

# Topics on Cutting-Edge Technology in LIS

**Shri Manoj Kumar K, Scientist D (CS) of the Centre is looking after the UGC-Infonet Network and iETD (Indian Electronic Theses and Dissertations) of the Centre. The Internet connectivity given to the universities is being enhanced from 512 Kbps to 2 Mbps to 10 Mbps with switching over of Internet Service Provider from ERNET to BSNL. Sh. Manoj in this article entitled "UGC-Infonet 2.0 and National Knowledge Network (NKN)" explains the shift from ERNET to BSNL. Sh. Manoj Kumar can be contacted at [manoj@inflibnet.ac.in](mailto:manoj@inflibnet.ac.in) for further details about the initiative.**

Knowledge based economy is the key element for the development of a nation which has to be built from the sharing of information and knowledge in proper manner. In order to share and flow the knowledge among academic Institutions and researchers, proper networks are required. Connectivity is a crucial issue to be addressed for information sharing. Many ISPs have come up with various technological solution to address the issue such as Broad Band, RF based, MPLS VPN, Wireless (Wi-Fi and Wi Max) . Even though seamless access to resources without any interruption still remains as a dream. Interaction and sharing are important paradigms for quality education and Innovation, National Knowledge Network (NKN) and extension of NKN to individual Institutions through NME-ICT, would act as Catalysts.

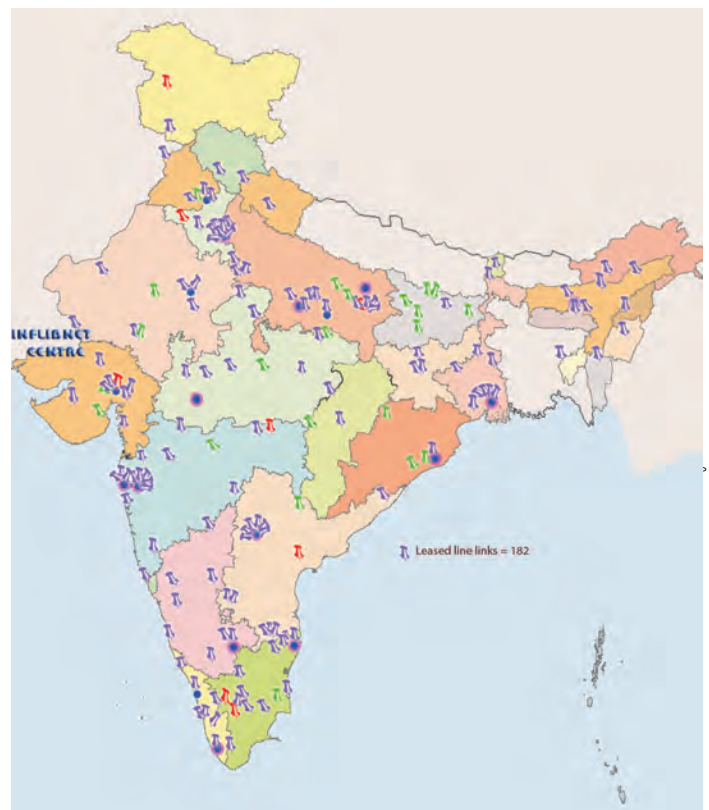
India has experienced with many networks for the above purpose. Some of the popular networks are

1. NICNET (Government Information)
2. ERNET (Education)
3. ARUDA (Grid Computing)
4. ANUNET
5. SPACENET
6. SWANs (35 in number)
7. UGC Infonet (180 plus universities)

Each one covers a specific application domain like UGC INFONET 2.0 also uses BSNL backbone for the UGC Infonet 2.0 project for sharing e-resources especially e-journals to research scholars in

university sector. The UGC-INFONET mainly provides Internet bandwidth, a pre-requisite for delivery of scholarly content subscribed through the UGC-INFONET Digital Library Consortium. The scheme has now been extended to 180+ Universities covered under UGC and 6 Inter-University Centres of the UGC.

UGC Infonet was launched in 2002 as an ambitious programme of UGC to interlink all the Universities in the country with state-of-the-art technology. Initially the network was consisted of judicious mix of all technology to reach remote locations which used VSATs (BB VSAT, SCPC VSAT, DAMA VSAT, etc), RF links, Leased Line, etc. which was executed by ERNET on a turn key basis. To keep abreast with technology, other newer technological solutions were also used and bandwidth was upgraded from 64 Kbps on VSAT to 2 Mbps with dedicated leased circuits.



