BIF RESPONSE TO TRAI CP ON 'REGULATORY FRAMEWORK FOR PROMOTING DATA ECONOMY THROUGH ESTABLISHMENT OF DATACENTRES, CONTENT DELIVERY NETWORKS, AND INTERCONNECT EXCHANGES IN INDIA'

BACKGROUND

Digital communication infrastructure ecosystem comprises of Content Delivery Network (CDN) service providers, Data Centre operators, and Interconnect Exchange (IXP) providers. The International Telecommunications Union (ITU) defines Digital Infrastructure (as provided below) in their report on 'Digital Infrastructure Policy and Regulation in the Asia-Pacific Region'[1] to include other essential critical elements that are key to the operation of Data centres & Cloud Infrastructure .

"Digital infrastructure is the key to enabling the benefits of the digital economy and society. Digital infrastructure is the physical hardware and associated software that enables end-to-end information and communications systems to operate. Digital infrastructure includes: - Internet backbone including national and trans-oceanic fibre cables; - Fixed broadband infrastructure such as analogue coaxial and optic fibre cable networks; - Mobile communications infrastructure and networks including FWA, transmission towers, radio and optic fiber backhaul networks; - Broadband communications satellites; - Data and cloud computing facilities; - End user equipment such as mobile handsets, PCs, modems and local Wi-Fi and Bluetooth networks; - Software platforms including computer and mobile device operating systems as well as application programming interfaces; and - Network edge devices such as sensors, robots, autonomous and semiautonomous vehicles, and other Internet of things facilitating devices and software.

Digital public goods are public goods in the form of software, data sets, AI models, standards or content that are generally free cultural works and contribute to sustainable national and international digital development. India is pioneering the concept of digital public goods that **enhance the ease, transparency and speed** with which individuals, markets and governments interact with each other. All these elements viz. Data Centres, Content Delivery

[1] *Available at* https://www.itu.int/en/ITU-D/Regional-Presence/AsiaPacific/SiteAssets/Pages/Events/2019/RRITP2019/ASP/ITU_2019_Digital_Infrastructure_5Sep2019FNL.pdf (September 2019).

Networks & Internet Exchanges are all essential part of the Public Goods/Digital Public Goods Based on market forecasts and trend analysis, by 2022, video content will constitute 80% of all internet traffic (Cisco) worldwide. Based on the same study it was estimated that there would be one million minutes of video data traversing the internet per second (Cisco). India's data consumption is growing at a tremendous 72% CAGR (Assocham-PwC). While current interest skews towards pre-recorded and uploaded content such as movies and TV shows, the world of live streaming is taking the internet by storm.

We note that the global video streaming market size is anticipated to reach USD124.57 billion by 2025, according to a new report by Grand View Research, Inc., registering a 19.10% CAGR during the forecast period. News networks, sports coverage, and interactive gaming currently dominate. However, businesses and social user-generated live streaming (e.g. TikTok) are not far behind. All this user demand for video and live streaming increases the requirement for robust CDNs to transmit content efficiently. Indeed, the global CDN market size is expected to grow from USD 14.4 billion in 2020 to USD 27.9 billion in 2025, at a CAGR of 14.1% during the forecast period.

The importance of CDNs is well established through the market data available. Together with Datacentres and Internet Exchanges, they are extremely vital for growth of Digital Infrastructure. It is important that the availability of these elements viz. Datacentres, CDNs and Internet Exchanges is all pervasive and not restricted to only Tier-1 cities as at present. However, to enable this, the entire ecosystem for their presence is made available beyond Tier1 cities and in different States and smaller cities so that it provides boost to digital economy everywhere and the success of Digital India.

Separately, an allied concept to the establishment of data centres, CDNs and IXPs is that of 'universal public service'. It has been noticed that the digital divide in India between the 'haves' and 'have-nots' is rising as we, as a society, place greater reliance on new and emerging technologies. Accordingly, the philosophy of universal public service must be interwoven with regulatory oversight and initiatives for the establishment of digital infrastructure in order to take corrective measures against the current digital divide, wherever required. However, Regulation must be preferably ex-post and not ex-ante as the latter tends to be stifling and anti-innovation. Regulation should also be 'light-touch' so that it permits innovation to prosper but at the same time the Regulator may be permitted to intervene whenever required to take corrective measures in case of market failure, lack of adequate competition, perceptible consumer uneasiness and potential harm so that it acts as a deterrent instead of a market barrier. Light-touch Regulation should be such that it should ensure 'Digital Agility'. Since we are at a nascent stage of our journey towards becoming a Digital Economy giant, we should ensure that Regulation is kept to a bare minimum. and is flexible enough to permit innovation and competition.

Additionally, we acknowledge the need to establish more data centres. However, we believe that there should be no mandated requirement of setting up data centres. Rather, the Government should facilitate the creation of data centres, particularly in smaller towns and tier-2 cities in an organic manner. However, keeping in view the humungous power requirements and other allied requirements of data centres, even for a medium sized data centre, we believe that we also need to strike a balance between establishing data centres and meeting the challenges arising out of the demands for power, water and real estate.

We definitely need to incentivise (and not mandate) initially and gradually phase them out, once we start getting results.

As regards IXPs, we believe that the National Internet Exchange of India (***NIXI***) can play an important role in facilitating the establishment of IXPs in smaller towns and cities and can also play a significant role in spreading the concept of universal public service vis-à-vis digital public goods, as discussed above. Further, we believe that the Government needs to encourage and galvanise NIXI even more than what it is already doing. Additionally, since private IXPs are mostly coupled with internet service providers (***ISPs***) (i.e., through an integrated model), it should be ensured (for example, through a suitably designed regulatory framework) that such private IXPs do not discriminate between their co-hosted/co-located ISPs, when it comes to peering and transiting traffic from other ISPs other than their partner–ISP. Considering the expected high increase in traffic,

Keeping in view the significance of data centres, CDNs and IXPs, we now seek to answer the questions posed by the Telecom Regulatory Authority of India (***TRAI***) in the Consultation Paper on 'Regulatory Framework for Promoting Data Economy through Establishment of Data Centres, Content Delivery Networks, and Interconnect Exchanges in India' (***Consultation Paper***).

Q.1: What are the growth prospects for Data Centres in India? What are the economic/financial/infrastructure/other challenges being faced for setting up a Data Centre business in the country?

BIF Response

Basically, Data Centres fall in two categories depending on functionality:

1. Core data centres for primarily video, and repository of large enterprise information as well as disaster recovery. These are termed Tier IV centres, and need huge power, water resources and multiple redundancies. Their numbers required are comparatively small (say 200 in 10 years. We are talking about very large centres, consuming 20-40 MW power)
2. Edge Data Centres, located close to the points of consumption. These again are defined by end-use, one being data for enterprises and Government, and the other for video caching and buffering.
3. In addition, data centres at landing points/international fibre connection locations, coupled with Internet exchanges for inland distribution.

Planning and scaling of Data Centre and associated infrastructure depends on anticipated traffic flow. And to cater to traffic for next 20 years. While the base infrastructure for DCs can be planned for the long term, the provisioning can be as per traffic demand. However, the core networks (and access networks for edge DCs) need to be planned for the long terms.

It needs to be borne in mind that traffic requirements in the future will be enormous, assuming the demand and planned expansions in content delivery and data access happens. Studies in developed countries indicate a stunning 1000-fold increase in bandwidth to cater to the demand. Multi-terabit cores will be needed, and networks of today need to be future proofed for this kind of growth, and new networks planned today have to be planned to this scale. It follows that DCs size will grow exponentially. At one point, YouTube was expanding at 10,000 servers per month. Thus, edge servers for CDN in particular will have to be the size of today's large DCs.

Q.2: What measures are required for accelerating growth of Data Centres in India?

BIF Response

It is essential that a national data & video plan is made out earlier. Based on the demand estimate, one needs to calculate the numbers and sizing. This is bound to be large. It can only be served by all stakeholders building the infrastructure together: OTT/Content distributors; large public data operators and independent CDNs need to expand to multiple times their current size in India. For this, there have to be fiscal and other incentives. All the large DCs need a lot of power (from two different sources) lot of land and water. This can only be provided by the State Governments, who need to become stakeholders. The model of TIDCO/SIDCO in TN, whereby the Govt. Co. provides a large land bank and other facilities can be followed for this.

Typically, the Indian experience has been that DCs have a 10-year payback period. This is beyond the scope of all but the richest corporates, considering an investment of 1-4 Billion USD each. We will need innovative financial models to deal with this.

Q.3: How Data Centre operators and global players can be incentivized for attracting potential investments in India?

Q.4: What initiatives, as compared to that of other Asia Pacific countries, are required to be undertaken in India for facilitating ease of doing business (EoDB) and promoting Data Centres?

Q.5: What specific incentive measures should be implemented by the Central and/or the State Governments to expand the Data Centre market to meet the growth demand of Tier-2 and Tier-3 cities and least focused regions? Is there a need of special incentives for establishment of Data Centres and disaster recovery sites in Tier-2 and Tier-3 cities in India? Do justify your answer with detailed comments.

BIF Response

Today's DC operators have bootstrapped themselves, with some outside funding. Their sizes are adequate for mid-size DCs, and well suited for multiple edge servers. Almost none of them can manage the large setups. But they are a vital part of the system, and their expansion needs to be helped. The new development bank being planned by GOI can take part in the funding.

As for cable operators, their fibre resources are not up to the highest international standards needed for DCs. They can of course upgrade their networks for distribution from edge DCs to end customer. These can be FTTH networks. Here again, unless they are recognised as infrastructure companies, funding will be a problem. Consolidation is happening in the cable sphere, and it is expected that MSOs will sell out and become network managers and customer-facing entities.

Much more important is the design and implementation of large capacity core fibre. This has to be multi-terabit in size. A few of the core networks which are new can be upgraded, but otherwise new networks have to be laid. Also, a census of available fibre (including Bharatnet and private Telco cores) needs to be taken up to decide how much of this can be used in the new system. Even Bharatnet, extrapolated to ten years hence, will need enormous capacity- 600,000 villages each with 1 Gbps!

The Indian data centre market is a critical element of the nation's digital supply chain and is evolving rapidly. The growth of this sector, while certain, is contingent upon a local enabling ecosystem that can support the expedited rollout of data centre capacity.

The momentous growth of the local market for digital services, especially during the Coronavirus pandemic, has highlighted the need for greater data centre capacity in India. Market forces have already led to the development of many data centres across the nation, however, as highlighted by the TRAI, there is an urgent need to consider mechanisms that can help the data centre market to scale to meet the ever-increasing demand for internet and digital services.

The growth prospects of data centres are significant, as noted in the Consultation Paper, and the sector will be a significant driver of the digitalization of regions across India, as well as the development of a capable technical workforce. In addition to the direct economic effects of data centre deployments across the nation, we believe that significant spill-over benefits will also manifest throughout the economy. A 2018 joint study conducted by Oxford Economics, revealed that Google's data centres generated *"$1.3 billion in economic activity, $750 million in labour income, and 11,000 jobs throughout the United States."* It also found that each data centre job supported "*an additional 4.9 jobs throughout the United States (for a national jobs multiplier of 5.9)"*, and that "*when economic activity from all channels is considered, the jobs multiplier attributable to Google's data centres at the state level ranged from 3.3 in South Carolina to 4.6 in Georgia*."[2] Another study from the same year on the economic effects of data centre investment in Ireland revealed similar insights. It found that data centres in Ireland had contributed Euro 7.13 billion to the national economy since 2010, as well as induced far reaching spill-over effects throughout the nation. Most notably, the study identified the

[2]*Google Data Centres - Economic Impact and Community Benefit, April 2018, Available at* https://www.oxfordeconomics.com/recent-releases/d8d830e4-6327-460e-95a5-c695a32916d9

creation of a local digital ecosystem, development of innovation clusters, increased demand for and impact of education and exports to have significantly benefitted because of data centre investments.[3]

Thus, it is clear that investments in data centres and in the development of supporting infrastructure is critical for growing digital economies and also acts as a significant growth engine for local economies.

However, there are certain key issues (listed below) that need to be addressed as a pre-cursor to the growth of data centres.

- **Data localisation and law enforcement access to foreign data:** The Consultation Paper notes that data localisation will enable India to become a data hub. Further, the proposed data protection law in India, i.e., the Data Protection Bill, 2021 (***DP Bill 2021***) empowers the Central Government to exempt companies that only process personal data of foreign nationals not present in India from the purview of the law. According to the TRAI, this provision can incentivise companies to invest in data centres. That said, we note that the draft law does not expressly consider the case where personal data may be located in India due to localisation requirements, but could be subject to the laws of the country in which such data has originated. This implies that the DP Bill 2021 does not have safeguards that prevent government access to data of foreign nationals stored in India. The absence of this can result in a scenario where the protections provided to personal data in other countries are overridden, potentially affecting compliance with data protection laws in other jurisdictions, etc. This may also impact the ability of cloud service providers to locate their servers in India since foreign jurisdictions may bar them from doing so on account of privacy and security concerns. This can consequently undermine India's goal of emerging as a data processing hub, as well as impact the ease of doing business. In light of this, we request the TRAI to raise this issue before the Ministry of Electronics and Information Technology (***MEITY***).
- **Incentives to foreign companies and stakeholder-inclusion:** The Consultation Paper has elaborated on the different incentives (both fiscal and non-fiscal) provided by States across India to promote the setting up of data centres. However, such incentives should equally be extended to foreign companies looking to establish data centres in India. This will enable ease of doing business and contribute to India's efforts of emerging as a data hub. Further, since foreign companies can become key investors in domestic data centres in India, the TRAI should ensure that they are equally involved in public deliberations and consultations on all future regulatory and policy initiatives to promote data centres and other digital infrastructure.

