

**REPORT
OF
TASK FORCE
ON
GROWTH OF INTERNET
IN
THE COUNTRY**

**TELECOM REGULATORY AUTHORITY OF INDIA
A-2/14, SAFDARJUNG ENCLAVE
NEW DELHI-110029.**

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Executive Summary

TRAI constituted a Task Force to address the issue of slow growth of the Internet services in the country. Experts from MOC&IT, IIT, IIM, C-DOT, TEC and ISPAI were invited to contribute. The main objective of the task force was to prepare an Action Plan to achieve a faster growth of Internet in the Country and recommending an implementable methodology to facilitate the establishment of Internet Exchange Points (IXP) for peering within the country.

The deliberations of the task force, spread over six meetings during May – August 2002, identified the following:

1. Need for setting up of Internet Exchange in India for routing the domestic traffic within the country.
2. Enabling the availability of cheaper access devices and low cost indigenous PCs as well as the Internet enabled second hand PCs.
3. Policy initiatives like treating ISP services at par with telecom infrastructure, reduction of dialup access tariffs, permitting co-location, bringing down capital and operation costs of ISPs to encourage the Industry as well as to benefit the users.
4. Need for de-licensing of 2.4 GHz (ISM Band) for low power outdoor usage for last mile Internet Access as well as permitting the use of Receive Only Satellite access by ISP's without need for SACFA clearance and licensing.
5. Usage of alternative access technologies like Cable TV network and W-LANs as well as the simultaneous provision of Internet access along with voice in the local loop.
6. Facilitation of direct access by ISPs to the bottleneck facilities required for access to International Submarine Cables landed in the country.
7. Need for implementation of e-governance and provision of citizen services through Internet to encourage its wider usage.
8. Importance of local content development.

The main recommendation of the Task Force suggests setting up of much needed Internet Exchange Points (IXP) in the country to be named National Internet Exchange of India (NIXI) for better utilization of International bandwidth,

better service quality and as an incentive to host Indian content in India. It is recommended to be established with an initial one-time funding of Rs.5 crore from the Government and to be run on cost recovery and self-sustaining basis. A project proposal for such an exchange has been annexed to the report.

Report also pinpoints the action points by various agencies like Govt., Regulator, BSOs and ISPs for immediate necessary action on their parts. It is believed by task force members that such actions will certainly lead to much needed growth of Internet services in the country.

20th August 2002

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Telecom Regulatory Authority of India.
Convener, TASK FORCE
on behalf of members

Glossary of Terms used

C-DOT – Center for Development of Telematics

DIAS- Direct Internet Access Service

E1/R2- 2 Mb PCM stream with R2 signalling

GR- Generic Requirement of TEC

IAD-Integrated Access Device

IGSP- International Gateway Service Provider

IILP- International Internet Leased Port

IIXP- India Internet Exchange Point

ILDO- International Long distance Operator

IPLC- International private Leased Circuits

ISPAI – Internet Service Providers Association of India

IXP- Internet Exchange Point

KBPS- Kilo Bits Per Second

MOC&IT – Ministry of Communication and Information Technology

NAP- Network Access Point

NIXI- National Internet Exchange of India

NOCC- National Operational Control Centre

PSTN - Public Switched Telephone Network

QOS- Quality of Service

SACFA- Standing Advisory Committee on Frequency Allocation

TEC -Telecommunication Engineering Center, DOT

WPC- Wireless Planning & Coordination wing of DOT

1. Introduction:

Concerned about the insufficient growth of Internet services in the country, TRAI decided to set up a Task Force to address this issue involving experts from Ministry of Communication and IT, IIT Delhi, IIM Ahmedabad, C-DOT, TEC and ISPAI under the aegis of TRAI.

The constitution of the task force was as follows:

1. Dr. H.V.Singh, Secretary, TRAI	Chairman
2. Sh.S.N.Gupta, Advisor, TRAI	Convenor
3. Sh.Jatindra Kumar, Sr.Director, MOC & IT	Member
4. Prof.H.M.Gupta, HOD, IIT Delhi	Member
5. Dr.B.H.Jajoo, Prof. IIM Ahmedabad	Member
6. Sh.B.S.Chauhan, Div.Manager, C-DOT	Member
7. Sh.P.K.Singh, Director TEC	Member
8. Sh. Amitabh Singal, Secretary ISPAI	Member

In addition following experts from different organisations were inducted:

1. Sh.Sameer Sharma,	Dy. Advisor, TRAI, Co-ordinator
2. Gen. Malik,	ISPAI
3. Sh.M.K.Gupta,	CDOT
4. Dr.Govind,	MOCIT

The Task Force was mandated to suggest the implementable steps to be taken by various agencies to accelerate the growth of Internet in the country.

2. Terms of Reference

The Task Force was entrusted to undertake the following key tasks:-

1. Identify the reasons for the slow growth of Internet usage in the country.
2. Prepare an Action Plan to achieve a faster growth of Internet in the Country, comparable to what has been achieved in other countries of the region.
3. Study the best international practices of Internet Peering and Internet Exchange and to recommend a modus operandi to facilitate the establishment of Internet Exchange Points (IXP) for peering within the country.

