



FROM: Raunak Maheshwari, Extreme Infocom Pvt Ltd
TO: Shri Sanjeev Kumar Sharma, Advisor (Broadband and Policy Analysis),
Telecom Regulatory Authority of India
RE: Consultation paper on ***Regulatory Framework for Promoting Data Economy Through Establishment of Data Centres, Content Delivery Networks, and Interconnect Exchanges in India***

Dear Sir,

Extreme Infocom is operating Extreme IX (www.extreme-ix.org) - one of India's leading Internet Exchange Providers.

Extreme IX is serving peak traffic of about 1.5 Tbps (www.extreme-ix.org/technical/statistics/) in 35 Points of Presence across 5 cities - Mumbai, Delhi NCR, Chennai, Hyderabad and Kolkata.

We're committed to bringing India up to speed and making India a global hub for internet content, services and apps by providing world class peering solutions across all states of India.

We are honored to participate in this consultation process and we are really impressed with the initiative TRAI is undertaking. It shows a great responsibility toward developing the Digital India of the future!

You can find our comments on the questions related to IXP - from Q.38 to Q.46 in the following pages.

Kind Regards,

Raunak Maheshwari
Executive Director
Extreme IX

Q.38: Do you think that presently there is lack of clear regulatory framework/guidelines for establishing/operating Interconnect Exchanges in India?

A.38.1: In the past, TRAI had recommended creating a separate class license for IXPs. There is no evidence to show that this was accepted by DOT. It is clear that the Government of India wants to keep Interconnect Exchanges free of any licensing. Yet, due to lack of clarity in the current regulatory frameworks (example UASL, IP1 etc) for accommodating operations of Interconnect Exchanges in India, DOT reached an interpretation that traffic exchange in an IXP is covered by UASL-ISP license. Extreme IX challenged this interpretation in its writ petition in Hon'able Delhi High Court which has ordered a stay while final decision is pending. Our view is that current regulatory frameworks should be expanded/changed to accommodate requirements of operating an Interconnect Exchange

A.38.2: Operating IX under UL ISP Class license is not feasible, due to multiple reasons:

- IXP can be considered as a Closed User Group (CUG) service - traffic exchange between users of specific AS numbers and not general transit to the Internet. There is an explicit prohibition for ISPs to provide CUG services in the Indian UL ISP Class license.
- Although it facilitates exchange of IP traffic, IXP is a simple Layer 2 ethernet service, thus is not essentially an Internet service on its own.
- Potential conflict of interest between the IXP who is acting as an ISP and ISPs, who are supposed to be members of the given IXP. Reduced neutrality.
- There is no such practice of IXP operating under ISP license across the globe

Q.39: What policy measures are required to promote setting up of more Internet Exchange Points (IXPs) in India? What measures are suggested to encourage competition in the IXP market?

A.39.1: It is of utmost importance to have a regulation clarity regarding IXP operations in order to address the fear, uncertainty and doubts of many of the members of the Indian peering ecosystem – TSPs, Content Networks, Academia and Enterprise segment. The regulatory framework shall be simple, inclusive, providing ease of doing business in order to allow flexibility of business models suitable for a large and diverse country like India.

A.39.2: Addressing the leased line cost issues for Tier 2 and Tier 3 cities as per the detailed explanation in our response to Q.44. Providing incentives in the form of leased line costs reimbursement or mandate to Government controlled entities like BBNL, BSNL, MTNL, RailTel and PowerGrid to provide IXP connectivity for free or at nominal rates.

A.39.3: Mandate BBNL, BSNL, MTNL, RailTel and PowerGrid to share facilities like Data Center and dark fiber with IXP.

A.39.4: Mandate, incentivize or encourage otherwise all relevant government controlled entities to participate in IXP - E-government Agencies and Services, Academic and Educational Institutions, Enterprises like Ticketing, Banking, etc.

Q.40: Whether there is a need for separate light-touch licensing framework for operating IXPs in India? If yes, what should be the terms and conditions of suggested framework? Do justify your answer.