Additionally, we note that data centres face several other challenges in the Indian market, ranging from high costs of reliable power, unavailability of land, and access to reliable fibre connectivity (such as dark fibre). The successful management of data centres is also contingent upon the availability of a multi-disciplinary workforce that can adequately address the security, power, facilities control and cooling management concerns unique to the sector. IT

[3] *A Study of the Economic Benefits of Data Centre Investment in Ireland, 2018, IDA Ireland, Available at* https://www.idaireland.com/newsroom/publications/ida-ireland-economic-benefits-of-data-centre-inves

service providers also find it challenging to identify and rollout data centres in appropriate locations in India, mostly because of a lack of access to sustainable and critical resources in a cost effective manner. In this regard, we propose certain key measures (listed below) that would help bolster the growth of data centres in India.

Incentivising investments and accelerating the growth of data centres

At the outset, as noted by the TRAI, numerous States across India have already announced a broad range of incentives to support the construction and operation of data centres. A similar basket of fiscal and non-fiscal incentives, as has been approved by these States, must be adopted by other States to build data centre hubs throughout the nation, and support the goals laid out in both the National Digital Communications Policy, 2018 as well as the National Broadband Mission.

We believe that while India needs more data centres, there should be no mandatory requirement of setting-up data centres. Instead, the Government should facilitate creation of data centres, particularly in smaller towns and cities in an organic manner. However, as noted earlier, keeping in view the humungous power and other requirements of even a medium sized data centre, we believe that we should strike a balance between promoting and establishing data centres and meeting the challenges arising in relation to the same, such as the demands for power, water and real estate. Initially, while promoting data centres, the Government may consider incentivising (and not mandating) the establishment of data centres. The Government can gradually phase the incentives out, once the sector is well-developed. The incentives which the Government may consider adopting and introducing are as follows:

- Fiscal incentives such as promoting FDI, tax breaks and duty concessions, subsidized land and power, patent/copyright reimbursements, internet leased line subsidies and others would immensely benefit the business case for data centre deployment and incentivize investments from both domestic and global service providers.
- Non-fiscal incentives such as inclusion of data centres in the 'essential services' list and providing them with an 'infrastructure status', relaxed building norms, flexible labour laws and hardware import norms, single-window clearance systems, sharing of telecom infrastructure, such as passive infrastructure, by IP-1 companies, setting-up high quality fibre connectivity, delivery of subsidised power on priority, continuous access to electricity and water, etc. will all ensure investors have confidence in their ability to effectively manage data centres on the ground.[4]

[4]Please note that lessons can also be learnt from initiatives taken by Singapore to promote itself as a data centre hub. Singapore has become data centre hub because of the following factors: (i) extensive subsea / submarine cable networks, skilled workforce, low rates of natural disaster, a stable political environment, relatively lower tax rates, and a business-friendly eco-system; (ii) Data centre parks are fully equipped with adequate infrastructure such as dual power feeds, redundant systems of cooling and network path diversity, supporting infrastructure that is scalable for "plug and play" deployment, and readily available tracts of land; (iii) established standards for data centres for better energy management and information security; and (iv) innovative and sustainable cooling solutions for data centres located in tropical locations to promote low energy consumption and reduce carbon footprint.

- Certain other incentives can also be introduced to promote data centres in India. For example, the Government can enable the creation of dedicated and pre-provisioned data centre parks or data centre economic zones (akin to the Singapore model).

    - Regulatory relaxation can be granted to such parks vis-à-vis stringent regulatory and legal requirements, including exemptions from law enforcement access to data stored in a data centre owned and operated by a foreign company or service provider.
- Additionally, the wide range of incentives announced by States such as Gujarat, Maharashtra, Odisha, Telangana, Uttar Pradesh and West Bengal must be encouraged as templates for other States to follow to incentivize local investments in data centres. In fact, the implementation of such incentives has already spurred other States to begin framing their own state policies. For instance, Telangana was one of the first States to announce its own data centre policy in 2016. Since then many other States have also done so, with Tamil Nadu being the latest entrant in November 2021.

Further, we note that a vast majority of data centres are currently located in tier-1 metropolitan areas, however, the shrinking of the 'land bank' and the increasing pressure on the power supply is making tier-1 cities unsuitable to build and maintain data centres. Given that access to the internet has now spread to tier-2 and tier-3 cities/towns, this has created new locations for disaster recovery and edge data centres in such cities and towns. Thus, in order to ignite growth engines in India, relevant stakeholders should consider locating external disaster recovery sites for data centres in tier-2 and tier-3 cities/towns, while also accounting for demographic advantages offered by them (such as low land costs and labour expenses). Hosting data centres and disaster recovery sites in such cities/towns will help meet the demands of disaster management, pave way for expansion of the data centre market in low priority/less-preferred States of India, as well as promote deeper penetration of optical fibre and internet connection in unserved and underserved areas.

In light of the above, we recommend the constitution of a 'central task force' to engage with State Governments to sensitize administrators to the benefits of promoting the development of a data centre market within their respective States, as well as provide incentives suitable for local data centre deployment and management. The same may be affected through the use of a central-level data centre policy, as may be formulated after adequate consultation with the public and industry stakeholders.

We also recommend the development of an index to measure data centre readiness and rank States based on availability of supporting infrastructure and forward-looking policies and incentives to invest in the development of data centres and associated infrastructure.

Q.6: Will creation of Data Centre Parks/Data Centre Special Economic Zones provide the necessary ecosystem for promoting setting up of more Data Centres in India? What challenges are anticipated/observed in setting up of new Data Parks/zones? What facilities/additional incentives should be provided at these parks/zones? Do give justification.

BIF Comments

Data centre parks and special economic zones can be useful vehicles to incentivize the development of data centres at scale. This is because of the facilities that are usually offered to companies to set up data centres within such parks. For example, these parks offer a "plug and play" model by providing data centre operators with the necessary infrastructural support and the ability to scale their operations within short timelines. We believe that such benefits should be coupled with the regulatory support that is usually provided to special economic zones – such as tax exemptions and single window clearance systems.[5]

Further, considering the intended scope of data centre parks and zones, significant investments are a necessary condition for successful implementation. Attracting such investments requires long term regulatory clarity, and States promoting data centres must implement policies and incentives that give investors the confidence to undertake the development of data centre projects.

We believe that these policies and incentives may additionally factor in the following considerations: assessing seismic and climatic conditions of the geographic location for these data centre parks; pproviding concessional rates for acquiring land within the parks; ensuring proximity to local CDNs / IXPs; ensuring grant of permission for private captive power plants to self-manage electricity requirements; enabling ease of access to telecom infrastructure (such as optical fibre networks) without the need to enter into agreements with telecom service providers (***TSPs***); and promoting access to rights-of-way and establishing common service ducts and utility corridors for fibre connectivity.Further, due to the emissions profile inherent in the operation of a data centre park, it is recommended to locate such facilities far away from densely populated area so as to not negatively affect the environment, but close enough to benefit from access to the skilled workforce living within cities. States rich in renewable energy resources must also evolve mechanisms to make available alternative renewable and clean sources of energy to help data centres, particularly data centre parks, improve their emissions profile. Further, while we acknowledge that such mechanisms would be more relevant for data centre parks than individual data centres, we believe that these incentives and access to new technologies, where available, must be made available to all data centres – regardless of whether they are situated in a special economic zone or not.

Given the scale of data centre parks, it also recommended that key strategic locations be identified across North, East, West and South India for data centre parks that serve the economic interests of not only the States they operate in, but also induce spill-over effects in neighbouring regions, and maximize the economic impact that accrues from such investments.

[5] *Available at* http://sezindia.nic.in/cms/facilities-and-incentives.php.

Q.7: What should be the draft broad guidelines to be issued for Data Centre buildings, so as to facilitate specialized construction and safety approvals?

Q.8: Is there a need to develop India-specific building standards for construction of Data Centres operating in India? If yes, which body should be entrusted with the task? Do provide detailed justification in this regard.

Q.9: Till India-specific standards are announced, what standards should be followed as an interim measure?

BIF Comments

The Government can assist in the promotion of the setting up of data centres by providing best practices to help design data centre facilities. These best practices can relate to the following areas: recommending data centre building designs and details (such as single-story, etc.); having a draft floor plan ready for use, as well as rack space layout, after estimating the general space and power requirements of a data centre building; providing an assessment of the level of fault tolerance for each design specification; ensuring appropriate planning and placement of critical building systems (such as security systems, power sources, ventilation and cooling systems, etc.) and recommending disaster recovery sites.

Further, we recommend the use of established global standards (such as the 'EN 50600' standard / certification for the construction of data centres), till such time that a set of India specific standards are designed and announced. The Bureau of Indian Standards may be requested by the TRAI to develop said standards.

Synergy between the nomenclature used in the Indian standards with international standards should also be maintained so as to avoid confusion and ease the decision-making process. In fact, the compatibility between the 'Bharat' and 'Euro Stage' norms for private transport may serve as a useful template for the development of India specific data centre standards.

Q.10: Should there be a standard-based certification framework for the Data Centres? If yes, what body should be entrusted with the task?

Q.11: Should incentives to Data Centres be linked to the certification framework?

BIF Comments

We recommend the use of a standard based certification framework for data centres in the country. A certification framework will enhance competition among data centres and will incentivize the roll out of higher tier services over time. However, the said certification

framework must be implemented in a manner that does not disincentivize small data centres from developing.

Further, while we recommend the use of a standard based framework, we believe that the coupling of incentives conferred to data centres, if improperly implemented, may act as a disincentive for smaller data centres. It would be critical for the growth of the Indian data centre market to ensure that the most impactful incentives be extended to all – regardless of certification.

Q.12: Are there any specific aspects of the disaster recovery standard in respect of Data Centres that needs to be addressed? If so, then provide complete details with justification.

BIF Comments

The two fundamental DR site options are: internal and external. A Data Centre company itself sets up and maintains an internal site, while an external site is maintained by an outside provider. Companies with large information requirements and aggressive recovery time objectives are more likely to use an internal DR site. The internal site is typically a secondary DC and allows a company to recover and resume operations following a disaster at the primary DC. But this secondary physical DR site involves investments in additional DC space, connectivity, and servers. This leads to additional Opex pertaining to power, cooling, site maintenance, and manpower requirements.

External DR sites are cost-effective where an outside provider owns and operates an external DR site. External site options are hot, warm, and cold sites:

a. At a hot site, an organization has access to a fully functional DC with hardware and software, personnel, and customer data, and is ready to operate in the event of a disaster.

b. A warm site is an equipped DC but does not have customer data. Additional equipment is installed to introduce customer data when a disaster occurs.

c. A cold site has the infrastructure to support IT systems and data, but no technology until an organization activates DR plans and installs the equipment.

There can be various disaster scenarios for which the companies and organizations should be prepared beforehand. The outages can range from a simple application failure to the disaster of the whole Data Centre. Data Centre operators in the northern part of India are running into new challenges posed by the impact of earthquakes and frequent seismic activity. It is worth noting that seismic activity is a concern for anyone building a new DC in northern and northeast regions. (This has been solved in the US -and also in Japan_ where DCs are located in special buildings designed to withstand seismic activity. San Francisco is an example) Disaster Management is one of the top priorities for all organizations to lay specific emphasis

while choosing building designs, location, and standards for a Data Centre. Disaster mitigation plans should include provisions to address earthquakes, floods, tsunamis, or any other natural/technological/man-made disasters for the setting up of Data Centres.

While setting up a new DC, the site should be as protected and made as resilient as possible, and secondly, the Data Centres require sufficient server capacity to ensure a high level of operational performance and allow to scale up or scale-out, depending on the requirement. Considering these factors, external DR sites for setting up hot sites that are fully functional DCs and are ready in the event of a disaster can be feasible and a low-cost option for expanding DCs in non-crowded regions in the country. The hot sites for disaster recovery provide virtual machine snapshots of physical or virtual servers from the primary Data Centre and also functions as a fully operational independent Data Centre.

Disaster Recovery standards

ISO 22301 covers the continuity of business as a whole, considering any type of incident as a potential disruption source (e.g., pandemic disease, economic crisis, natural disaster, etc.), and using plans, policies, and procedures to prevent, react, and recover from disruptions caused by them. These plans, policies, and procedures can be classified into two main types: those to continue operations if the business is affected by a disruption event and those to recover the information and communication infrastructure if the ICT is disrupted.

ISO 27031 is a tool to implement the technical part of ISO 22301, providing detailed guidance on how to deal with the continuity of ICT elements to ensure that the organization's processes will deliver the expected results to its clients. ISO Standard 27031 is focused on the information and communications technology (ICT) requirements for business continuity and disaster preparedness. ISO 27031 includes both crucial data security and enterprise operations of an organization or business.