The Network is being switched to BSNL backbone w.e.f 1st April 2010 and renamed as UGC Infonet 2.0. On the new scheme 10 Mbps (1:1) Leased line is being established in 180 plus universities by using Fiber in many places to provide Internet Services.

INFLIBNET is responsible for executing and monitoring the entire project.

UGC Infonet 2.0 is laid on Fiber backbone of BSNL network which covers almost 614,755 Rkm of OFC Cable and 50,430 Rkm of Microwave Network connecting 602 Districts, 7,330 cities/towns and 5.6 Lakhs villages in India. Any university covers under the 12B/2F Section of the UGC Act can join UGC Infonet 2.0 by requesting INFLIBNET Centre in prescribed format.

Forms are available at the UGC Infonet web site ([www.inflibnet.ac.in/infonet](http://www.inflibnet.ac.in/infonet)). Bandwidth test such as download/upload speed, latency, jitter delay, etc. are also made part of the UGC Infonet 2.0. 32 IP addresses are allocated to Universities to host their content and also authenticate access to e-resources as part of UGC Infonet Digital Library Consortium. Finally this network will subsumed to National Knowledge Network once implemented. Details of NKN and NME-ICT which is also part of the overall development of network, are given below. As part of UGC Infonet 2.0, BSNL would provide the following facilities:

- ▶ 10 Mbps (1:1) Internet leased line (with provision of 4/6/8 Mbps initially depending on feasibility), scalable upto 50 Mbps (1:1)
- ▶ NTU and router for Internet connectivity.
- ▶ 24x7 NOC support for maintenance of Internet Leased lines.
- ▶ Add on facility like web hosting, video conferencing & Broadband- VPNoBB
- ▶ Single window access for all type activity.
- ▶ Escalation matrix for removal of fault for all location
- ▶ Service support at district HQ live.
- ▶ 24x7 NOC support for maintenance of Internet Leased lines.

Once NKN is established in universities, UGC Infonet would take new format to utilise the network effectively for sharing and dissemination of academic content using latest technological tools.

#### **NKN Preamble**

As per the report submitted to Hon'ble Prime Minister of India by National Knowledge Commission, it is envisaged that the key to successful research today demands live consultations, data and resource sharing. Towards this end, NKC has recommended the establishment of a high-end National Knowledge Network connecting all our knowledge institutions in various fields and at various locations throughout the country, through an electronic

digital broadband network with Gigabit capacity. The recommendation has strongly emphasised on building a National Knowledge Network with Gigabit capabilities to connect all universities, libraries, laboratories, hospitals and agricultural institutions to share data and resources across the country. For this purpose around 5,000 nodes covering all major institutions are to be connected with actual implementation in various phases targeting 500 to 1,000 nodes in the first phase.

#### **NKN Objective**

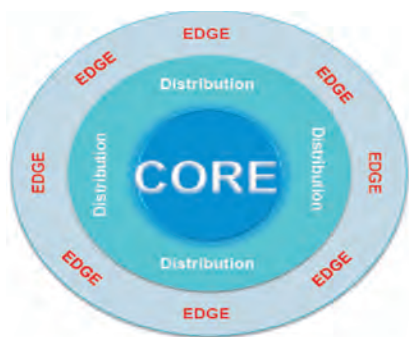
The Objective of NKN is to build a Network like National Highway to enable different initiatives to leverage the common infrastructure.

There are many applications and services which require high bandwidth such as.

- ▶ Virtual Laboratories
- ▶ Collaborative Mega Science Projects
- ▶ Innovative Info-Bio-Nano Experiments
- ▶ Non-invasive Medicare for Diseases like Cancer
- ▶ Diagnostic Domes as Public Health Centers in Rural Areas
- ▶ Country-wide Classroom
- ▶ University without Walls
- ▶ Voice Conferencing among Researchers
- ▶ Video Conferencing among Researchers
- ▶ On-line access to multimedia based Electronic Resources

The objective of the National Knowledge Network is to bring together all the stakeholders in Science, Technology, Higher Education, Research & Development, and Governance with speeds of the order of Gigabits per second coupled with extremely low latencies; through PoPs in the respective institutions/organisations. NKN will interconnect all institutions engaged in research, higher education and scientific development in the country, over a period of time. The output of the project will be a high capacity countrywide Infrastructure at education & research Institute level, which will be available 24x7 to support education and research application, and other application as envisaged by these institution which require very high bandwidth.

