

Leaving no citizen behind: Realizing the dream of an inclusive Digital India

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As India aspires to develop into a digital behemoth, on the solid foundation that already exists, connecting the outer fringes of the villages and citizens in remote areas, takes on even more importance. Hence, there is a need to dwell on the opportunities that abound, to overcome the challenges of the past and herald a new future of inclusivity for the over 640,000 villages and Gram Panchayats (GP), to join the mainstream digital readiness community, and contribute to building and achieving the nation's dream of Education for All, Healthcare for All, through 'Broadband for All' - thereby "Leaving No Citizen Behind".

While fibre has been chosen to provide connectivity from the GPs to Villages, fibre cannot reach most parts of the deep, rural, remote and undulated terrains of the country due to reasons of techno-economic feasibility. Therefore, it becomes essential to explore other technology options concurrently, which would help plug the gaps and complement the mainstream technologies to deliver seamless, holistic and inclusive digital connectivity.

Robust Wireless Middle-Mile Technologies

A combination of E band or FSOC (Free Space Optical Communications) technologies along with Fibre and Wi-Fi in the last mile can be a quick, cost effective and reliable panacea to effectively bridge the gap between the GPs and the additional villages in the shortest possible time.

A mix of Millimeter Wave Technology for the Middle Mile, combined with Public Wi-Fi for last mile access can be utilised effectively. This would entail deployment of commercial grade E band (71-76 GHz & 81-86 GHz), the equipment for which is readily available. This can be used to carry the signal from the GP (Fibre Hub) right up to the Village Hub/Cluster which could be created within 500 metres of a village cluster or at the village itself. The E band equipment can provide Multi-Gigabit capacities or fibre like capacity and can be hauled over longer distances using multiple hops.

PM-WANI

Under the progressive PM WANI initiative through use of efficient Public Wi-Fi hotspots, this Broadband Connectivity can be enabled up to the end user in the village in the last 500 metres,

PM-WANI is the most effective and cost-competitive last mile connectivity solution which can be used to bridge the digital divide, and would enable the creation of millions of Public Wi-Fi hotspots in a

decentralised manner. With increased customer awareness programmes like the BIF Connectivity Accelerator, the proliferation of PM-WANI led Public Wi-Fi hotspots is likely to bring about the connectivity revolution that Digital India truly needs, in its march towards meeting the NDCP target of creating 10 Mn Public Wi-Fi hotspots in the near future.

FSOC

Another Wireless Option that could be explored is Free Space Optical Communication (FSOC) - a line-of-sight, optical communication technology that propagates light in free space - air, outer space, vacuum. Currently, FSO is capable of transmitting up to 40 Gbps transfer of data, voice and video communications through the air, allowing fiber grade connectivity without requiring fibre-optic cable. The technology operates between 780 – 1600 nm wavelength and use O/E and E/O converters.

Citoto, a homebred innovative startup company is working on FSOC as an indigenised solution for Terrestrial, Space and Deep Space applications. ERNET India is conducting a MeitY-funded Pilot - D project to provide high speed network connectivity through FSOC technology in Nagaland. This infrastructure connectivity project aims to perform rich R&D by implementing a high-speed communication link across two sites using FSOC, where other means of terrestrial connectivity have been unsuccessful due to various challenges like difficult terrain, River/Railway tracks, frequent fiber cuts, etc. The project has established a live and working point-to-point FSO based Internet connectivity with several Gbps throughput under clear visibility conditions.

Satcom

With the plethora of advanced Satcom technologies viz. LEOs and MEOs along with the next generation High Throughput GEO Satellites, Satcom can not only be used to backhaul large amounts of data traffic and suitably complement terrestrial 5G across geographically difficult and remote terrains, but can also provision direct high capacity and high speed internet access to such remote and rural areas where it is not feasible or economically viable to deploy fiber.

Satcom was traditionally conceived as an overlay network. However, with Satcom now being integrated into the Next Release of 5G by 3GPP, seamless inter-operability between Satcom and terrestrial networks is a distinct possibility.

With Government making meaningful policy moves towards mainstreaming Satcom in the past one or two years, one expects Satcom to play a major role. With the onset of opening up of the space sector and increased participation by the private entities in the sector, we expect Satcom to play an increasingly important role in the future both for commercial broadband as well as in Bharat Net Project.

With careful planning and a heterogeneous mix of technologies and unique capabilities, the vision of leaving no citizen behind can be achieved.