Q.13: Whether trusted source procurement should be mandated for Data Centre equipment? Whether Data Centres should be mandated to have security certifications based on third-party Audits? Which body should be entrusted with the task? Should security certifications be linked to incentives? If so, please give details with justifications.

BIF Comments

At the outset, trusted source procurement, as has been currently defined and structured, requires the oversight of the MEITY, Department of Telecommunications, the Ministry of Power and the National Cyber Security Coordinator. As a consequence, delays and inordinately long approval processes resulting from overlapping levels of oversight and priorities have the potential to come in the way of the ease of doing business. In its current

form, the framework for trusted source procurement renders it unclear as to which agency is the rightful authorizing entity for different areas of concern.

While trusted procurement is essential for the security of the nation, the same must be implemented in a streamlined manner so as to not inordinately delay the rollout of critical digital infrastructure. Further, till the time the data centre sector in India is adequately established, such regulatory oversight should be avoided.

Q.14: What regulatory or other limitations are the Data Centre companies facing with regards to the availability of captive fiber optic cable connectivity, and how is it impacting the Data Centre deployment in the hinterland? How can the rolling out of captive high-quality fiber networks be incentivized, specifically for providing connectivity to the upcoming Data Centres/data parks? Do justify.

Q.15: What are the necessary measures required for providing alternative fiber access (like dark fiber) to the Data Centre operators? Whether captive use of dark fiber for DCs should be allowed? If so, please justify.

BIF Comments

Response to Q14:

At the outset, broadband infrastructure can be expensive to deploy in rural regions, especially by a single operator. This can be circumvented by enabling infrastructure sharing on a 'wholesale' basis between different operators. This will promote competition, improve quality of service, and consequently benefit consumers in the long run.

The Government can promote deployment of broadband infrastructure particularly by promoting sharing of infrastructure, especially passive infrastructure, as well as streamlining licence processes, improving timelines for processes and reducing fees for granting rights-of-way. In addition, sharing of active infrastructure would also help promote innovation and investment in rural regions that usually lack fiscal or economic incentives.

The Government can also pursue policies that lower the cost of infrastructure deployment while ensuring competition. This can be done by developing policies promoting access to rights-of-way, as well as the sharing of infrastructure (passive and active) in rural areas to decreases costs and increase investment by adopting incentives for such sharing (including relaxation in license obligations) and a "dig once, build once" policy model that encourages providers to share the costs of deploying and maintaining broadband infrastructure.

High-quality fiber connectivity is a must have requirement for Data Centre operations as they run critical applications that need 24x7 uninterrupted connectivity to store and distribute the data. That is why DCs are generally constructed in areas with dense fiber networks that can connect them to reliable and high bandwidth internet access components. Good network connectivity plays a key criteria in deciding the site for a DC construction in India, and thereby

majority of the Data Centres are concentrated in Tier-1 cities like Mumbai, Chennai, and Hyderabad.

As newer Data Centres are constructed, and the utilization of optical fiber cable grows, more capital expenditures on the creation of new fiber infrastructure will be required. The development of proper connectivity could thus enhance the establishment of Data Centres. As the average broadband speed in India is very low and uneven across cities, this affects the performance (QoS) of the Data Centres. Lack of access to quality broadband and capacity restrictions of the fiber and cable is the critical challenge faced by many clouds and DC service players.

The Data Centre provider needs to offer seamless and scalable fibre connectivity between the infrastructure of enterprises and between two or more Data Centre buildings. In India, the state of intercity and intra-city fibre networks are far from what exists in other developed countries. Data Centre providers or Cloud Service Providers or CDN providers presently are forced to procure generic network connectivity services from local TSPs/ISPs. This is problematic because traditional networks operated by TSPs/ISPs are principally designed for voice or public data services, such as IP services. They are not suitable for many new services, which require very high bandwidth availability and low latency for extremely high amounts of data. Achieving these outcomes using TSP services is especially difficult given India's vast geography and relatively limited existing technology infrastructure and broadband connectivity speeds.

Response to Q15:

Access to Dark Fibres: The need for greater network connectivity and faster performance puts demand pressure on existing telecom infrastructure, thus increasing the value of unutilized dark fiber as an alternative option for Data Centres. Dark fiber has become a hot commodity, as cloud computing platforms seek more network capacity to deliver data across their massive Data Centre campuses. Globally, several companies have targeted this opportunity by deploying new dark fiber routes to connect major Data Centre hubs. Data Centres could use dark fiber to overcome degraded network performance. These avoid latency, provide greater bandwidth, stability, and security.

In the US, local Govt. authorities- municipality/city govts have been encouraged to set up dark fiber networks covering their area and connected to the core networks. This is a common facility, and anyone can access these networks. Apart from incentivising the local authorities with continuous income, it also reduces the burden of the last mile operator. One can start this in India with a modern pilot, which can be followed by local authorities. This will also clear the RoW issue.

Regulatory Challenge:

Since dark fibre is considered to be a telecom infrastructure, it can only be provided by licensed entities, and such licensed entity has the authority to sell, lease or share the same with an interested agency based on commercial agreements.

Consequently, companies who want to operate data centres would have to enter into commercial agreements with TSPs/ISPs, even if the services they provide are not competing with those being provided by TSPs/ISPs. This is a huge economic burden, as the dark fibre provided by TSPs/ISPs is significantly expensive, which substantially increases data centre costs.

This regulatory hurdle should be done away with to attract investments and promote competition in this segment. Data centre providers should be permitted to construct, operate, and efficiently manage their own captive optical fibre networks, akin to the concept of private networks/non-public networks.

Q.16: What are the challenges faced while accessing international connectivity through cable landing stations? What measures, including incentive provisions, be taken for improving the reliable connectivity to CLS?

BIF Comments

At the outset, as noted by the TRAI, the non-availability of submarine cables and fibre networks for international connections is the main reason for companies to incur further investments in establishing data centres in regions that do not have landing points

Separately, we note that in a few countries, access to international connectivity is monopolised and controlled by operators that charge excessively high prices from ISPs/TSPs in order to generate revenues. These high costs eventually trickle down to consumers, affecting their welfare and affordability of internet services in the long run.

In light of the above, we propose the following measures which can be taken to improve connectivity to cable landing stations (***CLS***):

- **Flexible licensing requirements for private networks:** A private network operator does not provide transmission capacity or traditional communication services to its customers and only uses the private network for its own purposes. Accordingly, regulatory flexibility should be provided to private network operators. They should be able to own and operate their own fibre connections vis-à-vis exemptions telecoms licensing requirements, both within India and even for terminating a subsea cable in India, provided the same is for private use. Lessons can be learnt from international best practices. European Union (***EU***) countries, for example, do not require private networks to comply with the same authorisation conditions as public electronic communications network operators. This makes it easier for private network operators to invest in domestic infrastructure. Further, we believe that CLS facilities themselves should not be regulated as public telecom facilities. If at all, regulatory efforts should be limited to a licensed carrier's operation of public telecom networks using CLS facilities.

- **Allow for private investment (including foreign investment):** Both private investors and foreign investors should be permitted to land cables, and to invest in and operate CLS

and carrier neutral colocation (***CNC***) facilities in India. Avoiding restrictions and enabling flexibility vis-à-vis foreign ownership will help attract investment.

- **Avoid monopoly of CLS and CNC facilities:** Monopoly vis-à-vis operation of CLS and CNC facilities should be avoided to promote competition and resultantly improve quality and innovation of services – benefitting consumers in the long run. Regulators can help avoid monopoly of CLS and CNC facilities by: opening CLS and CNC facilities to private or foreign investment; ensuring operators of CLS or CNC facilities provide access to each facility in an open and non-discriminatory manner; exercising regulatory oversight over existing CLS or CNC operators and preventing prohibitive pricing and other barriers to entry; providing fiscal incentives (such as tax breaks to encourage open access to such facilities.

- **Promote cross-connects:** Establishing connections between public networks and between public and private networks should be easy and cost-efficient. High cross-connect fees can affect the provision of low cost capacity in an end-to-end supply chain. CLS or CNC operators should also be regulated in a manner that ensures that cross-connect fees and allied terms are nominal and reasonable. Further, licencing of cross-connects should be avoided in the interests of promoting our digital economy.

- **Ensure reasonable land and power costs:** Incentives that ameliorate costs of land and power for CLS or CNC operations should be promoted. Tax holidays for 'open' CLS and CNC operators and access to developmental funds for obtaining land on a long-term lease are other options that should in explored to avoid prohibitive costs that will hinder businesses to scale and expand – ultimately impacting investments in the sector and hindering growth of internet-access in rural areas.

Submarine cables connect the digital economy across the world. If Data Centres are the heart of the digital economy, then submarine cables are the arteries of modern connectivity. These cables terminate in the country through cable landing stations (CLS). Access to submarine CLS is an essential input for services requiring international connectivity. Mumbai and Chennai have the maximum concentration of such landing points. The cables connect Mumbai and Chennai to various strategic cities in South and Southeast Asia, the Middle East, Africa, and Europe. Given the higher cost of pulling the cable inland, these two cities remain the favourites for most operators to locate their initial Data Centres. The non-availability of submarine cables and fiber networks for international connections is the main reason for the companies not establishing Data Centres in the other cities/regions.

Q.17: Is the extant situation of power supply sufficient to meet the present and futuristic requirements for Data Centres in India? What are the major challenges faced by Data Centre Industry in establishment of Data Centres in naturally cooled regions of India? What are the impediments in and suggested non-conventional measures for ensuring continuous availability of power to companies interested in establishing Data Centres in the country? What incentivization policy measures can be offered to meet electricity requirements for Data Centres?

Q.18: Should certification for green Data Centres be introduced in India? What should be the requirement, and which body may look after the work of deciding norms and issuing certificates?

Q.19: Are there any challenges/restrictions imposed by the States/DISCOMs to buy renewable energy? Please elaborate. Please suggest measures to incentivize green Data Centres in India?

BIF Comments

Response to Q17

Data centres are among the most power-hungry elements of the digital supply chain, making the current state of power in the nation inadequate to address the growing energy needs imposed by any future large-scale rollout of data centres across the nation.

While power requirements are certainly lower for data centres operating in cooler regions of the world, they require continuous access to reliable sources of energy to maintain the high uptime thresholds optimal for a digital economy. Access to constant power on priority from redundant sources is also essential for data centres and must be provisioned for investor confidence.

However, in order to counter the immense power requirements of data centres, States rich in renewable energy resources may adopt approaches to incentivize the use of RETs (i.e., renewable energy technologies), as well as provide renewable energy incentives such as feed in tariffs to keep energy costs low. At the same time, States should promote building of resilient energy redundancies for data centre operators.

Separately, any Indian certification framework must be harmonised with established global frameworks, and also include mechanisms to certify green data centres. The Ministry of New and Renewable Energy and Bureau of Indian Standards may be requested to jointly develop this green certification standard, after engaging in adequate consultation with the public.

Lastly, please note that to incentivise and help data centres achieve the green certification, access to the 'Green Term-Ahead Market' (***GTAM***) launched in 2018 may be extended to data centre operators. It is understood that implementation of this initiative at the State level is still pending in some States. Accordingly, mechanisms to expedite the operationalization of the GTAM must be implemented quickly to promote access to potential green data centres.

Response to Q18:

Green Data Centres are the modern-day Data Centres that can keep carbon emissions to a minimum. For India, it plays a more important role, since we are energy and water deficient. Most big Data Centres could slash their greenhouse gas emissions by switching to efficient, off-the-shelf equipment, and improved energy management. The green Data Centres need to be brought to a strong place in the country

The push towards Green Data Centres has been a combination of incentives provided for Data Centres that use energy-efficient mechanisms, certification for voluntary standards that give businesses a better selling point, and environmental requirements mandated by the Governments. There is a fine balance maintained in most countries across the three approaches to ensure that Data Centres become environmentally efficient without greatly increasing the burden of compliance and diminishing the ease of doing business.

The incentive-based program has been successful in several countries in reducing energy usage and developing renewable energy solutions for powering the Data Centre industry. In US, companies get a tax break of nearly $2 per square foot for buildings that save at least 50% of the heating and cooling energy of a system, or a building that meets standards specified by the Government48. Additionally, the US administration has extended 30% tax incentives for facilities researching in or using certain renewable energy sources. The UK provides a variety of rebates on the purchase of equipment for the usage of renewable energy in Data Centres. The Malaysian Government is also providing tax exemptions of up to 100% on capital expenditure for companies that undertake Green Data Centre projects. There are certifications for green Data Centres that can be obtained from several agencies that are used around the world. The LEED (Leadership in Energy and Environmental Design) certification is an important certificate for green buildings that are used in multiple countries and was developed by the US Green Building Council.

Keeping the international best practices in mind, we agree with the TRAI that there should be a Government initiative to promote green technology enabled data centres. Those players interested in setting up green data centres can be given supplementary benefits like easy approvals and permits, ease of restrictions in availing existing renewable energy resources, buying renewable energy through open access, or investing in renewable energy power plants. We also agree with the TRAI that several criteria can be used to incentivize energy savings and green energy at data centres. These include cooling optimization by the establishment of data centres in naturally cooled regions, using or investing in research on renewable energy resources for data centres, and data centres designed on green computing principles that use natural cooling and natural light in addition to having low energy requirements processes.