A.40.1: We support the EU licensing model – license or any other form of explicit approval shall be required only in case of scarce resources (like spectrum or numbering capacity) or in case of risk for the health of the population (copper networks that carry electricity for instance). In all other scenarios there are no explicit approvals required - it is either free to operate or requires a simple registration via General Authorization. The EU model mandates all fees collected from operators outside charges for scarce resources to be cost-oriented and not used as a revenue stream from the Government.

A.40.2: IXP facilitates/aggregates an activity that is already unlicensed by nature – the peering between different AS networks. AS number allocation doesn't require any license, thus there are many unlicensed IP networks in India. It's perfectly legal and even encouraged for two unlicensed networks – a big cloud provider like Google and a big university like IIT - to peer directly without any regulatory interference.

A.40.3: As the direct peering between members is not regulated, we don't see the value of introducing a specific license for aggregation of such unlicensed activity at specific meet-me locations - IXP PoPs.

A.40.4: While IXP is not a telecommunication service per se, it requires deeper integration with telecom infrastructure in order to provide optimal services. Especially important are the access to facilities required to connect the members as well as connect the different PoPs of an IXP. In essence, the IXP requires guaranteed access to cross-connect facilities in a Data Center as well as access to dark fibre infrastructure (IP1) between the data centres in order to build a redundant and distributed architecture in a cost efficient manner.

A.40.5: In our opinion the ideal solution would be to provide an IXP framework without introducing a specific IXP license. Let operation of an IXP remain unlicensed activity, but expand existing TSP regulations (UL/IP1/DC) and guidelines in order to mandate current license holders provision of critical facilities required for a flourishing IXP ecosystem:

- IXP operators shall have the explicit right to build distributed exchanges spread across multiple DCs. This is crucial for scalability, efficiency and utility of an IXP. All large exchanges in the world are spread across multiple DCs with cross connections between them.
- International members shall be explicitly allowed to connect directly to IXP in India. This is key in order to make India a global hub, similar to Singapore and Hong Kong. ILD and International Gateway operators shall honour connection requests from foreign companies to Indian IXPs.
- Access to IP1 dark fiber infrastructure is a must-have for IXPs to scale across different DCs in addition to the classic leased line solutions. IXP shall have granted RoW for connecting their facilities between the different DCs.
- IXP has the right to share Data Center, fiber network and similar infrastructure with Government controlled operators like BBNL, BSNL, MTNL, RailTel and PowerGrid. This is especially important for developing IXP operations outside big Metros and Tier 1 cities, where such infrastructure is scarce.
- All DCs in India shall provide unrestricted access to cross-connect facilities to the IXP and its members. DCs shall honor the RoW of IXP willing to connect its PoPs outside of the given DC.

- IXPs shall have the right to provide a cache-fill capacity (NLD, ILL, etc) for caching/edge nodes for CDNs who are willing to participate in such a way. IXP then shall be able to recover the cost for the cache fill by charging extra from ISP members, willing to get such “premium” traffic. This is crucial for bootstrapping an IXP in Tier 2 and Tier 3 cities, where CDNs do not have their own Node and are unwilling to invest in creating one yet.

A.40.6: In case a light-touch class license is to be adopted, we suggest a General Authorization model, which is based on the following key principles in addition to the specific requirements from the previous point - A.40.5:

- Any legal entity can apply by submitting a simple application form. Once the form is submitted, the entity may start operating an IXP immediately, without waiting for an explicit approval.
- No AGR applicable. As there’s no AGR involved when Google peers directly with IIT, there should be no AGR when they do so via an IXP.
- There should be no technical specifications and requirements. The industry is self-regulating well enough with global standards and improvements emerging at a high pace. Technical regulation cannot add significant value, while significantly slowing down innovation and futuristic development.
- No mandate for content filtering or similar law enforcement facilities at IXP level. IXPs are usually tiny organizations working for nominal port fees. The service is provided via simple Layer 2 Ethernet infrastructure, capable of carrying terabits of traffic, most of which is encrypted. It’s not feasible for IXPs to invest in expensive Layer 3 DPI equipment, able to process the terabits of traffic passing. A proper content filtering policy for content and services located abroad shall rely primarily on comprehensive filtering facilities at the limited number of International Gateways operated by India’s largest TSPs in case of. Resources located in India can be addressed with direct content/service take-down notices to India-based content providers even without participation of TSP/ISP/IXP.