As per the statement of Dr. B K Murthy who is coordinating NKN from Ministry of IT, Govt of India, the outcome of the project is difficult to quantify. The NKN will facilitate the knowledge sharing, collaborative research, countrywide classrooms (CWCR), etc. and help the country to evolve as Knowledge Society. This will also contribute in socio-economic activities of the country indirectly.



### Design Philosophy and Features of NKN

The design philosophy & NKN is to build a scalable network, which can expand both in the Reach (spread in the country) and Speed and to act as a common Network Backbone like

national highway, wherein different categories of users shall be supported.

The Features includes providing high Capacity, highly Scalable Backbone, Provide Quality of Service (QoS) and Security on the Networks, cover wide geographical Coverage, build a common standard platform by hiring/merging bandwidth from Many NLD's with highly Reliability and also create test beds for various implementation on dedicated or/and Owned Network.

During 2008–09, Rs. 100 crore was allocated for the National Knowledge Network (NKN) which proposes interconnecting all knowledge institutions in the country with Gigabit capabilities, for sharing resources and research. A High Level Committee (HLC) constituted by the Department of Information and Technology (DIT), under the chairmanship of the Principal Scientific Adviser, was set up to operationalise the network. The design of NKN was prepared by a Technical Advisory Committee set up by the HLC, and the initial implementation is being managed by NIC (under DIT).

### NKN Architecture

The NKN architecture consist of a CORE using Internet Protocol (IP) and Multi-Packet Labeled Services (MPLS) technology, an Aggregation or Distribution network, and an Access or Edge network linking the institution's local area network (LAN) to the Core as shown in the figure given below. The Core network could be a single hierarchy or a two-stage knowledge network with a high speed network at the top to accommodate architecture flexibility and security concerns in a VPN-based Internet Protocol-Multi Protocol Label Switching (IP-MPLS) network.

In the initial phase of NKN, following projects have been taken up and their status are as follows (as on Jan 2010) :

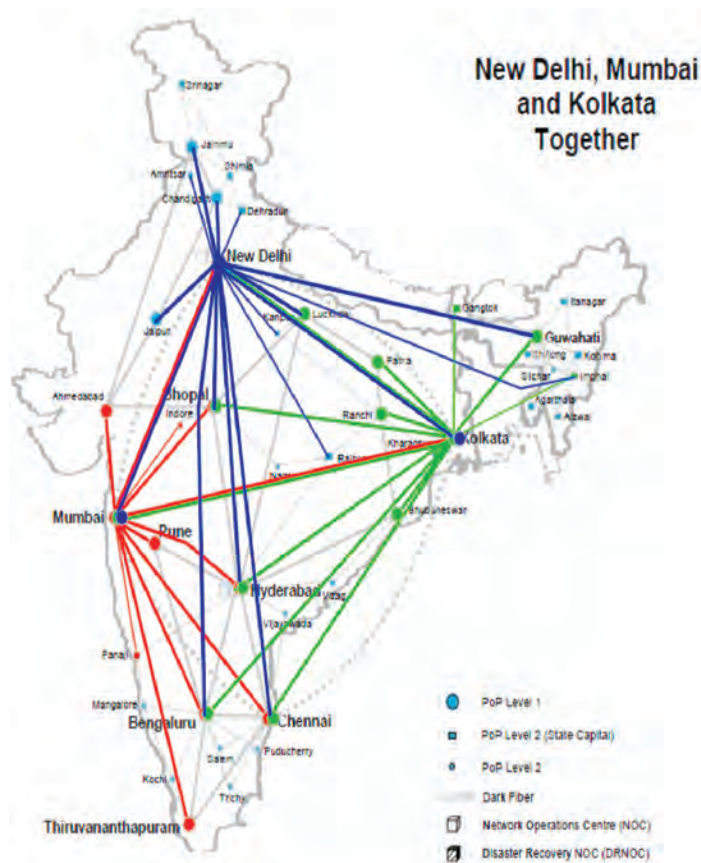
- Up-gradation of the NICNET PoPs at 15 locations to handle gigabits of speed has been completed in December 2008. The locations are: Delhi (Delhi), Chandigarh (UT), Jaipur

Pradesh), Bhopal (Madhya Pradesh), Kolkota (West Bengal), Bhubaneswar (Orissa), Mumbai (Maharashtra), Chennai (Tamil Nadu), Guwahati (Assam), Thiruvananthapuram (Kerala), Bengaluru (Karnataka), Lucknow (Uttar Pradesh).