Further, as noted by the TRAI, the naturally cooled regions in India which remain vastly unexplored for data centre ventures are the best-suited alternatives for greenfield rollout owing to their lower expenditure requirements, relatively lower cost of land, cheap labour, low water-based cooling requirements, and abundance of opportunities for investment in renewable energy power plants for powering data centres.

We note that in India, the Indian Green Building Council (***IGBC***), which is a part of Confederation of Indian Industries, gives certification to companies wishing to obtain a 'LEED' (or, leadership in energy and environment design) certificate. In addition to this, the IGBC also has a green data centre certification, which looks specifically at data centres and uses multiple criteria for judging efficiency. We agree with the TRAI that these kind of certifications can be used as a criterion for providing tax breaks and are important for data centres to attract business as well.

Response to Q19:

Measures for purchase of renewable energy:

We generally agree with the TRAI's recommendation that to promote green data centres, data centre investors should be permitted to buy power from large generating/distributing companies (i.e., DISCOMs) having renewable energy certificates directly and without any restrictions.

Q.20: What supportive mechanisms can be provided to Data Centre backup power generators?

BIF Comments

Considering the power deficiency situation that exists in various parts of the country, the establishment of dual power grid networks to ensure uninterrupted quality supply of electricity to the Data Centre is required. Additional power generation capabilities through captive power sources such as solar and wind farms should be installed to supplement power sourcing.

In India, the majority of Data Centres are in Maharashtra, Karnataka, Tamil Nadu, Telangana, Uttar Pradesh, and New Delhi. The State Governments have already laid down power tariffs and subsidies, and this has become instrumental for DC's growth.

Given the significant consumption of fuel by backup power sources such as generator sets, we agree with the TRAI that fuel subsidies should be granted to the eligible players, such as data centre operators, as this will improve the data centre foundation in rural areas and tier-2/tier-3 cities, and divert the concentration of data centres from already crowded tier-1 cities. As proposed by the TRAI, we agree that energy or duty tax exemptions may be granted to benefit the data centre industry in a situation where many outsourcing companies are experimenting with renewable energy for bundling or part-powering their units.

Q.21: Availability of Water is essential for cooling of Data Centres, how the requirement can be met for continuous availability of water to the Data Centres? Are there any alternate solutions? Please elaborate.

BIF Comments

Reliable access to Water: An enormous volume of water is required to cool high-density servers and data racks, which is making water management a growing priority for Data Centre operators. A 15- megawatt Data Centre can use up to 1 million litres of water a day, and as the scale increases Data Centre operators have to depend heavily on water supply. Due to the huge computing power in Data Centres containing hundreds of thousands of servers, in many designs, all the heat from those servers should be managed through cooling towers. The water serves to cool the air as it enters the Data Centre. In the process, however, some of the water evaporates and is lost. Thus, there is a need for a reliable, continuous source of water for these systems to be effective. This is the reason a Data Centre construction is feasible only when adequate water supply is available in its proximity.

Q.23: Is non-uniformity in state policies affecting the Pan-India growth and promotion of Data Centre industry? Is there a need for promulgation of a unified Data Centre policy in India, which acts as an overarching framework for setting Data Centres across India? What institutional mechanisms can be put in place to ensure smooth coordination between Centre and States for facilitating DC business? Do support your answers with detailed justification.

Q.24: What practical issues merit consideration under Centre-State coordination to implement measures for Pan-India single-window clearance for Data Centres?

BIF Comments

At the outset, while we acknowledge the need for more data centres, we would like to reiterate that establishment of data centres should not be mandated, but rather promoted through suitable fiscal and non-fiscal incentives, particularly in smaller towns and cities.

A 'National Data Centre Policy' on the lines of the draft policy released by the MEITY in 2020, would aid the development of State/local initiatives to enhance the footprint of data centres across the nation.

As noted by the TRAI, data centre operators must comply with different laws and regulations imposed by numerous agencies/authorities to set up a data centre, making it immensely challenging for data centre service providers to commit to large investments expected for modern data centre rollouts. Further, since data centres are subject to various legal frameworks relating to infrastructure, taxes, labour, electricity, etc. we note that these areas either fall within the jurisdiction of States or within the concurrent jurisdiction of the Central Government and States. Accordingly, policy differences are likely to impact the ease of doing business, which could then disincentivise investments. In order to remedy this, Centre-State coordination can be achieved by establishing institutional mechanisms, such as a nodal agency, to supervise and facilitate the implementation of initiatives relating to data centres (as

also recommended by the MEITY). Such an agency should have participation from the Centre and States to promote coordination. Further, we would also like to urge that these initiatives should mandatorily be grounded in public discussion and dialogue, especially with stakeholders within the data centre sector, before being implemented.

Separately, single window clearance mechanisms should be implemented via a national data centre policy (such as the one proposed by the MEITY) to simplify the process of establishing data centres. Given that numerous States have already, and some others are set to soon announce local data centre policies, we believe that such a national data centre policy must equally focus on supporting and supervising State-level initiatives. For instance, access to the GTAM was enabled in 2018, yet implementation of mechanisms has varied from State to State. Accordingly, close coordination between the Centre and State Governments will be crucial, especially for initiatives such as the GTAM that have a dependence implementation at both the Central and State level. In addition, close coordination among States and the Central Government on a number of other data centre related implementation and authorization issues would aid in expediting the development of data centres. data centre policy would aid in expediting the development of Indian data centres.

We wish to reiterate that the Draft National Data Centre Policy 2020, released by MeitY was a welcome step in the right direction for promotion of Data Centres. BIF provided extensive and exhaustive response to the same, which is attached (at Annexure 'A') with this submission and forms an essential and integral part of this submission. All the points given below should be considered in the overall policy framework in the context of Data Centres

Some of the key highlights of the BIF submission to the Draft Datacentre Policy of Meity in 2020 which is germane to this consultation are given below:

The Draft Data Centre Policy must be crafted with the following key objectives viz.

> ***India should be able to attract more investments from domestic and international datacentres. There should be sufficient incentive for international datacentres to relocate /move their datacentres from other countries to India****. India could be an ideal location for Disaster Backup of overseas Data Centres. We already have direct fiber connectivity to Singapore & Europe, and by providing adequate incentives for SEZ-based backup operations, we can attract many overseas players.*

a) *This could be done with a slew of measures that could attract among others viz.*
   - *Good Regulatory environment*
   - *Equitable and fair Policies*
   - *Ease of doing business and simplification of processes with reduction of regulatory barriers*

Once it is perceived that India presents a viable business model with a stable policy and regulatory regime, investors-both domestic as well as foreign would automatically find it attractive to invest. Also recent geo-political developments also make India as a destination of choice to relocate/move IT & Telecom supply chains/hubs.

b) *We laud the government's dedication for promotion of ease of doing business and simplifying the process of setting up data centres in India. We believe that* ***a clear identification of data centres' needs shall assist the government in aligning and crafting an ecosystem that makes India the top destination for data centres globally and attracts global attention and investment in this field.***

c) *To cope with the huge amount of data being generated and expected explosive growth of data, India would need a number of high quality and high capacity data centres. This would be a medium to long term initiative Therefore, we would* ***need sustainable, hospitable and more attractive measures to make the overall environment more conducive to ease of doing business than other data centre jurisdictions****.*

Keeping the above objectives in mind, we wish to take the liberty to make some suggestions as regards the draft Policy as given below:

Issue 1: Development of the data centre ecosystem by incentivising all players-domestic & foreign in an equitable manner

Recommendation: *Government may kindly consider various initiatives/measures to develop the data centre ecosystem which should incentivise all players -domestic and foreign, in an equitable manner so as to ensure a level playing field for all.*

Issue 2: Industry Engagement

Recommendations: *We applaud the government's initiative to set up the Inter-Ministerial Empowered Committee ("**IMEC**") and the Data Centre Industry Council ("**DCIC**") in the DC Policy. We agree that consultations with industry members and associations will be the best way to build data centre policies.*

Issue 3: Data Localisation

Recommendation: *Storing data locally does not necessarily ensure access, control or security of data. We believe that data storage and data privacy should not be conflated. Keeping the above in mind, we are of the opinion that while sensitive and sensitive personal data may be mandated for localisation, other kinds of data including non-personal data (NPD) should not be mandated. Mandatory data localisation requirements of non-sensitive and non-personal data may deter companies' from offering services in India and / or open data centres in India. We would also like to suggest that there is need to provide adequate safeguards to allow all companies to remain compliant within their respective jurisdictional compliances, irrespective of whether they happen to be domestic or foreign. India can do so by establishing clear norms around data processing, data protection and data governance and establish safeguards against unauthorised access to data stored in India by any stakeholder.*

Issue 4: Regulatory Requirements

Recommendation: *We support the government's proposal to ease the regulatory process for upcoming data centres. To that end, the simplification and rationalisation of clearances is an important measure. Additionally, the creation of Data Centre Parks and Data Centre Economic Zones with boutique regulations for data centres is a sensible decision. We suggest ensuring that regulatory clearance processes get streamlined and fast-tracked through a single window and in a time bound manner*

Issue 5: Land and Power Supply

Recommendation: *Data centres have significant needs viz. infrastructure, power supply, water, air cooling etc. The* ***DC Policy*** *makes allowances for these and proposes solutions to provide guaranteed power supply that will not fail, and land parcels. However, land is a scarce resource in India and many states have high tariffs on power supply. Additionally, data centres have very high energy requirements, since downtime can have huge industry costs and cause data losses. Such high consumption can be very demanding on power grids while also generating a lot of pollution, if relying only on conventional sources of energy.*

For the land issue, we recommend focusing on Tier-2 and Tier-3 cities or satellite cities of Tier-1 cities to ensure maximal access to land. Further, we suggest envisaging within the National Building Code, a method to ensure most efficient use of land, such as designing data centres that can be sustainably expanded vertically, and not just horizontally, as land-scarce Singapore has done. We also urge that

Guidelines be issued to State Industrial Development Corporations to start giving land on Long – Term Lease (Preferably 99 Years)

a. *at nominal charges with immediate affect*
b. *within 30 -45 days TAT (Turn –around Time)*
c. *Accountability and reasoning for delay and rejection of request*

From source of energy point of view, we would urge Govt. to look at mandating some minimum requirements for use of non-conventional and renewable sources of energy and permission to draw power from different substations to have backups in place.

From a safety standpoint, Data Centres are usually located in areas with low seismic activity. We would request ***Govt.*** *to keep that under consideration while identifying land parcels for the Data Centre Economic Zones.*

We also suggest Guidelines be provided to Power Discoms to provision redundant feeders /Power stations at Industrial Areas of all State capitals, Tier-1 Tier-2 Cities with

d. *Aim to provide 500 KW of Power within 6 weeks of application*
e. *Subsidized Electricity charges*
f. *With a scope for provision of alternate energy source*

Issue 6: Investment

Recommendation: *We note that the* ***DC Policy*** *provides fiscal and non-fiscal incentives to the use of domestic IT and non-IT equipment and products. Further, we see that the* ***DC Policy*** *intends to improve terms of credit for data centres and also plans to permit foreign and domestic investments in the sector. We recommend offering fiscal and non-fiscal incentives to all data centre equipment to offset relocation costs for data centres and reduce hurdles to long-term investment. Additionally, we recommend specifying tax breaks for data centres, as many other countries are doing, such as tax rebates on corporate income. Additional incentives may be provided to companies operating 'Edge Data Centres'*

Issue 7: Network Connectivity

Recommendation: *Similar to power downtime, loss of connectivity and internet downtime can cost clients and data centres a lot of money and data. We note the government's proposal to use the Dial*

Before You Dig policy as well as their commitment to providing common service ducts and utility corridors through optical and dark fibre cables. We also note that ***Govt. i****ntends to permit Infrastructure Providers to provide active and passive infrastructure to data centres. We would request that some clarity is provided how it proposes to do so.*

We would request that as part of the Policy, it should be mentioned that all OFC providers would be provided an equal opportunity to connect Data Centres together. This will also ensure redundancy of OFC connectivity. Shared network should also be promoted as it would obviate the need for redundancy. Hence we request that all Infrastructure providers be given equal access to connect OFC with the Data Centres. OFC Infra of State Owned Companies and Power utilities are underutilised and these companies are currently not sharing their infra with TSPs/ISPs/IP1s. It is requested that State owned companies and Power Utilities be mandated to share their infra with TSPs/ISPs/IP1s which would help in faster rollout and lower CAPEX to the service providers and would also offer better value to the State owned companies.