3. Background

NTP 1994 had set the tone for introduction and licensing of various value-added services in the country and in due course, some service providers began offering E-mail services. The usage was mostly by corporates and based on X.400 platform, in addition some educational institutes and software units had basic access to Internet. Internet services were made available to public with effect from 15 August 1995 when VSNL, then the state-owned monopoly in the International Long Distance Operator (ILDO) started offering Internet services in 6 cities (Delhi, Mumbai, Chennai, Kolkatta, Bangalore and Pune).

On 6th November 1998, new ISP policy was announced to facilitate and encourage entry of private sector and other players in this field as ISPs. New packages, new locations and reduction in tariffs coupled with a few of new dotcom ISPs offering free access, fuelled the initial growth of Internet throughout the country. Corresponding growth in PC penetration and increase in tele-density also helped the case. While during 1995-1998, people used to access Internet because they had computers, by the year 2000 people began acquiring computers because they wanted to access Internet. Of late, the growth of Internet in the country has not kept pace with the expectation of various agencies.

TRAI started monitoring the Internet services in the country through Performance Monitoring Reports (PMR) from ISPs on quarterly basis. The figures obtained by TRAI indicate that subscriber base growth was 222% through the period March 2000-March 2001, which declined to 12% for the period March 2001-March 2002. It is evident that at this stage of development the above growth rate is not sufficient and therefore; special steps need to be taken to accelerate this. In this context, a brainstorming session was organised by TRAI involving major ISPs along with the representatives of the ISPAI.

During the above session, the various issues inhibiting the growth of Internet in the country were brought out and it was established that urgent steps are required to be taken by all concerned to stimulate the growth of Internet in the country.

The Authority there upon decided to form a task force on the line of High level Technical Committee, comprising of experts from Deptt. of IT, TEC, C-DOT, IIT Delhi, IIM Ahmedabad, ISPAI under the aegis of TRAI to address this.

4. Issues discussed and Steps Identified

The task force had six meetings, which were held on 15.5.2002, 22.5.2002, 19.6.2002 in TRAI, 04.7.2002 in C-DOT, 08.08.2002 and 14.08.2002 in TRAI. In addition a special meeting was held in TEC on 18.7.2002, to discuss the architecture and the project model for Internet Exchange Points (IXP) of India.

The task force recognised that the growth of Internet in the country is intrinsically linked with various factors including tele-density, PC penetration, literacy and language issues, availability of locally relevant content, Quality of Service and the overall value proposition vis-à-vis access cost of Internet as perceived by a common man.

The issues discussed and steps considered necessary to accelerate the growth of Internet Services were identified to be following:

- (i)** Setting up of Internet Exchange Points (IXP) in the country (starting with four metros) so that all the ISPs peer together for the purpose of routing the domestic traffic within the country, instead of taking it all the way to U.S. and back. This will result in cost saving as well as decongestion on the International Link, resulting in better Quality of Service for customers.
- (ii)** Popularizing the usage of cheaper inexpensive access devices for Internet. Steps are also required to reduce the cost of PCs through various duty concessions like concessions on Excise Duty, Customs Duty on components etc, and innovative technology upgradation including second-hand PCs to become Internet enabled through addition of modules for this purpose.
- (iii)** Reduction in the tariff for International Internet leased lines provided by various International Gateway Service Providers.
- (iv)** Reduction in Dial-up charges for Internet Access by BSOs.
- (v)** De-licensing of the 2.4 GHz (ISM) band for low power, short-range W-LAN applications and last mile Internet access.
- (vi)** Permitting Receive only satellite system by ISPs without the requirement of licensing and clearances from the Government agencies, except for the mandatory security clearance.
- (vii)** Formulation of Government policies and regulations to facilitate donation of used PCs by corporate entities, Government

organizations and higher educational institutions to schools, local colleges and community centers. The current policies are complex and de-motivate donors from undertaking such tasks. For corporate entities, tax concessions as available to R&D entities may also be considered for such donations.

- (viii) Co-location of ISP Nodes at BSOs' exchange premises to help the ISPs to save capital expenditure as well as operation and maintenance expenditure. This arrangement is a must to help the Internet to penetrate into the smaller cities and rural areas.
- (ix) Bringing ISP services under 'Infrastructure Category' to enable various concessions available under this to be applicable to ISPs.
- (x) Encouraging the usage of alternative access technologies like cable TV network and wireless based access for simultaneous voice and data to reduce the burden on PSTN dial up network and to provide better quality of service.
- (xi) Facilitating the usage of Internet for e-governance at state level.

5. Recommendations for Action Points:

In line with its mandate, Task Force recommends the following action points for various agencies:

For the Government(s)

1. National Internet Exchange of India (NIXI) should be set up in the country under the umbrella of an Industry representative neutral body including ISPAI. MOC&IT should facilitate this by one time grant for capital requirement and also the provision of space at nominal rent in four metros, to start with. The Government owned subsidiary providing Internet Services to be motivated to join the 'NIXI' (A detailed proposal for this purpose is annexed in the end of the report).
2. Receive only satellite system by ISPs should be permitted without the requirement of licensing and clearances from the Government agencies, including SACFA, except for the mandatory security clearance.
3. De-licensing of the 2.4 GHz (ISM) band for low power, short range outdoor W-LAN applications and last mile Internet access.

