE (modem) under forbearance. Thus it is not included in pricing of MLLN circuit. But the Authority is of the view that these modems must be provided on rental, with tariff for such equipment based on cost and reasonable recovery period. Therefore, this element would be part of the tariff filing requirements.

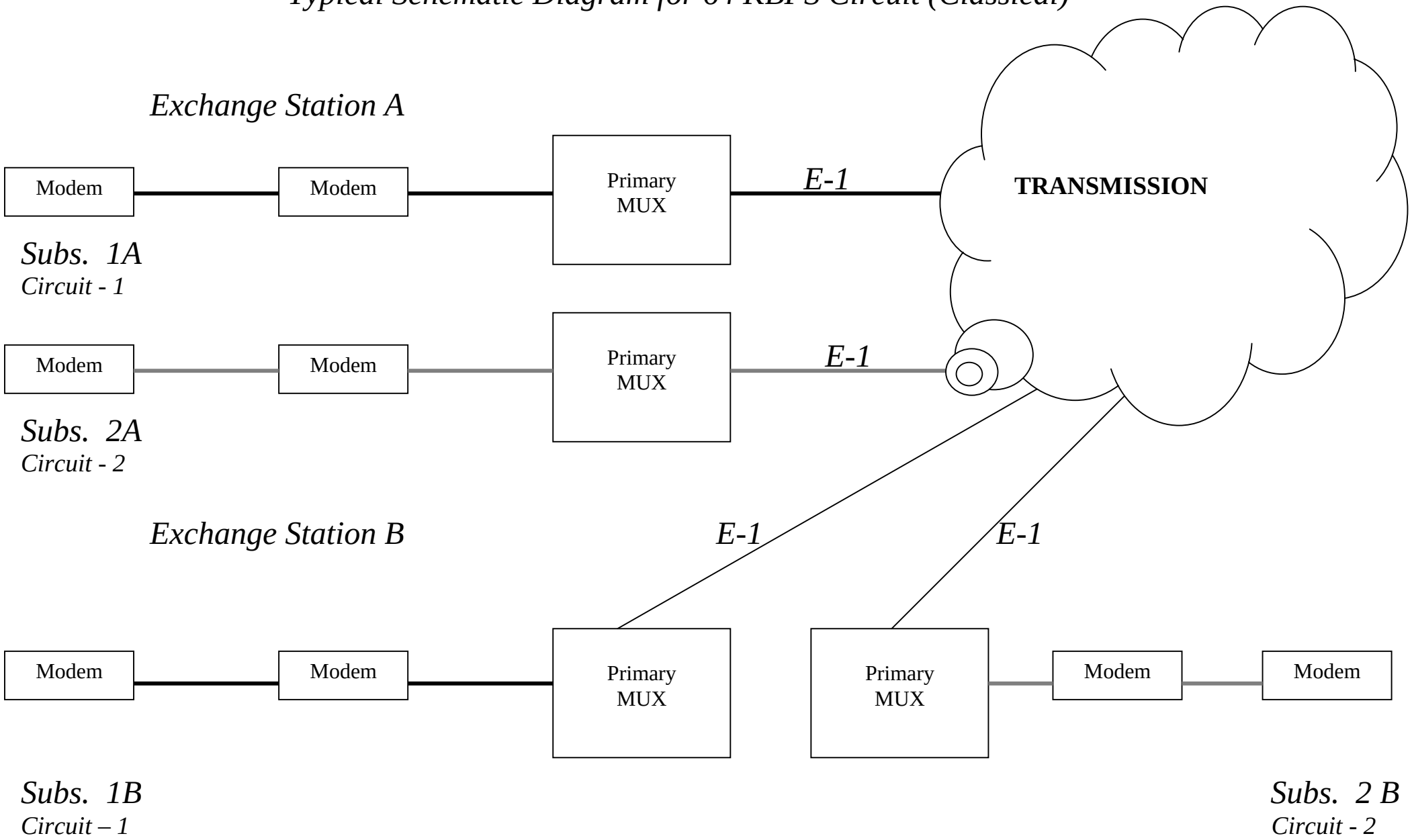
26. The complete distance wise ceiling tariff for 64 kbps circuits provided on MLLN technology is available in Annexure 5 to this order, which will form Annexure 5 to Schedule IV. The ceiling tariff for capacities above 64 kbps were set in the original TTO 1999 based on co-efficient multiples recommended by ITU (Recommendation D.8 of the International Telecommunication Union) for capacities of 128 to 960 kbps. As in the 36th amendment, these multiples have been adopted in respect of MLLN circuit in the current tariff order to only give specifications for multiples at 128 kbps and 256 kbps where the bulk of demand is present. These multiples are 1.8 for 128 kbps and 3.1 for 256 kbps. This is further supported by the fact that even though DXC and VMUX ports can be capable of N*64 kbps capacity, the overall maximum through capacity of that equipment is capped at a fixed value, whether circuits are sold as individual 64 kbps links or N*64 kbps. So the cost does proportionally increase as the capacity does, even though MLLN circuits are typically