While we laud ***Govt*** *for their recommendation that the Data Centres be provided an Infrastructure Status. However, Data Centres are extremely dependent on OFC connectivity and its reliability. It is therefore essential the OFC and the Infrastructure Providers –Category 1 that provide the same should also be granted the infrastructure Status*

Issue 8: Global Competitiveness

Recommendation: *We suggest undertaking a deep-dive study of best international practices in top data centre locations. For instance, Singapore's network of undersea cables and strong business climate (tax holidays, lowered rents, steady power supply, skilled workforce etc.) play a large role in attracting companies to store data in its data centres. We recommend deploying capability to build similar kinds of capacity in India as well.*

OTHER KEY SUGGESTIONS

- *Incentivize Carrier Neutral Data Centres in place of captive data Centres*
- *Policy framework mainly talks about Core / Metro Data centres; we also need to have enabled framework for Edge/ Micro Edge data Centre (less than 100 Racks / 500 KW Capacity)*

- *Guidelines to all Smart cities to collaborate with Data Centre Operators for building Data Centre on PPP model – whereby land is provided by Smart cities and in turn Developer would provide contracted Rack space for usage by smart cities.*
- *Free RoW for Fiber Connectivity to Data Centres under One Time Dig policy.*
- *Government may sign MoU with Developers as captive customers; this will encourage setting up of DCs at Tier-2 & Tier-3 cities/towns*
- *Relaxed FAR norms and Design flexibility for Data Centre Buildings*
- *Appropriate Security / Law and order enforcement in Industrial areas having Data Centres support*
- *Setting up special zones for Data Centres, should not create ' dead zones of high security, low activity'. Some associated activities should also be planned / allowed in such specialized zones, similar to SEZ.*
- *Setting up of Data Centres in Green Field areas for industries, should be encouraged, through Tax benefits, etc.*

This policy framework should be followed by a detailed scheme with an implementation guideline document detailing incentives to be provided to the DC sector by the Central and State Governments. Most Data Centres favouring states already have economic development processes in place that offer tax incentives, investment assistance, loan guarantees, and other forms of business assistance designed to attract Data Centres. But with the huge investments that Data Centres can represent, the playing field has changed. This calls for a greater thrust on Centre-State coordination favouring the implementation of uniform tax abatement code, analogous labour laws, and a common framework to facilitate ease of doing business.

Q.25: Is there a need for Data Centre Infrastructure Management System (DCIM) for Data Centres in India? What policy measures can be put in place to incentivize Data Centre players to adopt the futuristic technologies? Elaborate with justification.

BIF Comments

We agree with the TRAI that in order to optimize the cost of operations of data centres, it is significant to create an efficient 'Data Centre Infrastructure Management System' (***DCIM***) to correctly assess the requirements of data centres. We agree with the TRAI that a DCIM not only streamlines the costs of data centres but also ensures sustainability by reducing carbon

footprint. However, creating and maintaining a robust DCIM might pose cost concerns, especially in a country like India, which still does not possess the necessary framework for technical and designing expertise as compared to the developed countries of the world. Given that new technological developments will keep happening in the data centre space, policy measures must be put in place to promote the adoption of future technologies viz. DCIM, AI, etc. for data centres. Of course, once the data centre market reaches a maturity level, a free and thriving market for data centre services will ensure significant competition among data centre service providers, as well as ensure that such providers continuously improve their offering to match the needs of the market.

We agree with the TRAI that in order to optimize the cost of operations of data centres, it is significant to create an efficient 'Data Centre Infrastructure Management System' (***DCIM***) to correctly assess the requirements of data centres. We agree with the TRAI that a DCIM not only streamlines the costs of data centres but also ensures sustainability by reducing carbon footprint. However, creating and maintaining a robust DCIM might pose cost concerns, especially in a country like India, which still does not possess the necessary framework for technical and designing expertise as compared to the developed countries of the world. Given that new technological developments will keep happening in the data centre space, policy measures must be put in place to promote the adoption of future technologies viz. DCIM, AI, etc. for data centres. Of course, once the data centre market reaches a maturity level, a free and thriving market for data centre services will ensure significant competition among data centre service providers, as well as ensure that such providers continuously improve their offering to match the needs of the market.

Q.26: What institutional mechanism needs to be put in place to ensure digitization of hard document within a defined timeframe?

BIF Comments

Data Digitization is the process by which physical or manual records such as text, images, video, and audio are converted into digital forms. There are many methods of digitizing, but the main focus rests primarily on texts and images, as these are the main objects in the digitization process. In this context, some of the fundamental things like scanning and image capture, necessary hardware, and software selection are crucial for the process of digitization.

Digitization of records has been a priority for Government of India as digitized data offers the long-term preservation of documents, orderly archiving of documents, easy and customized access to information, and easy information dissemination through images, text, internet, intranets, and extranets. Digitized data offers the possibility of monetization by introducing the discovery, capture, storage, analysis, dissemination, and use of that data. Converting physical records into the digital form will not only facilitate easy access of Government records and services but will also enable easy access and data analysis for informed decision

making. Data digitization would further help data principals in data sharing to gain beneficial terms or conditions from businesses, information bartering, selling data outright (via consent managers or independently), etc.

Digitize India Platform (DIP) is an initiative of the Government of India under the Digital India Programme to provide digitization services for scanned document images or physical documents for any organization. The aim is to digitize and make usable all the existing content in different formats and media, languages, digitize, and create data extracts for document management, IT applications, and records management. DIP provides an innovative solution by combining machine intelligence and a cost-effective crowdsourcing model. It features a secure and automated platform for processing and extracting relevant data from document images in a format that is usable for meta-data tagging, IT application processing, and analysis.

The DIP platform provides a facility to digitize various kinds of physical records through crowdsourcing (www.digitizeindia.gov.in). The platform uses an innovative algorithm, which ensures the accuracy of the digitized document at a significantly reduced cost. It also improves the quality of record-keeping and reduces the real estate required for maintaining large record rooms for legacy records. The DIP initiatives, taken in 2015, is helping the State Governments, which are the custodian of huge volumes of legacy data in forming land records, land registry, birth and death records, exam results at school and university levels, service records of government employees, etc. However, there are still many physical records that need to be digitized. For ensuring that the digitization of all records is completed in a time-bound manner some institutional mechanism needs to be put in place that would ensure digitisation of all current records in real-time and legacy records in a specified time frame..

Today, the banks insist on original paper documents. Similarly, land records will be accepted in the original paper form only. This has to change, and well-secured electronic records must be used as evidence and for transactions. This also means all new transactions- like hypothecation, registration of properties need to be electronic. Suitable legislation has to be passed for this to take effort.

Q.27: Would there be any security/privacy issues associated with data monetization? What further measures can be taken to boost data monetization in the country?

BIF Comments

Measures to boost data digitisation and data monetisation have been provided in Q26 above. Data acquisition, data storage and data processing rights and rules should be strictly based on obtaining user consent. Data Privacy and Data Security should be based on the rules laid down in the Data Protection Bill (PDP Bill 2019).

Q.28: What long term policy measures are required to facilitate growth of CDN industry in India?

Q.29: Whether the absence of regulatory framework for CDNs is affecting the growth of CDN in India and creating a non-level-playing field between CDN players and telecom service providers?

Q.30: If answer to either of the above question is yes, is there a need to regulate the CDN industry? What type of Governance structure should be prescribed? Do elucidate your views with justification.

Q.31: In case a registration/licensing framework is to be prescribed, what should be the terms and conditions for such framework?

BIF Comments

Response to Q28

Based on market forecasts and trend analysis, by 2022, video content will constitute 80% of all internet traffic (Cisco) worldwide. Based on the same study it was estimated that there would be one million minutes of video data traversing the internet per second (Cisco). India's data consumption is growing at a tremendous 72% CAGR (Assocham-PwC). While current interest skews towards pre-recorded and uploaded content such as movies and TV shows, the world of live streaming is taking the internet by storm.

The global video streaming market size is anticipated to reach USD124.57 billion by 2025, according to a new report by Grand View Research, Inc., registering a 19.10% CAGR during the forecast period. News networks, sports coverage, and interactive gaming currently dominate. However, businesses and social user-generated live streaming (e.g. TikTok) are not far behind. All this user demand for video and live streaming increases the requirement for robust CDNs to transmit content efficiently. Indeed, the global CDN market size is expected to grow from USD 14.4 billion in 2020 to USD 27.9 billion in 2025, at a CAGR of 14.1% during the forecast period. The Indian market is expected to grow at 60-70% CAGR.

India is witnessing an increased demand for online streaming of video content. Today, consumers are making a shift from conventional and cable-based video subscriptions to OTT Internet-based delivery platforms. Numerous players have emerged in the OTT market space, directly resulting in increased Internet traffic. Buffering is seen as a major reason for user dissatisfaction and low experience levels, leading to more OTT and VOD-based CDN services.

The main drivers of CDN in the 5G era will be the digitization of everyday processes. The use cases in 5G, including autonomous vehicles, Industry 4.0, video surveillance, cloud-based gaming, and telemedicine, etc., will require very low latency delivery of content at the edge. As 5G network rolls out, migration of storage from end-user devices to 5G edge locations and the public cloud, where storage and processing are cheaper is expected. One of the most significant drivers will be the increased use of video data (more cameras everywhere) and the

improved resolution of image sensors. The increased use of video data, the improved resolution of image sensors, underlying virtualization of the infrastructure, and the move towards cloud-native architectures will bring more and more focus on CDNs.

At the outset, the importance of CDNs has been well established through the market data available Together with d ata centres and IXPs, they are extremely vital for growth of India's digital infrastructure and to promote connectivity across all regions in India.

That said, we note that TSPs/ISPs and content providers currently have collaborative and voluntary initiatives in place to enable delivery of good quality content to Indian consumers. Further, content providers, particularly global ones, have contributed towards caching, peering and other allied activities in the interest of providing consumers with affordable services, as well as stable and speedy access to digital content, while having regard to the operations of TSPs/ISPs as well. We believe that such voluntary and mutually beneficial initiatives, through driven by technical necessities and commercial considerations, have undoubtedly helped bolster India's digital economy.

However, Regulation must be preferably ex-post and not ex-ante as the latter tends to be stifling and anti-innovation. It should be 'light-touch' so that it permits innovation to prosper but at the same time the Regulator may be permitted to intervene whenever required to take corrective measures in case of market failure, lack of adequate competition, perceptible consumer uneasiness and potential harm so that it acts as a deterrent instead of a market barrier. Light-touch Regulation should be such that it should ensure 'Digital Agility'. Since we are at a nascent stage of our journey towards becoming a Digital Economy giant, we should ensure that Regulation is kept to a bare minimum.

The last mile delivery needs of CDN content as well as local data needs to be addressed by the TSPs and other entities using 5G. Wi-Fi 6 (and the upcoming Wi-Fi 7) will cater to local distribution as well. These need to be encouraged with adequate incentives including adequate availability of unlicensed spectrum.

In light of this, we believe before any long-term policy initiatives are adopted to regulate the CDN industry, the TRAI should ensure that the long-standing relationship between TSPs/ISPs and content providers should continue to be voluntary and mutually beneficial. This will ensure that these relationships can easily adapt to changes in the digital world and global connectivity demands that may arise in this regard. Ultimately, this will allow for the continued growth of the internet and digital connectivity and boost India's digital economy.

Response to Q29 & 30

CDNs form a layer in the internet ecosystem, where the content owners such as media companies and e-commerce vendors pay CDN operators to deliver their content to their end-users. In turn, a CDN pays ISPs, carriers, and network operators for hosting its servers in their Data Centres. The large deployment of the CDN-based solution has induced blurred borders on the content delivery market and TSPs/ISPs sometimes build their own distribution network. Deployment of a distributed Network Function Virtualization (NFV) platform at the

edge of the Internet Service Provider's network where a virtual Content Delivery Network (vCDN) can cater to the needs of end user, is a model that is prominently emerging.

A possible CDN-ISP collaboration could emerge where the CDN players make use of servers, storage capacities, space, power, and network site locations to host their cache servers, whereas ISPs, in turn, are benefitted from reduced bandwidth costs, security from DDoS attacks, and enhanced QoS to their customers. It is expected that vCDN is set to change the landscape of content delivery, providing new opportunities for ISPs to play a more significant role in the CDN ecosystem.