4. Facilitation of direct access by ISPs to the bottleneck facilities for access to International Submarine Cable Systems.
5. ISPs should be conferred the status of Infrastructure Industry similar to the one granted to Telecommunication Services. Since the ISPs have already been granted income tax exemption under Section 80(1)(A), additional concessional duties including those relating to custom duties etc. should also be made applicable. Further, taxation on Internet Services needs to be rationalized to prevent multiple taxation.
6. Economic incentives (higher rate of depreciation & lower customs duty for input components) should be considered to reduce the cost of Internet access devices.
7. Government should encourage setting up of Cyber Cafes in rural and remote areas by offering infrastructure facilities at subsidized cost and encouraging provision of soft loan facilities to such entrepreneurs.
8. Government policies and regulations should be formed to facilitate donation of used PCs by the corporate entities, Government organizations and higher educational institutions to schools, local colleges and community centers. For corporate entities tax concessions as available to R&D entities may also be considered for such donations.
9. Policies & plans should be formulated and implemented by Central Government (Department Of IT) for e- Governance applications providing citizen services through Internet at all the levels by suitable standardization & with an objective of increasing efficiency and improving citizens care.

For the Regulator (TRAI)

1. Tariffs for the domestic leased line including E1/R2 links as well as International leased lines including both Internet Leased Line Ports (ILLP) as well as IPLC should be rationalised and reviewed on the basis of costs.
2. BSOs should be directed to offer concessional tariff for Internet access over PSTN/ISDN during off-peak hours, to start with.
3. Recommendations to be sent to the licensor to issue facilitating guidelines in respect of direct access to submarine cables, permission of Receive Only Satellite System by ISPs, delicensing of 2.4 GHz (ISM) band.

For the BSOs

1. Co-location of ISPs equipment in telephone exchange premises should be permitted on commercial negotiation basis.
2. Innovative technical solutions like simultaneous voice and Internet services over wired as well as wireless local loop should be introduced to enable cheaper and faster Internet access over PSTN lines.

For ISPs

1. Subscribing to the National Internet Exchange of India (NIXI) (details at Annex 1) and supporting its operation through a neutral representative agency with continued goodwill.
2. Usage of alternate access technologies like cable TV, W-LAN etc. to increase the quality of service as well as to reduce load on PSTN dialup network.
3. Encouraging usage of alternative Customer Premises Equipments (Low cost indigenous PC's, Thin Clients, Web phones, IP access devices) in order to reduce the cost of Internet access devices.
4. Hosting up of portals and web sites in regional languages and development of local contents.
5. Spreading greater awareness about the Internet and its potential among the masses.

6. Bibliography

- 1) Internal Report of TRAI on Growth of Internet in the country
- 2) C-DOT's paper on "Service Provider Interconnection for Internet Protocol Best Effort Service"
- 3) TEC's GR/IXP-01/01.July 2000.
- 4) TEC's document on "Internet Lease Access Line Doubler"
- 5) ISPAI document on "Starting An Internet Exchange Point in India"
- 6) ISPAI's presentation on "Techno Commercial Proposal on Internet Exchange Point in India"
- 7) ISPAI's presentation on "Peering and Transit"
- 8) MOC&IT's document on "Internet Exchange"
- 9) Prof.Jajoo's document on "Hong Kong Internet Exchange"
- 10)TRAI's document on "Definition of NAP".
- 11)TRAI's presentation on "Internet Routing and Peering Status of Asia-Pacific Countries"

7. Annexes

1. Project Proposal on Setting up of Internet Exchange (IXP) in the Country.
2. Terms of Reference of Task Force.

**PROJECT PROPOSAL FOR SETTING UP OF
NATIONAL INTERNET EXCHANGE OF INDIA (NIXI)**

1. BACKGROUND:

The Telecom Regulatory Authority of India had constituted a Task Force to identify the main drivers for accelerating the growth of Internet and to suggest implementable steps needed to foster a higher rate of growth of the Internet in the country.

One of the tasks entrusted to this Task Force was to study the best international practices of Internet Peering and National Internet Exchange and to recommend a modus operandi to facilitate the establishment of Internet Exchange Points (IXP) (Similar to Network Access Points in USA) within the country.

This paper provides a techno-financial proposal for establishing Internet Exchange Points at four locations viz. New Delhi, Mumbai, Kolkatta and Chennai to facilitate interconnectivity amongst ISPs of the country.

2. INTRODUCTION

India has not been witnessing a sustentative growth in the use of Internet though there is an expectation of exponential growth over the next 3-5 years. The current Internet subscriber base in India is 3.3 Million and the user base can be taken as 16.5 Million assuming an average of 5 users per connection. The planned projection by Govt. is 230 Million users by the end of the year 2007. There are around 450 ISPs who have been

issued licenses to offer Internet services, out of which over 160 only are operational. With increasing use of Internet this number as well as the intra-India Internet traffic will grow. It is neither cost effective, nor manageable to interconnect all of Indian ISPs with each other individually for the purpose of exchange of domestic traffic locally. To enable this kind of interconnection a common peering point within the country is a must.

Establishment of an Internet Exchange Point (IXP) within the country can provide a solution to above. An IXP is a single physical network infrastructure, (often an Ethernet local area network) to which many ISPs can connect. Any ISP that is connected to the IXP can Exchange traffic with any of the other ISPs connected to the IXP, using a single physical connection to the IXP, thus overcoming the scalability problem of individual interconnections. Also, by enabling traffic to take a more direct route between many ISP networks and routing the domestic traffic within the country, an IXP can improve the efficiency of the Internet and reduce the latency, resulting in a better service for the end user and a lower access cost.