- Creation of minimum infrastructure at 40 Institutions (out of 57 Institutions) to connect to NKN have been completed. The Institutions includes: IIT-Gandhinagar (Gujarat), IIT-Mumbai (Maharashtra), TIFR Mumbai (Maharashtra), BARC Mumbai (Maharashtra), IIIT-Hyderabad (Andhra Pradesh), IIT-Patna (Bihar), VECC Kolkota (West Bengal), IIT Kharagpur (West Bengal), IIT-Chennai (Tamil Nadu), IGCAR, Delhi (Delhi), IIT-Guwahati (Assam), IMTEC (Chandigarh), IITM-Pune (Maharashtra), CDAC Pune (Maharashtra), IGIB- JNU (Delhi), IGIB-Okhla (Delhi).
- Six virtual classrooms (out of 50 Virtual classroom) over NKN have been established at six IITs [Chennai (Tamil Nadu) - Hyderabad (Andhra Pradesh), Mumbai (Maharashtra) - Gandhinagar (Gujarat), Guwahati (Assam) - Patna (Bihar)].

The initial phase of National Knowledge Network (NKN) was inaugurated by H.E. Smt. Pratibha Patil, Honorable President of India on April 9, 2009 at Rashtrapati Bhavan. The final phase of NKN is at an advanced stage of planning, design and cost estimation. The network final phase is ready for roll out and is awaiting launch. As mentioned, the network would be operationalised in two phases. The core and distribution network covering 1000 nodes with Gigabit capacity would be set up in the first phase and this process has already started. The network is scalable and coverage can grow up to 10,000 nodes/institutions. Institutions across the nation will be connected to various PoPs located in major Cities, State Capitals etc. Level-1 POP (Point of Presence) Centre located in major cities like New Delhi, Mumbai, Kolkata, Chennai etc. Level-2 POP are located in all State capitals and in other cities. Level-1 POP connected institutions can reach another Institution in 2 hops and cities like Kohima can reach any where in India in 4 hops. In this way an MPLS Grid is morphed for all the network with VPN. INFLIBNET Centre is already connected with a node, but right now used for UGC Infonet 2.0. When all Institutions are connected to NKN, UGC Infonet connected Institution will be migrated to NKN and the UGC-Infonet will take another format to support universities in better utilisation of NKN. NKN would also support E-Governance as per the XI plan projection which will add Data Centre and Network State wide. The XI Plan envisages the creation of core infrastructure such as SWAN (State Wide Area Network), Common Service Centres (CSCs) and

State Data Centres (SDCs) for creation of a common service delivery platform SWAN has been implemented in 6 states/ UTs



till date and in 18 states implementation is in process.

Till date SDCs have been approved for 26 states by the Government. Under the approved CSC scheme which envisages establishing over 100,000 CSCs across India, 20,558 CSCs have been rolled out. The process for roll out for another 250,968 CSCs has also been initiated.

### National Mission on Education through ICT (NME-ICT)

Under the Mission, computer infrastructure and connectivity will be given to 419 Universities and more than 18,000 colleges in the country including each department of nearly 400 universities, deemed universities and institutions of national importance. In addition to utilising the connectivity network of BSNL, MTNL, Powergrid, Railtel and other providers, the mission will explore the possibility of providing connectivity utilising other technologies, if required, such as Very Small Aperture Terminal (VSAT), VPN and EDUSAT channels.

The objectives of the National Mission on Education through ICT

personalized needs of the learners; b) research in the field of pedagogy for development of efficient learning modules for disparate groups of learners; c) standardization and quality assurance of content to make them world class; d) building connectivity and knowledge network among and within institutions of higher learning in the country with a view of achieving critical mass of researchers in any given field; e) availability of knowledge content, free of cost to Indians; f) spreading digital literacy for teacher empowerment; g) experimentation and field trial in the area of performance optimization of low cost access/devices for use of ICT in education; h) providing support for the creation of virtual technological universities; i) identification and nurturing of talent; j) certification of competencies of the human resources acquired either through formal or non-formal means and the evolution of a legal framework for it; and k) developing and maintaining the database with the profiles of our human resources.