For such business models and others to flourish and contribute to the Indian digital economy, some issues need to be addressed.

a) **Revenue share between CDN-ISPs:** The relationship between CDN players and ISPs is that of a mutual facilitator. While CDN providers help ISPs in terms of helping them save bandwidth cost and in enhancing the user experience, ISPs provide the access without which CDNs cannot deliver the content. While the CDN providers are investing in the server hardware, the ISP is also arranging space, power, and bandwidth for fetching cache content, etc. Thus, both the players invest in their own systems and in process they help each other improve their commercial viability. The market for the interconnection of CDNs and ISPs is at a nascent stage. There is a need for regulatory oversight and perhaps intervention too, to see that the market is not misused to create dominance, hurting the smaller players by way of arbitrary and unjustified demands.
b) **Lack of equal access to CDN:** Some of the big OTT players have started their own content delivery platforms. Such dominant players can dictate terms for interconnection with smaller ISPs by refusing them direct peering. For any Digital Communication network to function smoothly, it is imperative to have a regulatory oversight for interconnection between various players which is fair and just and gives equal opportunities to each player. Further, Large ISPs, who are also in the CDN space, can create exclusive tie-ups with large content providers like OTT platform companies excluding other players from direct access on equal terms.

c) **Net-neutrality issue**: If the access to CDNs is not on equal terms, the issue of net-neutrality may arise whereby customers of preferred players may be provided with better quality CDN services. In its Net-Neutrality Recommendations of 28th November 2017 TRAI has recommended that the CDNs should not be included within the scope of any restrictions or non-discriminatory treatment, which are designed specifically to cover the providers of Internet Access Services. However, at the same time, TRAI has also said that there is a need for more transparency relating to the arrangements between TSPs and CDNs. Knowledge of such arrangements would be useful for gaining a proper understanding of the factors affecting the flow of traffic on the Internet, the potential for anti-competitive practices, and monitoring violations of the non-discrimination requirements by TSPs. It was also mentioned that TRAI may

frame appropriate regulations to specify the disclosure and transparency requirements in this regard.

d) An important issue is the multiplicity of regulators and ministries involved. We have silos like TSPs. ISPs, Tier-I providers, Content owners, Cable & Satellite providers. With convergence having obliterated functional distinctions for these providers abroad, India is still suffering from this silo phenomenon. It is time to recognise the convergence of voice, video and data and have a simplified regulatory regime, allowing multiple channels of content/data delivery. Singapore and USA. This has facilitated unhindered rapid growth of media delivery as well as advances in IT like ML/Big Data etc. Same with South Korea and Japan. These advances in regulation and licensing have to be studied to make up the best of these to provide a new-age system of regulation and licensing. The Governments are charging small percentages of revenue-if at all, and small amounts for licenses, knowing well that high growth will still assure high enough revenues for Government. Also, these services are reckoned as public infrastructure and treated as such. One effect of such a change in India will attract a lot of investment as the profitability goes up. Everybody benefits.

e) In a study paper published by the Competition Commission of India on 'Market study on the Telecom Sector in India - Key Findings and Observations' dated 22nd January 2021, it has been deliberated that Internet companies(ISP/TSPs) often utilize Content Delivery Networks (CDNs), to facilitate faster delivery of their content to users. In turn, CDNs have agreements with ISPs or TSPs to host servers on their network. CDNs reduce congestion in the last mile, lower transit costs, and improve overall network utilization. With data traffic set to grow and a limited number of players controlling a significant proportion of internet traffic, chances are there for anti-competitive agreements between CDNs, ISPs/TSPs, and internet companies. Since commercial arrangements between CDNs, and ISPs/TSPs are not disclosed, monitoring of such arrangements and traffic patterns would help in ensuring net-neutrality principles and fair competition. However, for monitoring any such interconnect agreement, some regulatory framework will be required.

f) **DNS filtering, Content blocking and Security**: The Domain Name System (DNS) is a naming database in which internet domain names/URLs are located and translated into IP addresses so that browsers can load the internet resources/websites/ requested URLs. DNS directs the websites' traffic to the CDN servers instead of directly to the origin servers hosting the website. When user computer wants to find the IP address associated with a domain name, it first makes its request to a recursive DNS server or recursive resolver that is usually operated by an ISP or other third-party provider, and it asks the exact DNS servers to resolve the name of a site with its IP address. The servers that actually have the needed information are called authoritative DNS servers.

The Unified License Agreement for ISP services does not specify whether the recursive/authoritative DNS servers are to be setup/maintained by Licensees or not. Currently, some of the ISPs have setup their own DNS and many of the ISP Licensees are using other DNS server including public DNS servers in their network for their users. The security of DNS system used by ISPs for delivering services, also affects the overall cyber safety of the end users.

DNS based content filtering and URL blocking allows or blocks access to the website´s or URLs as per the Government orders under Section 69A of the IT Act. URL blocking is implemented effectively in DNS system maintained by ISPs, but some of the blocked websites/URLs still remain accessible to subscribers of ISP networks who are using public servers or other third-party DNS servers or DNS-based CDN servers. In absence of any regulatory and security framework, it has been observed that few CDN providers are hosting their contents co-locating them with ISP gateways through direct peering or at Private IXPs. This arrangement results into bottlenecks in effective blocking of contents under the direction of Hon'ble courts or under provision of IT Act and there is possibility of by-pass of Lawful Interception system also. Further, a CDN essentially acts as a DDoS protection and mitigation platform with edge servers distributing the load equally across the entire capacity of the network, which is encouraging the ISPs to install CDN servers and provide content services.

We believe that CDNs should not be regulated in a manner that disrupts content delivery services aimed to improve the quality of services provided to consumers and reduce costs of content delivery that is provided in collaboration with content providers and TSPs/ISPs. Since the CDN sector in India is still at a nascent stage, regulation should be avoided till the time the sector is well-developed. As regards the issue of a non-level playing field between telco-operated CDNs, and other CDN players, many telco CDNs operate CDNs under a different company. Hence, we believe that the question of a non-level playing field does not arise and should not be a ground to regulate the CDN sector.

Q.32: What are the challenges in terms of cost for growth of CDN? What are the suggestions for offsetting such costs to CDN providers?

Q.33: Do you think CDN growth is impacted due to location constraints? What are the relevant measures required to be taken to mitigate these constraints and facilitate expansion of ecosystem of Digital communication infrastructure and services comprising various stakeholders, including CDN service providers, Data Centre operators, and Interconnect Exchange providers expansion in various Tier-2 cities?

BIF Comments

Response to Q32 & 33

Challenges for CDN establishment: Like Data Centres, CDNs also face multiple technical and economic challenges due to infrastructure issues. Indian players have been slower to integrate with CDNs compared to many developed countries. One of the major challenges for a service provider or network operator to launch a CDN is the initial investment for the basic infrastructure. The basic infrastructure includes the streaming web servers with the content, the proxies, and the caching servers in addition to the network management software. Consequently, high-bandwidth costs for data transmission are also the major consideration for most CDN providers.

The importance of CDNs is well established through the market data available. Together with Datacentres and Internet Exchanges, they are extremely vital for growth of Digital Infrastructure. It is important that the availability of these elements viz. Datacentres, CDNs and Internet Exchanges is all pervasive and not restricted to only Tier-1 cities as at present. However, to enable this, the entire ecosystem for their presence is made available beyond Tier1 cities and in different States and smaller cities so that it provides boost to digital economy everywhere and the success of Digital India.

An allied concept is that of Universal Public Service. It has been noticed that Digital Divide between haves and have-nots is rising as we invoke new and emerging technologies. The philosophy of Universal Public Services must be interwoven with Regulatory oversight to take corrective measures, wherever required.

However, Regulation must be preferably ex-post and not ex-ante as the latter tends to be stifling and anti-innovation. It should be 'light-touch' so that it permits innovation to prosper but at the same time the Regulator may be permitted to intervene whenever required to take corrective measures in case of market failure, lack of adequate competition, perceptible consumer uneasiness and potential harm so that it acts as a deterrent instead of a market barrier. Light-touch Regulation should be such that it should ensure 'Digital Agility'. Since we are at a nascent stage of our journey towards becoming a Digital Economy giant, we should ensure that Regulation is kept to a bare minimum.

The costs of maintaining servers (including energy to power and cool the servers) and maintenance staff costs are also significant. Implementing and maintaining CDN servers and equipment is therefore challenging for many small- to medium-sized internet providers who have limited resources. **A favourable policy and regulatory environment can help in attracting huge investments required to set up a large number of CDN servers in India in smaller cities and towns and eliminating various other roadblocks for CDN service providers**.

Broadly CDN has two types of costs. First, the CDN servers' costs that include the storage capacity, aggregating hardware, estate, and energy costs. Second, the cost of peering and IP-transit Costs of Peering and IP transit: Both peering and IP transit are key technical and monetary cost components in operating a CDN network.

a. **Peering:** It is an arrangement between two ISPs or stakeholders to let the traffic destined to each of them pass through to reach its required destinations (end-users). Peering can be either public or private, and it allows for packet exchange on a horizontal level (without crossing from a higher to a lower-tier ISP or vice versa).

b. **IP Transit**: CDN transit fees are paid to transit networks to get the content from the origin servers of the Content Providers for making it available to the end-users. This cost is a function of the volume of data exchanged. The transit cost per unit of data volume can be low if the CDN owns the transit network; otherwise, these costs can be considerable. These transit costs can differ Content Provider wise, as they may have different origin servers to fetch data, and, therefore, the path between the origin server and the corresponding ISP may differ. However, when the data is taken from the edge servers, the cost is significantly lower.

The cost of peering or IP transit is substantial and can be a barrier to the launch or success of a CDN. These costs depend on the volume (e.g., committed, consumed, etc.) of multimedia data traffic transferred or exchanged. Pricing for CDN services and charging the customers is governed by bandwidth costs, traffic distribution, content size, etc., along with the expenses incurred for peering or transit.

Apart from the above costs for CDN players, there are cost constraints involved for ISPs also to connect to CDNs or IXs. High costs of National long-distance (NLD) charges and high costs incurred in Domestic Leased Circuits (DLC (P2P)) link charges are also a major constraint for ISPs to connect to CDNs or IXs at the Data Centre.

Connectivity issues: There are certain challenges in setting up CDN servers close to the users, including real-estate costs, the need for a large and uninterrupted power supply, and bandwidth considerations. In remote and rural parts of India, wireless connectivity is more popular than fixed-line connectivity. Dependence on wireless networks to transmit data puts a constraint on handling large data loads (video content, live-media, on-demand data, etc.) To add to this, some rural parts still have either no mobile coverage or are still being served through 2G/3G networks

The importance of CDNs is well established through the market data available (as noted earlier). CDNs form the backbone of India's digital infrastructure and are responsible for the available of good quality internet and data services. Accordingly, CDNs should be established all across India, including in tier-2 cities and smaller towns.

Like data centres, CDNs also face multiple technical and economic challenges due to infrastructure issues. In fact, as noted by the TRAI, Indian players have been slower to integrate with CDNs as compared to many developed countries. One of the major challenges for a service provider or network operator to launch a CDN is the initial investment for the basic infrastructure. Such infrastructure includes the streaming web servers with the content, etc. Consequently, high-bandwidth costs for data transmission is also a major consideration for most CDN providers.

We believe that the different operational and infrastructural costs associated with setting up data centres in India can be reduced by adopting the following measures:

- Caching and/or edge servers should be allowed to be set up in different locations that suit content providers – and not just IXPs - in order to reduce bandwidth expenses;
- The licence fee(s) imposed on ISPs/TSPs – who are a major contributor to the CDN sector – should be reduced so that the same do not trickle down to content providers and end consumers; and
- Fiscal incentives such as tax breaks and licence fee exemptions should be granted to CDN operators in order to promote the establishment of a greater number of CDNs in India.

Separately, we note that since large CDNs tend to integrate with large ISPs (through an integrated model), it should be ensured, through a suitably designed regulatory framework, that such CDNs do not discriminate when it comes to peering with or transmitting content via smaller regional ISPs other than their partner ISP. This is because we believe that the possibility of such anti-competitive practices may hinder the growth of the CDN sector in India.

Q.34: What measures can be taken for improving infrastructure for connectivity between CDNs and ISPs, especially those operating on a regional basis?

BIF Comments

As regards connectivity between CDNs and ISPs, we note that there is a trend to CDNs to co-locate/co-host their network with large ISPs. To reiterate, we believe that suitable regulatory oversight must be designed to ensure that such CDNs do not discriminate between the other/smaller ISPs from their co-hosted /co-located ISPs, when it comes to distribution/sharing of content with other smaller ISPs.

Further, we note that currently most CDNs, large IXPs and data centres are situated mainly in metro cities like Mumbai, Delhi, and Chennai. Regional ISPs (i.e., those belonging to Category "B" and "C") can connect their networks with CDNs and IXPs, only by hosting their 'Border Gateway Router' in a data centre or IXP premises located in these metro cities. The investment required for bandwidth connectivity from their regional PoPs (or, points of presence) to metro cities precludes many small ISPs to peer directly at these locations. For providing the benefits of CDNs for subscribers of smaller ISPs, we believe that it is imperative that the connectivity between ISPs operating on a regional basis and CDNs be promoted. This can be done through the following measures:

Adopting policies that decrease infrastructure costs and rights-of-way access: These polices can relate to enabling and promoting the sharing of passive infrastructure to decrease costs and increase investment. For example, "dig once, build once" policy models can be adopted to enable ISPs to share the costs of deploying, as well as maintaining broadband infrastructure. Deployment of such infrastructure should also be promoted by easing the existing licence process, providing tax incentives, establishing single-window clearance systems, enabling rights-of-way access at low costs, etc.

- **Ensuring regulatory certainty:** This should be promoted vis-à-vis regulatory and legal frameworks that are clear and transparent. Further, all decision-making processes should be well-defined and in the interests of all stakeholders.

- **Implementing broadband strategies:** Such strategies should be forward-looking and should aim at achieving affordable internet access to the general public, especially in rural regions.

- **Promote competition to lower costs for consumers:** Promoting a free and fair competitive atmosphere, as well as encouraging new business models within the CDN ecosystem will help lower costs that trickle down to consumers and improve their welfare in the long run. A competitive environment can be ensured by reducing regulatory barriers to entry, as well as avoiding cumbersome regulations that may be imposed on different stakeholders within the CDN ecosystem – such as TSPS/ISPs and content providers.

- **Inclusive and transparent policymaking processes:** For any policy initiatives that affect stakeholders within the CDN ecosystem, it is important to ensure that these initiatives are made available to them in a transparency manner, so that they are able to engage in public consultations and discussions on such policy initiatives.