2.1 DEFINITION OF INTERNET EXCHANGE POINT (IXP) AND PEERING

(i) Internet Exchange Point (IXP): -

The accepted industry definition of an Internet Exchange Point for the purpose of this project can be taken as: -

“A network infrastructure operated by a neutral, not-for-profit entity with the purpose to facilitate the exchange of Internet traffic between Internet Service Providers (ISPs). The number of Internet Service Providers connected to an IXP required to be a minimum of three. There must be a transparent open and nondiscriminatory policy for any ISP to join the IXP”.

An Internet Exchange is a place for Internet Service Providers (ISPs) to Peer and Exchange IP traffic with each other at national level. In order to provide access to the 'global Internet', an Internet Service Provider (ISP) must, of course, have connectivity to the global Internet by itself and this connection should be totally independent of the connection made with the IXP.

(ii) Peering

Exchange of Internet traffic among two ISPs is known as 'peering' (hence IXPs are sometimes called 'peering points' or 'public peering points' and individual interconnections as described above are known as 'private peerings'). IXPs are not, generally, involved in the peering agreements between connected ISPs; whom an ISP peers with and the conditions of that peering are matter between two ISPs involved.

Whilst the role of IXPs is often invisible to the end user, they form a very important part of the overall infrastructure of the Internet in a country.

3. Basic Requirement for an IXP

With the exception of a small number of big ISPs having their own gateways, ISPs generally buy International Internet access (often called 'upstream connectivity') from one or more of the bigger ISPs. Due to the size of these networks, and their comprehensive interconnection with other networks, they can send and deliver Internet traffic to any network connected to the Internet; i.e. they have connectivity to the global Internet. It is this global connectivity that other ISPs buy and in turn sell access to the global Internet to their customers.

In a situation where there is a traffic meant to travel between a customer of one ISP to a customer of another ISP within the country, both ISPs

have to pay for upstream connectivity required to deliver and receive this traffic respectively. This is also the case even when both ISPs use the same upstream connectivity provider. Consequently, even for intra-India traffic, a lot of International bandwidth is consumed, which can be avoided resulting into decongestion of international upstream connectivity. Also this will reduce outflow of foreign exchange as payment to International Carriers for usage of their bandwidth for upstream connectivity by Indian ISPs.

In addition to reducing cost as above, in case two ISPs networks were domestically connected to each other, it will also reduce the amount of no. of networks ('hops') the traffic has to traverse resulting into less delays and reduced packet loss and hence better quality of service. Whilst upstream costs are reduced there is a cost involved in providing physical connection between the two ISP's networks, which must be considered while estimating the savings by having domestic interconnection between ISPs.

4. ADVANTAGES of “INTERNET EXCHANGE POINT” (IXP)

There are many areas wherein an “Internet Exchange Point” in India can help the consumer and country as a whole. The major benefits of IXP in the country will be as follows:

a) Immediate Benefits:

- 1) Improved Quality of Service to the consumer by reducing the delays and data loss.
- 2) Saving in the Foreign Exchange Expenditure on International Bandwidth by the country.
- 3) Cost reduction for Internet access services.
- 4) Resultant Growth of internet in the country.

b) Subsequent Benefits

- 1) Developing and promoting use of Internet for business, residential and e-governance applications through a collective effort of all members of the Internet exchange.
- 2) Enhanced reach offering Internet access across the country enabling users to get the benefits of e-governance.
- 3) Increasing the presence and visibility of ISPs, via Exchange web site portal providing the necessary information to ISPs throughout the world looking to connect to an Indian ISP and also, by representing the members at industry and government events. The increased presence helps ISPs increase their spread and service areas.
- 4) Providing the necessary “Confidence” to the market indicating a commitment from the Government as well as Industry towards increased usage of Internet.
- 5) Providing guidance to, ‘new comer’ or ‘looking to expand’ ISPs in starting new services.

5. INTERNET EXCHANGE POINT MANAGEMENT

Most of the Internet Exchanges in various countries are non-commercial co-operatives funded by membership fees paid by the subscribing ISPs and are operated for the benefit of the member ISPs and the Internet community at large. The membership fees are usually comparable with the amount of potential saving in upstream connectivity costs. The actual saving will depend on the cost of membership and amount of traffic that can be domestically exchanged in relation to the ISPs total traffic.

By function, an Internet Exchange normally is a not-for-profit, neutral and independent association meaning that it has no bias as to who connects to it (provided they meet the membership criteria) and its operational

decisions are not influenced by any financial motive. Normally the Govt. provides the initial grant for setting up of such an Exchange which should run on a self sustained, cost recovery basis subsequently. Generally, the functioning of such Exchange is managed through a neutral body having representation from various stakeholders.

6. National Internet Exchange of India (NIXI) and its organisation: -

With the objective of making available cost effective and quality Internet access to Internet users, TRAI's task force on Internet growth recommends setting up of an IXP in India, with facilitation by Govt. of India. This IXP is proposed to be known as "**National Internet Exchange of India (NIXI)**" being a national infrastructure.