Q.41: What business models are suitable for IXPs in India? Please elaborate and provide detailed justifications for your answer.

A.41: India is a vast and diverse country, thus all business models are viable. In our opinion, no specific model shall be treated more or less favourable than others. There are different markets with different market realities, different challenges, different stages of development and different rates of development. Having a variety of business models available is the only way to serve the different regions accordingly.

Q.42: Whether TSPs/ISPs should be mandated to interconnect at IXPs that exist in an LSA? Do justify your response.

A.42.1: IXP operations will definitely benefit from a Government mandate for interconnection at IXP, especially for Government controlled entities like BBNL, BSNL, MTNL, RailTel and PowerGrid.

A.42.2: Yet, we believe that understanding the reasons for TSPs not joining IXP is way more important. Once their issues are resolved, most TSPs will have a natural interest in joining as many IXPs as possible without an explicit mandate.

A.42.3: The largest TSPs in India are already participating in many IXPs abroad, so they’re clear about the benefits of a working IXP. Yet the same TSPs are not joining the local IXPs in India at will. We will try to summarize the main factors below.

A.42.4: The main reason is that there is a much bigger variety of Content Providers/CDNs present in international IXPs, compared to India. India has a relatively low number of big international Content Networks. Most of those Content Networks are already providing caching/edge nodes and private peering to big ISP/TSP in India, thus making their participation in local IXP redundant. “Why do I have to join an IXP, when I have direct access to the same content already?” is the notion at all major TSPs.

A.42.5: In order to have a robust IXP ecosystem, the Government shall encourage the long tail of mid-sized and smaller Content Networks to come to India and join the local IXP ecosystem. Those networks don't have the power of big CDNs, thus not able to provide caching/edge servers to individual TSPs, thus will naturally provide their services primarily through IXP. Variety of unique CDNs will provide a compelling reason for big TSPs to join local IXP, instead of carrying the same traffic from abroad.

A.42.6: The encouragement to international content networks shall be complemented by a stable framework that creates a predictable environment for content, services and apps. Sudden bans of some of the world's most popular apps like PUBG Mobile and TikTok may send wrong signals to the international community of Content Providers who may prefer to avoid India on the grounds of unpredictability.

A.42.7: The second reason for big TSPs not joining local IXP in India is the fear that local peering is cannibalizing their ILL wholesale revenues. This shall be addressed with proper communication, demonstrating the upside from a well-developed local peering ecosystem. If the only concern remains the ILL wholesale revenues, the quality of the Indian Internet will suffer greatly as most of the resources will keep coming from outside India and introducing congestion and delays.

A.42.8: In order to arrive in India, such small and medium sized international Content Networks will require international transit services from the same TSPs, basically reversing the business model. Currently a CDN stays abroad, peers with Indian teco. The Indian telco then carries this traffic on it's own cost to India, and charges local ISPs in India for this transit. When the IXP ecosystem develops in India the business model will invert - Content Networks will pay to big Indian TSPs for international leased circuits from abroad to India, thus establishing their own Indian PoP. Indian ISPs will then get free access to this no Content Network via IXP. Basically TSPs will stop being paid by ISPs in India, but will start being paid by international Content Providers.

A.42.9: Having a vibrant content peering ecosystem will increase the variety, speed and quality of service for Indian end-users, thus increasing their consumption. More users will use more data, so Indian TSPs will do more revenue from their higher-margin retail business at the expense of less revenue from their lower-margin wholesale business.

Q.43: Is there a need for setting up IXP in every state in India? What support Govt. can provide to encourage setting up new IXPs in the states/Tier-2 locations where no IXPs exist presently?