- **Universal service support:** This should be provided (for example through Government funding that is competitively bid for) to subsidize efforts to build rural broadband connectivity.

Q.35: Is there a need to incentivize the CDN industry to redirect private investments into the sector? What incentives are suggested to promote the development of the CDN industry in India?

BIF Comments

We believe that there is a need to incentivize the CDN industry to redirect private investments into the sector. We believe that ensuring an enabling and transparent regulatory environment will help promote the development of, as well as attract investments in the CDN industry in India. This can be done by adopting the following measures:

- Encouraging broadband deployment across India, particularly in rural regions, through policies that ameliorate infrastructure costs – such as promoting the sharing of passive infrastructure, as well as the costs of deploying and maintaining broadband infrastructure through "dig once, build once" policies.
- Lowering regulatory barriers that impose excessive compliances and prolonged clearance timelines related to approvals for establishing broadband infrastructure and provision of internet services will improve the rate of investments and enable new players to foray into the industry – thus increasing competition. In this regard, partial de-regulation for the telecom/internet sector will also help decrease costs, provide regulatory stability and generally promote initiatives that aim to improve connectivity across India.
- Lowering internet and other connectivity costs for consumers will also be in the interests of consumer welfare. This can be done, for example, by promoting infrastructure sharing and reducing the cost of international connectivity using alternate technologies, such as

satellites, or regulating connectivity costs for rural regions/areas where these costs are typically higher.

Q.36: How can TSPs/ISPs be incentivized to provide CDN services? Please elucidate your views.

BIF Comments

TSPs/ISPs generally have network and connectivity infrastructure in place, as well as existing relationships with end-consumers and content providers to help deliver content across their network. Thus, it is clear that they have an inherent advantage in providing CDN services. Accordingly, they can be further incentivised to do so by being offered fiscal incentives – such as tax relaxations and licence fee exemptions vis-à-vis their operation of CDNs.

Q.37: Are there any other issues that are hampering the development of CDN Industry in India? If there are suggestions for the growth of CDNs in India, the same may be brought out with complete details.

BIF Comments

None

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

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?

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.

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

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

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?

BIF Comments

Response to Q38-43:

IXP Business Models:

The importance of CDNs is well established through the market data available. Together with Datacentres and Internet Exchanges, they are extremely vital for growth of Digital Infrastructure. It is important that the availability of these elements viz. Datacentres, CDNs and Internet Exchanges is all pervasive and not restricted to only Tier-1 cities as at present. However, to enable this, the entire ecosystem for their presence is made available beyond Tier1 cities and in different States and smaller cities so that it provides boost to digital economy everywhere and the success of Digital India.

An allied concept is that of Universal Public Service. It has been noticed that Digital Divide between haves and have-nots is rising as we invoke new and emerging technologies. The philosophy of Universal Public Services must be interwoven with Regulatory oversight to take corrective measures, wherever required.

However, Regulation must be preferably ex-post and not ex-ante as the latter tends to be stifling and anti-innovation. It should be 'light-touch' so that it permits innovation to prosper but at the same time the Regulator may be permitted to intervene whenever required to take corrective measures in case of market failure, lack of adequate competition, perceptible consumer uneasiness and potential harm so that it acts as a deterrent instead of a market barrier. Light-touch Regulation should be such that it should ensure 'Digital Agility'. Since we are at a nascent stage of our journey towards becoming a Digital Economy giant, we should ensure that Regulation is kept to a bare minimum.

As regards Internet Exchanges, NIXI would have a very great role to play in spreading the IXs to smaller towns and cities and would have a great role to play in spreading the concept of Universal Public Service and Digital Public Goods, The Government needs to encourage and galvanise NIXI even more than what it is already doing. Since the Private Internet Exchanges are mostly coupled with the ISPs (integrated model), it should be ensured through suitably designed regulatory framework that they don't discriminate between their co-hosted /co-located ISPs, when it comes to peering and transiting traffic from other ISPs other than their partner –ISP.

IXP business models vary depending on whether an IXP is for-profit or not-for-profit. In general, a for-profit IXP aims to be profitable and distributes this profit as a dividend, or payment, while not-for-profit IXPs exchange traffic, without the intention of distributing profit, but to invest any surplus funds in the future development of the IXP. Some not-for-profit IXPs charge fees for their services based on a cost recovery model, whereas others seek external support such as sponsorships, subsidies, or donations. Normally, a not-for-profit IXPs operates under one of the following models: free, subsidized, or independent.

Non-profit IXP business models:

- Relies on contributions from IXP network members and volunteers.
- Contributions can be in the form of labour, equipment, time, money, or other as per the IXP needs.
- No membership, joining or monthly fees are charged to the IXP participants.
- Based on subsidies from the Government or an external entity that sponsors the IXP, mostly for a sustained period.
- The IXP meets some of the operating costs by charging members a nominal fee. In some cases, contributions from IXP members gradually allow to cover Opex and members to take ownership of the IXP and eventually to the transition to a fully independent model.
- Based on income generated by fees paid by members on a recurring basis. • Additional revenues from value added services, one-time fees, etc. All operational expenses are met by the IXP. Typically, this model is introduced when the IXP matures and has proven its value to operators and the ecosystem. Advantages of this model are Low cost of peering for members with no additional costs other than capacity to IXP.; Low to medium cost of peering for members in addition to the cost of leasing capacity to the IXP.; Sustained revenue to meet operational expenses.; Easy to scale and grow due to ability; Neutrality of the IXP is guaranteed in a self-sustained model; Sustained revenue to meet operational expenses besides Easy to scale and grow due to ability to implement and maintain

Governance and Financial Models: Best practices for sustainability.

- Low operating costs for the IXP organization.
- Volunteer driven; less complexity on organization and management. to implement and maintain management/operational structures. management/operational structures.

While community-led exchanges have to treat all members equally, put the interests of members first, and avoid competing with its members, a commercial internet exchange can make itself an attractive colocation site over and above the interconnection offer.

A for-profit commercial IXPs can have favourable pricing suiting to the prospective member. The differential pricing practices allow for better margins than the cost recovery charging at not-for-profit exchanges. Further commercial exchanges have the potential to raise capital or take debt to grow through acquisition. For the non-commercial IXPs, the choice of business model is an important factor that impacts the management and sustainability of its operations.

Ensuring the presence of a local interconnect exchange (IX) has become an increasingly important economic priority for many countries. IXPs help in developing the local internet industry, improve the market competitiveness and serve as a hub for new technical activities by ensuring better and more connectivity, particularly in less connected areas of a country.

Policy and Regulatory Initiatives in India: The requirement of creating an Internet exchange point for peering of the ISPs was felt in India as early as 2002 when TRAI set up a Task Force involving experts from DIT, IIT Delhi, IIM Ahmedabad, C-DOT, TEC, and ISPAI, with an objective to prepare an action plan to achieve faster growth of the internet in the country. The Taskforce recommended the establishment of IXP for the exchange of internet traffic within the country.

TRAI forwarded the recommendations of the task force to the Government in August 2002, it included setting up of NIXI in the country under the umbrella of an Industry representative not-for-profit, neutral body. The taskforce emphasized that this would result in cost-saving on international connectivity, lower internet usage prices for the consumers, and also improve the quality of service. The Government accepted the recommendations for setting up NIXI under a grant by the Department of Information Technology. National Internet Exchange of India (NIXI), registered as a Section 25 company under the Companies Act of India, is a public-private partnership between the government of India and industry ISPs. NIXI offers different ports capacity to ISPs, CDNs, with different billing cycles. Initially, four nodes of NIXI were made operational at Noida, Mumbai, Chennai, and Kolkata, which were physically hosted at the premises of Software Technology Parks of India. Currently, NIXI has 8 nodes, one each at New Delhi (NOIDA), Mumbai, Chennai, Kolkata, Bangalore, Hyderabad, Ahmedabad, and Guwahati, with a plan to interconnect Mumbai IX to Hyderabad IX. NIXI is presently working on expanding to two more IXP nodes at Lucknow and Mohali. Presently, 91 ISPs are connected with the various nodes of NIXI by the end of August 2021, and the aggregated maximum traffic exchanged at all the nodes is 245 Gbps as of May 2021

It was observed that despite NIXI's infrastructure having been established in 2003, only few operational large ISPs had joined NIXI nodes at various locations and the total number of connections to NIXI from these ISPs was very less. There were many issues in the efficacy of NIXI and a big chunk of domestic traffic was still not routed through NIXI. In this regard, TRAI had made several recommendations amongst which the most important one was:

a) Data Centres may be permitted to connect directly to the IXPs.

b) National level ISPs and International Internet bandwidth (IIB) providers may be mandated to connect to all IXPs.

Although ISPs and IIBs are mandated to connect to all IXPs, the number of ISPs connected to NIXI are still few. Only ISPs, as recognized and licensed by DoT, were till recently allowed to peer on NIXI, which excluded the content providers/CDNs. The delay in allowing cloud and content providers has accordingly shaped the ecosystem. The largest content and cloud companies have established their peering facilities at competing exchanges, or within large ISPs. NIXI has now permitted direct peering with CDNs

Today's NIXI exchanges are few in number, and we need many more Internet exchanges. Also, the sizing of the exchanges- switching points, space for providers' equipment, fiber connectivity to all networks etc need to be scaled in anticipation of the growth. A thorough study on anticipated traffic and the consequent infrastructure needs to be taken up on priority before more infrastructure is set up that is outdated/inadequate. Also, the geographical location needs to be carefully considered, taking into account the local demand, presence of fiber highways and the need to co-locate if possible with data centres. Many exchanges abroad have data centres next door to facilitate data flow. NIXI exchanges have be upgraded to carry multiple times the current volume. The Capex for this will probably be too much for current NIXI setup, so the Govt. has to help in the financing of the expansion. Also, NIXI exchanges need to come up in Tier II & III cities to keep up with local traffic needs.

Existing regulatory framework Issues

Presently there is ambiguity in Licensing framework of IXP in India, leading to confusion. While the integrated IXP players in India (IXP-ISP integrated model) are operating under ISP license, NIXI does not have any license. Therefore, clarity in respect of licensing framework for operating IXPs is required. It should be ensured that even for integrated IXP-ISP, the IXPs must be permitted to peer and transit traffic from any ISP in a non-discriminatory manner.

Those IXPs who are operating under Internet Service Provider licence to provide interconnect exchange facility to the users (most of whom are ISPs), cannot be considered to be neutral players. Being in the same business and competing with other ISPs, they can discriminate and refuse/delay interconnectivity to smaller and other ISPs. This conflict of interest may lead to a problem of trust with the competitors and can result in abuse of their position as IXP.

Another issue discussed with respect to the CDN content blocking is that the blocked contents ordered for blocking under Section 69A of IT Act have been found hosted at IXPs which are neither regulated nor mandated to implement the blocking system at exchange points. This scenario may result into bypassing of blocking directions of Hon'ble courts and MeitY under the IT Act in matters of national security.

For unbiased peering, interconnection and security, it can be argued that there is a need to bring all IXPs (integrated or otherwise) under a separate regulatory framework. This can help in promoting IXPs in the internet ecosystem.

Other Challenges for growth of IXPs The presence of Internet Exchange benefits the entire Internet ecosystem and encourages broadband penetration in India. However, the

establishment and operation of IXPs encounter several technical, economic, and policy-related issues

(i) **Location and Resource Availability** The internet exchange must be located in a building that is can fulfil its space, power, cooling, and security needs. Before setting up IXP at a location, availability of electric power, backup supply or generator, availability of reliable telecom links to the site, access to fiber facilities or rights-of-way, ability to build antenna towers or dig trenches for fiber, ease of access, etc., need to be ensured among others. Identifying potential site locations and managing them is one of the primary issues faced by an IXP. In India, the majority of IXPs are located in coastal states and metropolitan cities where submarine cable infrastructure exists for connecting to foreign exchange. Very few IXPs are located in the northern, central, and northeast regions, though there is significant penetration of internet and use of digital services in these areas. The growth of IXP in India has been confined to Tier-1 cities like Mumbai, Chennai, Kolkata, Delhi, etc., only.

(ii) India is a vast country with many internet service providers, who serve around 800 million internet users. Such operating scale requires highly distributed IXP locations and sites. However due to lack of connectivity and infrastructure, most states and Tier-2 cities do not have IXP presence, and they miss on the incidental benefits that an IXP presence can give. Companies or small exchange operators need to be encouraged/incentivized to set up IXPs at locations closer to the Tier-2 cities. This would lead to more efficient and economical interconnection and will serve the customers at the edge itself.

At the outset, as regards internet exchanges in India, we note that the NIXI would have a very great role to play in spreading IXPs to smaller towns and cities and would also have a great role to play in spreading the concept of 'Universal Public Service' and 'Digital Public Goods' (as noted earlier). Further, to reiterate, we believe that the Government needs to encourage and galvanise NIXI even more than what it is already doing. Since private internet exchanges are mostly coupled with the ISPs (via an integrated model), we believe that it should be ensured, through a suitably designed regulatory framework, that such private internet exchanges do not discriminate between their co-hosted /co-located ISPs, when it comes to peering and transiting traffic from other ISPs, other than their partner–ISP.