Providing connectivity to the colleges, institutions and universities is a key component of the NME-ICT, so that the high quality e-content could be reached to the teachers and students of these educational organisations. The connectivity under NME-ICT would seamlessly integrate with the National Knowledge Network (NKN).

Under the NME-ICT Scheme, it is ensured that every university gets from BSNL, an optical fiber connectivity of one Gbps to National Knowledge Network at one time cost of Rs. 2.00 crore, out of which 25%, i.e. Rs 50.00 lakh (10% i.e. Rs .20 lakhs in the case of North-Eastern Region) will have to be provided upfront by each university to BSNL as the remaining 75% (90% in the case of North-Eastern Region) would be provided centrally to BSNL by the Central Government. This would take care of connectivity charges for a period of 10 years. In addition, it is also ensured that each college gets a Virtual Private Network [VPN] of 10 Mbps [20 Nodes of 512 kbps; each or lesser Nodes of proportionately higher Kbps] from BSNL at an annual cost of Rs. 5000/- per Node [i.e. Rs. 1.00 lakh for 20 Nodes] out of which 25% payment, i.e. Rs. 2500/- per year (10% i.e. Rs.10,000/- in the case of North-Eastern Region) for a college will have to be made to BSNL directly, as the other 75% (90% in case of North-Eastern Region) is being centrally provided by the Central Government.

While 1 Gbps connectivity to NKN for 10 years and 400 node LAN for each of the Universities in the Country has been envisaged under NME-ICT at 25% cost to the Universities, to begin with the colleges and institutes, BSNL officials will be providing 10

connections of 512 Kbps VPN over BroadBand for unlimited use, with Internet connectivity, to each of the colleges institutions recognised under section 12-B of the UGC Act, cost of this connectivity by paying their contribution directly to BSNL. The total financial burden on each college institution on account of this level of connectivity would not exceed Rs. 15,000/- in a financial year. Rest 75% cost would be borne by NME-ICT by making direct centralised payment to BSNL. As an institution / college starts using more and more of bandwidth, the number of connections to those active users would gradually be enhanced to upto 20 connections per institution. With a view to encouraging BSNL to bring at its cost, optical fibre to as many colleges/ institutions as possible. Colleges/institutions are also expected consider providing some space for setting up a mobile tower in their campuses.

### Conclusion

While addressing the Nation on the launch of NME-ICT, Hon'ble President of India envisaged free connectivity to each citizen as a

right and national priority and make it part of essential infrastructure to all Indians. Connectivity will no longer be barrier for accessing valuable resources for research and academic purpose. The INFLIBNET Centre has already joined the movement and will act as a catalyst for academic community to get seamless access to resources and information.

### References

- 1) <http://www.knowledgecommission.gov.in>
- 2) Proliferation of ICT in Education – National Knowledge Network & NME ICT by Dr. B. K. Murthy, Director & Head, National Knowledge Network Division, Ministry of Communications and IT Govt. of India, August 26, 2009.
- 3) Welcome to 10,000,000,000 bits per Second by Prof Raghavan,
- 4) National Knowledge Commission : Report to the Nation (2006-2009)
- 5) NME-ICT Mission Document

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About UGC Infonet 2.0

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Please fill form-3 for 32 new IP addresses from BSNL

UGC-Infonet is an ambitious programme of UGC to interlink all the Universities in the country with state-of-art technology . The Network is being switched to BSNL backbone w.e.f 1st April 2010 and renamed as **UGC Infonet 2.0**. ON the new scheme 10 Mbps(1:1) Leased line is being established in 180 plus universities preferably by using Fiber to provide Internet Services. INFLIBNET is responsible for executing and monitoring the entire project. The UGC-INFONET mainly provides Internet bandwidth, a pre-requisite for delivery of scholarly content subscribed through the UGC-INFONET Digital Library Consortium.The scheme has now been extended to 200 Universities and 6 Inter-University Centres of the UGC.

Downloads:

BSNL ORDER  
Letter from Director/Chairman From-3 (IP Request Form)  
BSNL 10 Mbps LL Configuration  
BSNL Order 2Mbps

For Zoom View of Map Click on Map.. Old Architecture

Status of 182 Universities as on 22th June 2010	
	200
Funds Released From UGC	182
	114