'NIXI' should be a non-profit neutral organisation duly registered under the laws of India as a section 25 establishments without any profit motive. Its memberships should be open to all ISPs who wish to connect to this. In the initial phase "NIXI" is proposed to be deployed with four exchange points at Delhi, Mumbai, Kolkatta and Chennai.

The Task Force is of the view that the 'NIXI' should also be registered as "Other Service Provider (OSP)" like Data Centres etc. with the Department of Telecom.

Initially, "NIXI" is proposed to be a domestic exchange, which should facilitate the growth of Internet penetration in India and also help in removal of degradation in the form of higher latency caused due to inefficient management and international routing of domestic Internet traffic.

In National interest, the Govt. may need to take necessary steps to motivate its subsidiaries such as MTNL, BSNL, VSNL, ERNET & NICNET etc. to join the `NIXI`.

6.1 It is proposed that `NIXI` be operated and managed by following teams:

(i) **Executive Board:** comprising of 5-7 honorary members who should be representing relevant Ministries, Regulator, Industry Association Body and Academecia.

(ii) **Operating Team:** The Operating Team comprising of professionals should manage the daily operational activities of the Exchange. It should also act as a 'contact point' for the member ISPs and should handle all relationship with the various agencies. It may also make recommendations for future improvements and upgradation to the Executive Board. It should also advise Exchange Executive Board on the advancements in technology and new business opportunities.

6.2 General Body Meeting: After the initial period of operation when the Exchange is run on a self-sustained basis, a General Body Meeting, in which all subscribing members have a seat, may be held twice a year. During this members should be informed of major upgradations planned to take place at Exchange. All members of Exchange should have voting rights for decision making on major issues. This body should also direct the Executive Board on major policy issues.

Executive Board meetings, where all members of the executive board and representative of Operating team are present, should take decisions based upon the recommendation of the operating team as well as the directions of the general body meeting.

7. NATIONAL INTERNET EXCHANGE OF INDIA (NIXI) LOCATIONS & INFRASTRUCTURE :-

To address the needs of Indian market, it is suggested to have a distributed and redundant architecture with deployment at four metro locations i.e. New Delhi, Mumbai, Chennai and Kolkatta. These locations will be interconnected for enabling the routing of inter-ISP traffic only and will not carry any intra-ISP traffic.

The equipment of Exchange shall consist of fully duplicated Ethernet switches at each location, interconnected by Backbone Routers for Inter-Exchange Connectivity to form a ring architecture. ISPs are to be connected to Exchange, using 10/100 Mbps access over Ethernet.

7.1 NIXI Architecture: -

The generic layout of a NIXI node will be as per Figure 1 below:-

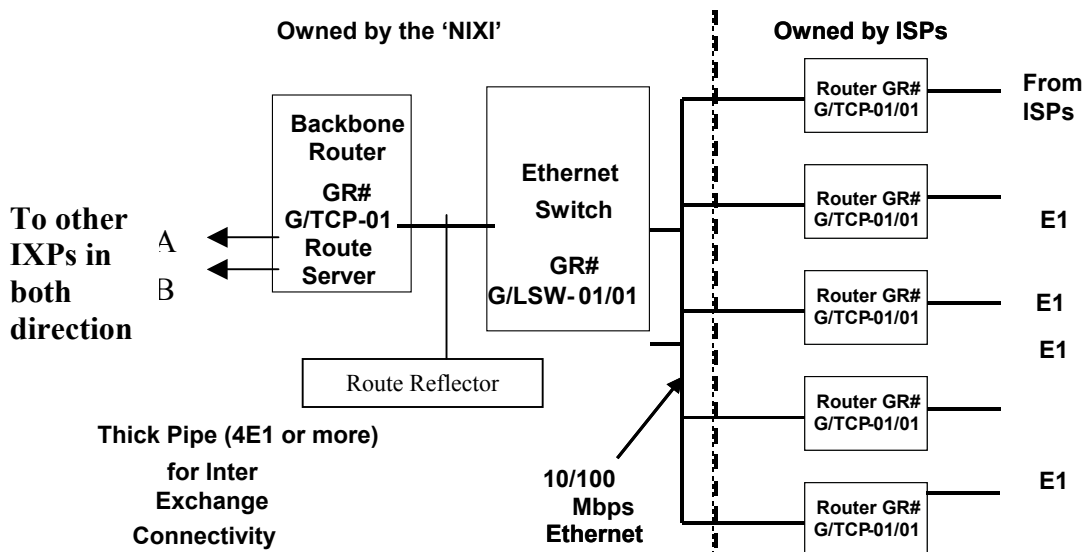
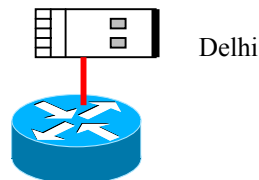


FIG.1

The network architecture of 'NIXI' connecting four nodes at Delhi, Mumbai, Chennai and Kolkatta is proposed to be as follows:



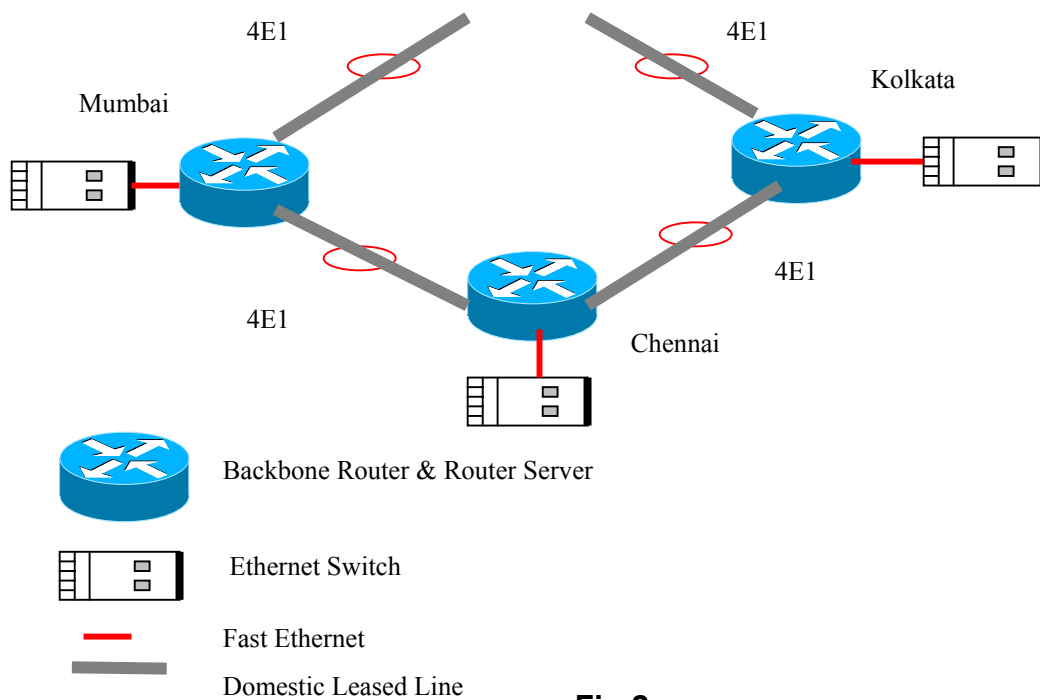


Fig.2

7.2 Equipment Specification: -

The requirements of all the equipment to be deployed are to be based upon respective TEC GRs as following: -

- ⇒ **Duplicated Ethernet Switch: GR#G/LSW-01/01**
- ⇒ **Backbone Router: GR#G/TCP-01**
- ⇒ **Route Server: GR#G/TCP-01**
- ⇒ **Routers to be owned by ISPs connecting to Exchange: GR#G/TCP-01/01**

The fully duplicated Ethernet switch: will be deployed and all ISP routers will connect to this switch over Ethernet. Initially it will be switching at layer 2 with provision of Layer 3 switching in future. The switches at each location will be configured with 48 ports each to address connectivity of upto 48 independent ISP connections initially, which should be upgradeable in future. The Ethernet ports should be sufficient to handle any connect capacity required by the ISP. Additional ports can be added if the Exchange intends deploying co-located servers for additional

applications and also for connecting additional ISPs as the Exchange grows.

The Backbone Router: will be used for interconnecting with other exchange locations and will not be used for Intra-ISP traffic transfer. At a later date, if the Exchange so needs, it can permit ISP traffic between exchange nodes at a predetermined charge. For such deployments, configuration of the backbone router can be suitably upgraded to address the bandwidth requirements. In the beginning the backbone router can be configured with a capacity of 4E1s (8 MBPS) connectivity in each direction.

ISP owned Routers: It is recommended that all A category ISPs should connect with a minimum of 2 E1 connectivity. B category ISPs can be connected via a minimum of one E1 connect. C category ISPs can connect via a shared E1 connection among 3-4 similar ISPs or can also have the option of connecting to the router reflector/server.

Router Reflector/Server: It is recommended that the C category ISPs can be offered an option to connect to a “Router reflector/Server” so that they do not have to invest in skilled manpower to peer with each of the other member ISP. Instead, the Router Reflector/Server can provide peering at a single point with the other ISPs. It will save a lot of duplicated effort. Since the functionality utilized will be of BGP peering only, it is recommended to use “Router” based reflector rather than Application based Server. The same GR as that for backbone router can be used for this.

Other Equipment: The center will also have additional equipment in form of administrative terminal (s), PCs, Fax, Telephone etc.

Physical Location: It is suggested that the four exchange points be located at Government owned premises, preferably near to some local Telephone Exchange. The premises should be equipped with power, air-conditioning, security and access control on a 24 hours basis.

8. NATIONAL INTERNET EXCHANGE OF INDIA-REVENUE STREAMS: -

'NIXI' can have the option of offering a wide variety of services ranging from basic connectivity to advanced statistical analysis and monitoring. It is recommended that 'NIXI' offers basic connectivity services to begin with but provide a clear roadmap of additional services that can be offered. Following is an indicative list of various options: -

8.1. Basics : (To be initially available)

- a) Connectivity: -
 - Physical E1 connectivity.
 - Peering among individual ISPs.
- b) Contractual Maintenance: -
 - Annual maintenance of connections and ISPs routers.