Separately, we note that the TRAI in a consultation paper on "Issues related to Telecommunications Infrastructure Policy" had recommended, in relation to the need for establishing IXPs in India, that:

- Data centres may be permitted to connect directly to the IXPs.
- National level ISPs and international internet bandwidth (***IIB***) providers may be mandated to connect to all IXPs.

Although we note that while ISPs and IIBs have now been mandated to connect to all IXPs, the number of ISPs connected to NIXI is still less. In fact, only ISPs, as recognized and licensed by Department of Telecommunications, were till recently allowed to peer on NIXI, which

excluded the content providers/CDNs. The delay in allowing cloud and content providers has resulted in some of the largest content and cloud companies establishing their own peering facilities at competing exchanges, or within large ISPs. That said, we note that the NIXI has now permitted direct peering with CDNs as well.

Presently, we also note that there is ambiguity in the licensing framework for IXPs in India. While integrated IXP players in India (i.e., those following the IXP-ISP integrated model) are operating under an ISP license, NIXI does not have any license. Therefore, we believe that clarity in respect of the licensing framework for operating IXPs is required. In this regard, we recommend that a licensing framework akin to that of ISPs should be avoided for IXPs, given that they do not provide internet or telecom services to consumers, but rather only enable seamless exchange of traffic. Further, if a licensing framework is extended to IXPs, entities that are usually not subject to telecom licensing requirements, may be prevented from foraying and investing in the IXP sector in India. This will impact the growth of IXPs in India.

We note that another issue that the TRAI is concerned with is implementation of content blocking laws. According to the TRAI, Content ordered for blocking under Section 69A of Information Technology Act, 2000 have been found hosted at IXPs which are neither regulated nor mandated to implement blocking orders.

In light of the discussion above, we propose the following policy measures that can be incorporated in relation to the functioning of IXPs in India:

- Introducing clarity in the licensing regime for IXPs. As noted above, licence conditions imposed on TSPs/ISPs should not extend to IXPs because of the fundamental differences in their functioning. There should also be regulatory clarity to ensure that IXPs are not governed by content blocking laws given the nature of their functioning.
- Equal treatment should be accorded to private IXPs and the NIXI. This will help attract foreign investment in the sector and promote India as a viable destination for establishing IXPs.
- As noted above, the NIXI has now enabled CDNs to peer. However, we believe that the NIXI should enable participation from other stakeholders as well – such as content providers.
- Suitable policy measures that ensure that IXPs are operated on the basis of trust and transparency (akin to the principles based on which the Singapore Internet Exchange operates) will help boost the growth of IXPs in the country.
- Lastly, the setting up of IXPs in rural areas should be promoted through measures such as Government funding, permitting the use of Government resources and land, providing tax breaks, etc. The Government can also promote training opportunities to increase employability in the operations of IXPs that can then be set up in rural areas. Policy

measures to increase demand for internet access across rural areas can also be implemented, to promote the establishment of IXPs in these areas.[6]

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?

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?

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.

BIF Comments

Questions 44-45

Connectivity and Infrastructure Limitations Once an IXP is established, ensuring connectivity with Internet Service Providers is the first important step. IXP operators just provide ports on their switches to the respective ISP to form a connection. ISP should bring their own fiber or buy point-to-point links from some telco and reach the exchange. However, the cost of this connectivity up to IXP is at times is prohibitive, and most small ISPs are left with no other option but to transit their traffic through bigger ISPs who may interconnect at a location that suits their own traffic rather than the small ISP's. In the bargain, smaller ISPs lose the advantage of control over their network design and also on reduction in latency. Further, the major internet service providers (ISPs), try to increase the cost of transit traffic of smaller ISPs. For a well-functioning IXP local IP transport capacity must be available for a reasonable price to allow stakeholders to connect to the exchange.

Autonomous System Numbers (ASN) An autonomous system number is necessary for any interconnection between two peered networks at IXPs. ASNs are important because the ASN uniquely identifies each network on the Internet. A unique ASN is allocated to each ISP for use in Border Gateway Protocol (BGP) routing. For joining an IXP in India, the member ISP must have its own ASN and use BGP for peering. The peering ISP must be identified at the local Internet registry of Asia Pacific Network Information Centre (APNIC). An IXP does not assign or provide IP addresses, AS Numbers, etc. The Internet Assigned Numbers Authority (IANA) is responsible for assigning ASNs to Regional Internet Registries (RIRs), which are organizations that manage Internet number resources in a particular region of the world. Asia Pacific Network Information Centre (APNIC) is the RIR, with which Indian ISPs have to make their own arrangements for obtaining an ASN.

[6]See Internet Society's report on 'Middle East and North Africa Internet Infrastructure', at https://www.internetsociety.org/wp-content/uploads/2020/09/Middle_East_North_Africa_Internet_Infrastructure_2020-EN.pdf.

There are two options to obtain ASN from APNIC: As a non-member of APNIC or as a member of APNIC. An ISP, who is a non-member of APNIC, has to pay AUD 500 (INR 28,027.83) as a one-time sign-up fee and a membership fee per year to obtain AS Number. This does not include allocation of any IP address. An ISP who is a member of APNIC has to pay member fee charges however allocation of AS number is free. The high fee required to obtain the AS number is the main barrier.

APNIC charges a very high fee for its membership based on the size of operation of the ISP. The lowest slab of the annual membership fee is AUD 1180 (INR 66,145.68) per year as per present rates. The high cost to obtain AS number, APNIC membership, and leased line to connect to an IXP are the reasons for many ISPs not joining the existing NIXI. Only ISPs who have their own AS number and have substantially high domestic traffic find it economical to connect to an IXP. To overcome the AS number allocation problem is by using private AS numbers from the upstream provider. As discussed above, small ISPs usually depend on larger ISPs for their upstream connectivity to International Internet Gateways. Therefore, these ISPs are expected to take unique private AS numbers from their upstream providers.

Question 46

Incentivizing establishment of more IXPs: Provision of incentives for encouraging investment to establish IXP can help in the growth of internet exchanges.

(i) **Fiscal incentives**: To attract start-ups into the emerging domain of IXPs, various schemes can be introduced, including but not limited to tax exemptions, investment benefits, and credit facilities. As the IXPs are usually non-profit entities, financial aid can also assist market growth, especially in small cities. Easy accessibility to bank loans may be made possible at cheaper rates, i.e., with lesser interests and collaterals. Promoting local investment opportunities via tax benefits, and reduced duties on the operational equipment needed to build IXPs will encourage the new entrants to get involved in the IXP business.

(ii) **Focus on priority regions**: Only in few Tier-1 cities are there where undersea cables and infrastructure is adequately available. The upcoming digital explosion and data localization will surely increase the traffic load in the IXs serving these areas, leading to inefficient traffic management. The priority areas need to be proactively identified considering various scalable factors for infrastructure creation and IXP establishment in such areas needs to be incentivized. The private IXPs would in turn necessitate the expansion of new peers such as Data Centres, CDNs, Content Providers in these areas heading to their overall digital ecosystem development. More incentives for such priority areas can be an option.

(iii) **Peering incentives:** Peering at multiple IXPs can increase reliability, help reduce latency and increase overall QoS. Direct peering can also be encouraged with content providers and hosting Data Centres. By giving incentives in terms of peering costs and port charges for interconnection to more than one IXPs, an ISP will be able to competitively expand its connections beyond a single exchange.

(iv) **Data Centre and IXPs coordination**: The synergy between Data Centres and IXPs can promote cost-effective strategies for an IXP establishment. Hosting an IXP in an existing Data Centre facility can substantially reduce the operating expenses associated with leasing space, purchasing power, and hiring staff, etc. Moreover, data hosting Centres already include the facilities that may be considered and used for an IXP establishment.

(v) **The right ecosystem**: An Internet exchange in an emerging competitive telecommunications market requires technical skill, participant trust, community engagement, and operational excellence to succeed. There needs to be a willingness to commit long-term budgeted funding, and plans need to be put in place to make the exchange self-sustaining and preferably self-governing.

Finally, the Internet-aware subscriber base will attract local or international content companies. Achieving this relies on the availability of supportive aspects in the ecosystem, access to diverse infrastructure, a competitive service-provider market, and a capable workforce. As the majority of the initial IXP expenditure is on the training of staff to establish and maintain the facility, free, or subsidized skill development programs can help in this direction.

Q.47: How can the TSPs empower their subscribers with enhanced control over their data and ensure secure portability of trusted data between TSPs and other institutions? Provide comments along with detailed justification.

Q.48: What is the degree of feasibility of implementing DEPA based consent framework structure amongst TSPs for sharing of KYC data between TSPs based on subscriber's consent?

Q.49: Are there any other issues related to data ethics that require policy/regulatory intervention apart from the issues that have already been dealt with, in TRAI's recommendations on the issue of 'Privacy, Security and ownership of the Data in the Telecom Sector' dated 16th July 2018 and the draft PDP Bill? Provide full details.

BIF Comments

Response to Q47 & 49

We note that the DP Bill 2021 is currently pending Parliamentary deliberation and enactment. Till the time this law is finalised, the TRAI should, in the interests of regulatory clarity, avoid issuing policy directives on issues that overlap with the ambit of the DP Bill 2021. Rather, we believe that the TRAI can engage with the Government on the following issues:

- **Data localisation requirements:** Cross-border data flows indeed play a crucial role in today's digital world. The same should continue to be promoted by India, even while pursuing the goal of data localisation. That said, we believe that allied issues relating to data localisation, such as law enforcement access to localised data, should be addressed in order to promote India as a location where data can be securely stored and processed. The potential of governmental access to such data (for example, through existing laws such as the Information Technology Act, 2000) will undoubtedly affect foreign companies' ability

to store data in India and set up data centres. This is because the same could impact their privacy commitments made to consumers, as well as affect their ability to comply with other jurisdictional laws. Thus, there should be adequate safeguards to enable them to remain compliant with the same. Enlisting reasonable and best-practices oriented norms relating to government access to data stored in India by foreign companies will be a step in the right direction.

- **Hardware testing requirements:** We note that the DP Bill 2021 intends to empower the Data Protection Authority to monitor, test and certify hardware and software on devices to prevent malicious attacks. This is because of the need that has been felt to establish certification mechanism and testing facilities to ensure the integrity of digital devices in the interests of security. While we appreciate this concern, we believe that before any kind of testing or certification requirements are implemented, data centre operators, CDNs and IXPs should be involved in consultations so that there is regulatory clarity on how these requirements may affect their existing operations, as well as their software and hardware equipment.

Response to Q48

Recently, NITI Aayog has come out with a discussion paper on Data Empowerment and Protection Architecture (DEPA) for a secure consent-based data sharing framework to accelerate financial inclusion. DEPA empowers every Indian with control over their data. It democratises access and enables secure portability of trusted data between service providers. It involves the creation of a standardized technology architecture implemented within the right institutional constructs. DEPA's technology architecture is an interoperable, secure, and privacy-preserving framework for data sharing through: a. A technology standard for a machine-readable Consent Artefact; b. Open APIs for data sharing; and c. A standard for Financial information. d. TRAI's Recommendation on "Privacy, Security and Ownership of the Data in the Telecom Sector"

In August 2020, NITI Aayog released a discussion paper on Data Empowerment and Protection Architecture (DEPA). Based on the consent philosophy codified by the PDP Bill, 2019, the aim is to provide individuals with the practical means to access, share, and use datasets containing their personal information in an accessible and easily understandable manner. This includes purchase data, traffic data, telecommunications data, medical records, financial information, and data derived from various online services. The main objective of DEPA is to give users control over how their data is used and to enable seamless accumulation and consumption of personal data while ensuring privacy and security. DEPA offer users access to better financial services. Its main features include:

a. Designing an evolvable and agile framework for good data governance.

b. Empowering people to access their data and share it with third-party institutions seamlessly and securely.

c. Giving free, informed, specific, clear, and revocable consent to users.

The basic building blocks of the proposed DEPA technology framework consists of:

i. An Electronic Consent Framework with a specification for a consent artefact managed by MeitY.
ii. Data Sharing API Standards to enable an encrypted flow of data between data providers and users. iii. Sector specific Data Information Standard. For the financial sector, this is the Financial Information Standard, which explains the required shared elements of a bank statement across institutions for instance.

DEPA's Institutional Architecture will involve the creation of new market players known as User Consent Managers. These will ensure that individuals can provide consent as per an innovative digital standard for every data shared. These Consent Managers will also work to protect data rights like the Account Aggregators (AAs) in financial sector The core principle of AA platforms built on DEPA is to give users complete authority over how their data will be used.

Under DEPA, the interaction between an individual, a potential data user, and the data fiduciary holding users' information will be mediated through consent managers—organisations maintaining the 'electronic consent dashboard' for users. Consent Managers will be having the responsibility of making sure that individual data is not shared without user consent.

Q.50: Stakeholders may also provide comments with detailed justifications on other relevant issues, if any.

BIF Response

In summary:

1. Liberalising and consolidating regulators and policies
2. Involvement of state agencies to provide DC parks and local fiber
3. Use of new and innovative planning approaches and tools for the anticipated boom in bandwidth requirement.

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