A.43: Yes, it is required to have even multiple IXPs in every state in India. IXPs are a natural catalyst for building a strong and healthy peering ecosystem. In order to overcome the digital divide between different states and territories of India, it is necessary to have a robust local peering ecosystem in every region.

Q.44: Whether leased line costs to connect an existing or new IXP is a barrier for ISPs? If yes, what is the suggested way out? What are other limitations for ISPs to connect to IXPs? What are the suggestions to overcome them?

A.44.1: In big metros and Tier 1 cities leased line costs are not a major concern. In such markets there is a well-developed ecosystem of local connectivity providers, including IP1 dark fiber vendors. In those cities, it is essential for the IXP to distribute its fabric across many DCs in order to be present at a short dark-fiber distance from every ISP.

A.44.2: Leased line costs are probably the single largest barrier for establishing a sustainable interconnection exchange point in Tier 2 and Tier 3 cities, where both cost and availability of such facilities are an issue.

A.44.3: A typical regional ISP will have only one or two options for point-to-point link by some of the largest TSPs in India. As large TSPs see independent peering as an existential threat to their ILL wholesale business, it is likely that TSP will either refuse a circuit to an IXP (on fuzzy regulatory grounds) or provide prohibitive pricing, drastically reducing the financial benefit of the local ISP connecting to an IXP.

A.44.4: In order for an IXP to attract local ISPs, it is critically important to connect the most significant Content Networks like Google, Facebook and Akamai in a newly established exchange point. These Content Networks are usually supportive for launching of a new regional IXP and are providing the required caching/edge servers. Unfortunately, IXP has to cover the OPEX for providing the cache back-fill capacity required until the given Content Networks decide to open a dedicated Node in the region.

A.44.5: In a typical scenario the caching servers provide around 70% Byte-Hit-Ratio, thus 30% of the total cache output has to be procured as either NLD (for most content) or ILL (for some content). It is not sustainable to cover the variable cost of expensive leased circuits via the fixed monthly port fees, thus IXPs are forced to charge local ISPs an additional bandwidth-based fee. This not only decreases the financial benefit of member ISPs to join an IXP but creates a regulatory uncertainty too.

A.44.6: In order to reduce the burden of leased line costs in early stages of Tier 2 and Tier 3 city IXP development, it will be wise to provide incentives and support to all members of the ecosystem. It can be in the form of either full or partial reimbursement of the connectivity fees incurred by the stakeholders or by mandate to Government controlled entities like BBNL, BSNL, MTNL, RailTel and PowerGrid for providing free or nominally charged IXP connectivity services. Such incentives can be valid for the first 3 to 5 years of a new IXP or until a certain capacity threshold at the given exchange is reached – i.e. 50Gbps of exchanged traffic or so.

Q.45: Is the high cost of AS number allocation an impediment for small ISPs to connect to IX? If yes, what is the suggested way out?

A.45.1: Yes, the high expenses for having AS and independent IPv4/IPv6 space can be an impediment for small ISPs to connect to IX.

A.45.2: Using private AS numbers will not resolve the problem as the global providers deny bilateral peering arrangements for members with private AS.

A.45.3: The Government of India can think of different schemes for reimbursement of APNIC fees to small and new ISPs for a given time period - 3 to 5 years. Alternatively It can reduce their expense by lowering the license fees, especially the AGR for Internet Service Providers.

Q.46: What other policy measures are suggested to encourage investment for establishing more number of IXPs? Any other issue relevant with IXP growth may be mentioned.

A.46.1: Loan guarantees and similar schemes for IXP for purchase of relevant equipment. IXPs usually are small entities who are unable to provide the needed collateral in order to fund tier expansion both capacity-wise as well as circle-wise, thus a help from the Government in the form of a loan guarantee will be both cheap and impactful way of supporting the ecosystem.

A.46.2: Strong support for wireline ISP operations, as those ISPs are the main beneficiaries of well working IXPs. Initiatives like FTTH incentive schemes and removal of AGR for ISP License holders will provide a strong incentive to small and regional ISPs to invest further and increase the fixed line broadband penetration outside of structured areas of big metros and Tier 1 cities.