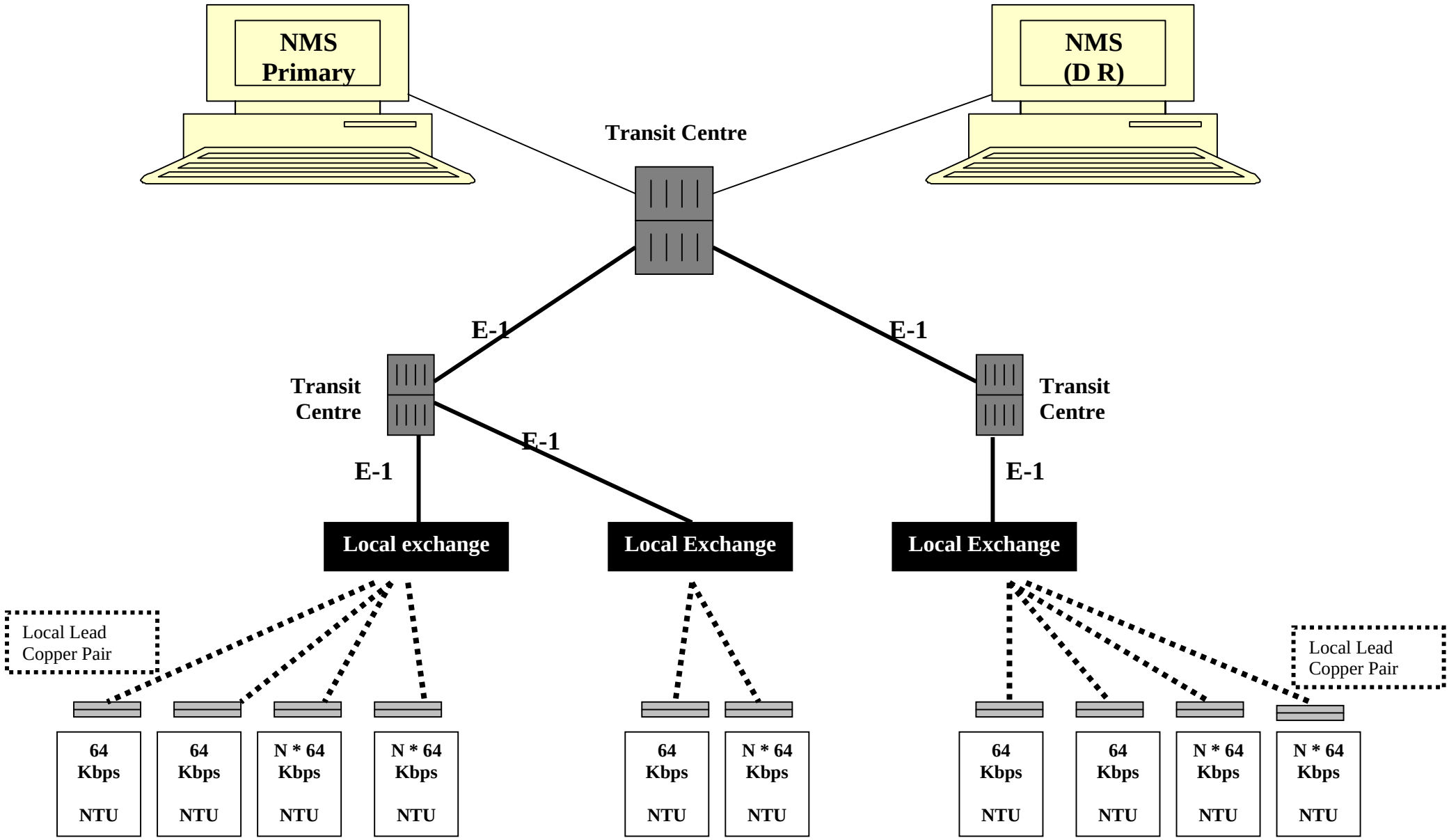
flexible in the bandwidth they offer. For capacities higher than 256 kbps and below 2 Mbps, the Authority has forborne specifying the multiples, which implies that service providers are given the flexibility to decide the tariffs for these capacities. It is noteworthy that the Authority had adopted the same method when it fixed tariff for lower capacities in the classical 64 kbps system up to 2 mbps notified vide its TTO's 36th amendment dated 21st April 2005.