8.2. Advanced : (To be available during future upgradation).

- a) Route Server Services: -
 - Specifically for C category ISP's.
- b) Web Based Information: -
 - Publish information about members.
 - Offer link to ISP from IXC web site.
- c) NTP Servers: -

- All ISPs need clock information for synchronization with other carriers. IXP can deploy a Stratum 1 Server and provide Stratum 2 NTP connections for a fee.
 - If required, the service can be started as a basic requirement itself.
- d) Secondary TLD DNS Server: -
- IXP can connect a secondary DNS server for India's TLD directly. It will speed up access; look-ups and this service can be offered at a fee.
 - IXP can explore options to host "in" services and similar applications.
- e) WWW Proxy/cache: -
- ISPs can pool WWW Proxy/Cache resources via the IXP hosted Proxy/cache server.
- f) Multicast Server: -
- Video based content is expected to increase as the penetration and acceptance of Internet grows among Indian businesses. IXP can then host Multicast server to help peer "multicast" based traffic among member ISPs.
 - Service can be offered on select basis also.
- g) Content Co-location: -
- ISPs can co-locate their content and/or server at IXP site for marketing their services including rate lists, promotional schemes and other similar activities.
 - IXP can also tie up with one or multiple IDCs to host the content and connect exchange site through dedicated and redundant links for this service.
- h) Route Policy Registry: -

- ISPs can register their peering policies and related information at a central site located at the IXP.

- i) Inter Exchange Services: -
 - Offer inter-exchange bandwidth services within India.
 - Provide Exchange facilities to ISPs from SAARC region.
 - Link up with other International Exchanges to offer ease of peering to Indian ISPs and vice versa.

- j) Statistical Analysis and Monitoring: -
 - As the networks grow, most ISP will be interested to analyze the traffic flowing through their peering points and may want to modify their policies, business practices and promotion schemes accordingly. IXP can offer Statistical Analysis Tools and Services using industry standard options.

8.3 Recommendations regarding Annual fees and Charges: -

- (i) ISPs to connect to Internet Exchange with a minimum of following: -
 - a. ISP-A should connect at all 4 nodes and with 3 E1
 - b. ISP – B nodes to connect with a minimum of 1 E1
 - c. ISP – C to connect with a minimum of 1/4 E1 (fractional E1)

- (ii) One time joining fees to be paid by each member to build a Corpus to be used for expansion and additional services to be added subsequently.

9. Financial Estimate for Internet Exchange of India

9.1

A. Equipment Cost – per Exchange Node (Rupees in Lakhs)

i) Backbone Router including Route Reflector	65.00
conforming to TEC GR No. G/TCP-01	
ii) Fully Duplicated Ethernet Switch conforming to	
TEC GR No. G/LSW-01/01	15.00

iii) Racks for ISPs routers & accessories	4.00
iv) Warranty charges @ 10% of capital cost for Router & Switch for the first year-	8.00
B. Other equipment per node PCs + Phone + Fax + Printer	3.00
C. Physical Infrastructure per node	
i) UPS System – 10 KVA UPS and battery backup for 2 hrs including Gen Set, 20KVA	10.00
ii) Civil, Furnishing, Electrical and Air Conditioning Works	5.00
iii) Fire Detection & Alarm System and Fire Fighting Apparatus	2.00
iv) Pest Repellent System	0.50
v) Miscellaneous Expenditure including contingency and insurance and pre-operative expenses	5.00
Total Capital Expenditure per Exchange Node	117.50
Capital Expenditure For 4 Exchange Nodes	470.00

Assumptions:

(i) The accommodation is to be provided by the Govt. through their agency, STPI at nominal rent.

(ii) Routers to be owned by ISPs are not included in above estimate

(iii) Warranty Charges for the first year are included

1st Year of Operation

9.2 Operating Expenses Ist Year (Per Exchange Node)	(Rs. In Lakhs)
A. Manpower Cost (Operating team)	20.00
B. Bandwidth for interconnecting NIXI nodes (4 E1)	44.00
C. Telecommunications & Travel etc.	4.00
D. Rent for each Node at STPI @ Rs 30,000 pm	3.50
E. Electricity, Water, Stationery etc	6.00
F. Miscellaneous Expenditure on Managerial Honorarium, Audit, Pantry etc.	5.00
Total Operating Expenses per annum per exchange node	82.50
Total Operating Expenses For 4 Exchange Nodes	330.00
Depreciation @ 15% of Capex	70.50
Grand Total- Ist Year Expenditure	400.50

Assumption: It is assumed that 50% discount over the Tariff Cap Set by TRAI will be obtained from the Bandwidth Providers.

9.3 Revenue Streams: First Year

Pricing for Basic Services (Lakhs of Indian Rupees)

Assumptions:

Number of ISP connections: Category A/B/C @ 3/1/0.25 E1 connections

Delhi : 8/5/8 = 21 = 31 E1s

Mumbai: 8/5/8 = 21 = 31 E1s

Chennai: 8/5/8 = 21 = 31 E1s

Kolkata: 6/5/8 = 19 = 25 E1s

Total 82 = 118 E1s

A. One Time Joining Fee to be charged from ISPs

@ Rs. 1.75 Lac per E1 for a no. of 118 E1 **206.50**

B. Recurring Fees (annual)

i) Charges for each Peering per ISP @20,000

Assumption each ISP peers with 4 others

Total peers = 328 (82x4) (approx.)

i.e. total charge will be for 656 peers

as charges to be paid by both ISPs

131.20

ii) Annual Fees @ Rs. 2,00,000 per E1 (118)

236.00

iii) Annual Maintenance Charges for connection & routers

@ 10,000 per E1 for 118 E1s

11.80

One Time Joining Fees

206.50

Total First year Revenue

379.00

For 4 Exchange Nodes

Total First year Revenue

For 4 Exchange Nodes

189.50

for an average of 6 months during the first year

9.4 The Glance : The First Year of NIXI (Rupees in Lakhs)	
A. Expenses	
Total Capital Expenses	470.00
Operating Expenses	400.50*
Total	870.50
B. Revenue	
Initial One Time (from ISPs)	206.50
Total Annual Revenue for 4 Exchange Nodes	189.50
Total	396.00
C. Government Grant Proposed	500.00
D. Brought Forward	-
E. Capital at Hand	25.50
B+C+D – A	

Assumption: Revenue for half the duration (average of 6 months) is taken during first year.