27. The Authority will revisit the ceiling tariff after a year based on the prevailing market trends and other relevant factors at that time. It is also the view of the Authority that costs and capacity utilization of classical 64 kbps and MLLN based 64 kbps circuits should converge over time, eliminating the need to differentiate. As already mentioned in the 36th amendment that, if license fee imposed by the Government are decreased in the interim period as recommended by the Authority, the tariff would be adjusted accordingly.

Appendix - I

Typical Schematic Diagram for 64 KBPS Circuit (Classical)

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Appendix III

Cost data of additional equipment required for providing MLLN based DLC service Normated i.e. second lowest cost of equipment, among operators.

Fixed Cost for various network element for Domestic Leased circuit – MLLN (Using E-1 Capacity) in Rs.		
Item No.	**Fixed cost items**	**Normated**
1	V-MUX Equipment Cost (2 per circuit)	138780
2	Digital Cross-Connect Equipment Cost	27450
3	Network Operation & Management (NOC & NMS)	22500
Total		**188730**

Note:

1. Cost of Installation and Commissioning already included in the original cost estimate."
2. The Cost of equipment has been considered for using E1 capacity.

Appendix IV

Cost of additional equipments required for provision of MLLN leased circuit

Cost Estimate of 64 Kbps stream (Rs.)

		A	B	C	D
Item No.	**Cost of elements**	**Cost of 2 Mbps stream**	**Cost for 64 Kbps stream (A/30)**	**Capacity Utilization @ 25 % in respect of MLLN equipment**	**Cost for 64Kbps circuits**
I	**Fixed Cost**				
	Additional Costs for 64 Kbps MLLN				
A	Total cost of two V-MUX, one at each end of circuit (Rs. 138780 * 2)	277560	-	-	-
B	Annual recovery of V-MUX (@ 25.81%)	71638	2388	9552	9552
C	Annual recovery of Transit Center #	-	-	-	4994
D	Cost of Modems $	-	-	-	-
E	Operating & Maintenance Cost of V-MUX (@ **10 %**)	27756	925	-	925
	Total	**-**	**-**	**-**	**15471**

NOTE:

The calculations given above are only in respect of the additional equipments required for MLLN service. The costs incurred as part of the Basic network including the costs of equipment and Cabling etc. considered earlier in the 36th Amendment have been retained after making suitable adjustment for purposes of ceiling tariff fixation in respect of MLLN service.

For detailed calculations see Appendix - V.

$ Not included as it is kept under forbearance

Appendix V

Cost Estimation detail of Transit Center for 64 Kbps MLLN Stream (Rs.)

		A	B	C
Item No.	**Cost of elements**	**Costs**	**Cost for 64 Kbps stream with 25% utilization for MLLN Equipment (A / 0.25)**	**Cost for 64Kbps circuits**
I	**Fixed Cost**			
A	Total Cost of Transit Center MUX	27450	-	-
B	Cost per 64kbps circuit for Transit Center MUX (27450 / 30)	915		
C	Number of Transit Center MUX's used per circuit	4		
D	Annual recovery of Transit Center per Circuit (915 x 4 x 0.2581)	945	3779	3779
II	**Total Cost of MLLN NOC**	22500		
A	Cost per 64kbps circuit for NOC (22500 / 30)	750	-	-
B	Annual recovery of NOC per Circuit (750 x 0.2581)	194	774	774
C	Operating & Maintenance Cost of MLLN Equipment (@ **10 %) [(27450 x 4)+22500]**	13230		
D	Operating & Maintenance Cost of MLLN Equipment per 64 Kbps circuit (13230/30)	441	-	441
	Sub Total per 64 kbps circuit			**4994**