* Includes Depreciation of Rs.70.50 lakhs.

2nd Year of Operation

9.5 Operating Expenses 2nd Year	(Rs. in Lakhs)
Total Operating Expenses For 4 Exchange Nodes (First Year)	330.00
Assuming 20% increase in expenses from previous year	66.00
Maintenance Cost – for 4 Nodes Average 10% of value of equipment / assets / machinery	47.00
Total Operating Expenses	443.00
Depreciation @ 15% of Capital Cost	70.50
Grand Total – 2nd Year Expenditure	513.50

Assumption: No major Expansion is considered.

9.6 Revenue Streams: Second Year	
Pricing for Basic Services (Lakhs of Indian Rupees)	
Assumptions:	
Number of ISP connections: Type A/B/C @ 3/1/1/4 E1 connections	
Delhi :	2/1/4 = 7 = 8 E1s
Mumbai:	2/1/4 = 7 = 8 E1s
Chennai:	2/1/4 = 7 = 8 E1s
Kolkata:	1/2/4 = 7 = 7 E1s
Total	28 ISPs with 31 E1s
Net Total	ISP (82+28) with (118 + 31) E1s
A. One Time Joining Fee to be charged from ISPs	
As per the below assumptions	
@ Rs. 1.75 Lac per E1 for 31 new E1	54.25
B. Recurring Fees (annual)	
i) Last Year Recurring + New Connections	
Charges for each Peering per ISP @20,000	
Assumption each ISP peers with 4 others	
Total peers = 440 (approx.) (82*4 + 28*4)	
i.e. total charge will be for 880	
as charges to be paid by both ISPs	176.00
ii) Annual Fees @ Rs. 2 Lakhs per E1 (118+31)	298.00
iii) Annual Maintenance Charges	
@ 10,000 per E1 for 118+31 E1s	14.90
One Time Joining Fees	54.25
Total Annual Revenue	
For 4 Exchange Nodes	488.90

10. Conclusion: -

As have been brought out in the proposal setting up of Internet Exchange in the country is an immediate national necessity. Most of the developing countries in the neighborhood like Pakistan, Sri Lanka, Thailand, Malaysia, Hong Kong, Singapore already have one or more than one IXP.

Setting up of 'NIXI' will result into various tangible benefits for Internet Users as well as for the country as a whole, as have been brought out. The cost of Internet Connectivity and bandwidth would be reduced and Quality of Services improved resulting in spread of Internet in the country in addition to the increased customer satisfaction.

'NIXI' will also result into better Internet infrastructure for country and saving of Foreign Exchange on International Bandwidth; this in turn will result into increased Internet penetration and overall development of E-Commerce and Economy.

Therefore, an all out effort is required by the Govt. as well as industry to establish 'NIXI' at the earliest.

**TERMS OF REFERENCE (TOR)
FOR**

TASK FORCE ON GROWTH OF INTERNET IN THE COUNTRY

Objective

The objective of forming this task force is to identify the main drivers for accelerating the growth of Internet and to pinpoint implementable steps needed to foster a higher rate of growth of the Internet in the country. A copy of the “Action Plan for accelerating growth of Internet in the country” prepared by TRAI (CN Division), which is relevant, is attached.

The terms of reference of the task force are given below.

Terms of Reference (Scope of work):

1. Identify the reasons for the slow growth of Internet usage in the country.
2. To prepare an Action Plan to achieve a faster growth of Internet in the Country, comparable to what has been achieved in other countries of the region.
3. Study the best international practices of Internet Peering and Internet Exchange and to recommend a modus operandi to facilitate the establishment of Peering Network Access points (NAPs) in the country.

Project Completion Schedule:

The Task Force shall be required to complete its work within two months.

Coordination At TRAI

Secretary, TRAI will be the chairman of the task force. Advisor (CN) will be the nodal officer at TRAI for the purpose of coordination and the convener.

Constitution of the Task Force:-

Organization

Nominee

TRAI	Dr. H. V. Singh Secretary Mr. S. N. Gupta Advisor (CN)	-Chairman -Convener
TEC	Mr. P.K. Singh, Director (ID)	
CDOT	Mr. B.S.Chauhan, Divisional Manager	
IIT Delhi	Prof. H. M. Gupta, Head of Electrical Engineering	
IIM, Ahmedabad	Prof. B H Jajoo	
ISPAI	Mr. Amitabh Singhal, Secretary	
Deptt of IT	Jatinder Kumar, Senior Director	

Reimbursements:-

Outstation Members will be reimbursed economy class airfare. They will also be paid an honorarium of Rs. 1000/- per diem, if they are not working with Government. Arrangements for their stay in Delhi will also be made by TRAI, if necessary.