

Digital Villages

India's Next Powerhouse

The Digital India program envisions connectivity upto the Gram Panchayat level. VNL can help extend its reach beyond, to the level of connected, Digital Villages.



India has leapfrogged on the back of an ICT revolution, and is today showing other developing economies how this can be done. With the Digital India program, the idea of leveraging the benefits of digitalization at the village level has found a renewed emphasis. In this context, the concept of a Digital Village sounds extremely appropriate and exciting.

But what exactly is a Digital Village? How does it benefit the villagers and the country? How can it be setup in a cost-effective manner, in a short timeframe?

This paper examines these questions and presents a solution that VNL, India's foremost wireless telecom innovation company has designed and manufactured indigenously, and is now deploying across the world. Our experience of transforming lives in the tiny village of Karenda in Rajasthan, India is highlighted here, as a case study.

What is a Digital Village?

Information Communication Technologies (ICTs) contribute in a significant manner to the development of a country, especially in a developing economy. However, like other infrastructure, these are often not distributed evenly in such economies, creating a 'Digital Divide'. Such Divide usually separates the highly developed, urban parts of the country from the underdeveloped, rural parts.

A Digital Village is often seen as an idea that can help remove this Digital Divide, enabling development to reach underdeveloped regions, and the country to leapfrog.

In physical terms, a 'Digital Village' generally refers to a village that is connected to the Internet. Though not specified, the assumption is that connectivity is broadband quality, providing sufficiently high bandwidth for most commonly used Internet applications to work on computers, tablets and mobile phones.

What is also not specified, but is assumed is that voice connectivity already exists or will be simultaneously achieved in a Digital Village. In other words, a voice network – fixed, mobile or both – has either been established previously by a Telecom operator, or will be enabled through technologies such as GSM and Voice over Internet Protocol (VOIP) once Internet connectivity is established.

Given the phenomenal march of mobile technology, a Digital Village today is

generally likely to have

- Ubiquitous voice connectivity (made available through GSM networks)
- Limited fixed phone connectivity (legacy, often at community points or with affluent inhabitants)
- Either ubiquitous Internet connectivity (through Wi-Fi) or limited connectivity (at select community points)
- Sufficient number of devices, capable of connecting to the Internet



Solar-powered broadband site at Karenda, Rajasthan

What does a Digital Village enable?

Once a village is connected in such a manner, it becomes fertile ground for inhabitants to achieve better productivity in all aspects of life, as well as enabling the government to reach the last mile and further its development agenda.

On the personal front, it enables villagers to get connected to the world at large, and with family, potential employers and the government, enabling them to

- Know and learn more (information, news, education)
- Entertain and socialize (social media, movies, TV shows)
- Connect instantaneously (with friends, family, employers, government)
- Do more (book tickets, bank electronically)
- Work better (agricultural and other information, how-to content, transactions)
- Live better (connect with doctors, book appointments, seek records, remote diagnosis)

On the other side, it enables governments to deliver governance of a higher order, more effectively through

- Communicating ideology
- Conducting a dialogue (public interest programs, feedback)
- Informing about and enrolling in programs, schemes
- Issuing identification and other documents like Aadhar card, passports, etc
- Gathering feedback and complaints instantaneously, for correction and redressal



Engrossed students attending the Digital Classroom in Karenda

A Karenda family logs in to the Internet



In fact, though most of the effects of a digital economy would be similar to those in urban, developed areas, given the extremely basic starting point in Digital Villages, the focus is generally on the effects that digital connectivity has on the following

1. Agriculture

Because agriculture is the mainstay of most villages, the effects that digital connectivity can have on the farmers' lives are tremendous. Information about weather, agricultural inputs, sowing and harvesting methods is vital, but far more important is the ability to find access to finance and markets, and the facility to bank online.

2. Education

The most obvious benefits are digitization of records, attendance and examination papers. But the gains are much more far-reaching in the area of e-Education. Students can not only get access to instant information about anything, but learn much better when digital classrooms open up the possibility of live and experiential education. A digital classroom is often no more than a connected computer attached to a projector, but it opens up new magical worlds to students. On the other hand teachers can prepare better lesson plans and engage in participative teaching a lot easier. Learning becomes much more fun, and enrolment increases dramatically. What's more, the fun can multiply many times over when tablets are distributed, or when students use smartphones even when classes are over!

3. Health

Connectivity ensures that lives are not put at risk because of lack of contact. Ambulances are now within reach, and lives can be saved through speedy action. Villagers are able to call doctors, make appointments and discuss their cases. Records



Solar-powered broadband site at Bahadari, Rajasthan

can be digitized and shared. Basic consultation can be delivered online. Plus villagers can watch video content about various illnesses and conditions and take first-level action themselves (eg in pregnancies). What's more, Blood Pressure measurements and even ECGs can be conducted at connected terminals with basic help and guidance.

4. Governance

Citizens' connectivity with governments facilitates a number of things. They not only get to know of policies, rules and

procedures, but can transact to get things accomplished more conveniently. Filling forms, registering vehicles, obtaining Aadhar cards, passports and even paying taxes are now much easier and obviate the need for travel and queuing up. What's more, local politicians and officials now become more accessible and answerable. Corruption potential is reduced, and governments can be held accountable. Governments find they can conduct a virtual dialogue with citizens, as communication and feedback become instantaneous and interactive on digital media.



Impact

690

GSM SUBSCRIBERS

509

BROADBAND USERS

150

EMPOWERED STUDENTS

100%

SOLAR POWERED SITES



Learning takes a leap in Karendra's Digital Classroom

Karendra was a remote underserved village in Rajasthan, India. At the best of times, it had erratic mobile and data coverage. All that has changed. Here's how.

VNL took the initiative to digitally empower an underserved Indian village, Karendra in Rajasthan. The village has a population of 2,155 (2011 Census). VNL deployed its WorldGSM™ solution with the objective of providing integrated mobile, broadband, broadcast and surveillance services to this underserved village. This site connects to 2 other nearby villages, Phalsa and Bahadari to provide high-speed broadband and has a Digital Classroom installed at Karendra's only Government School.

The VNL site is compact and energy-efficient. A triangular mast with mounted WorldGSM™ BTS is powered by just six solar panels. The site covers an area with 5 km radius for voice telephony using GSM. The site also has an IP-based Public Address System which can be accessed via IP or by dialing a phone number connected over GSM for making important announcements in these villages.

The Wi-Fi Access Point receives 100 Mbps bandwidth from a town 6 km away, and is delivered locally using APs and an

omni-antenna. The two smaller villages are connected wirelessly by IP-Radios to provide broadband to the three hotspots.

The Government School, Karendra is one of the biggest users of broadband services in the area. VNL has installed an e-Learning system at the school which provides a better, experiential learning platform for students and teachers.

The Digital Classroom has a large digital whiteboard, and a Linux based e-Learning platform for providing access to instant information via the Internet and pre-installed audio-visual content. Children can access vast amounts of information and material using e-Learning and websites like YouTube and Google. This has had a significant impact on attendance and has fired the imagination of the students and teachers.

The Digital Classroom and the broadband connection are powered by VNL's PowerCube™ 300 - a solar based power management solution mounted on the rooftop at the school.



"Now we don't have to travel 40 kms to the District Office to check the status of village related projects... Everything is now just a call away."

Krishna, Deputy Sarpanch, Karendra



"Technology creates a greater impact than traditional methods of teaching. Parents can see their children taking keen interest in studies because of the smart class."

Mahima Pandey, Principal,
Government School, Karendra



"We can now access YouTube to learn about subjects beyond our text books."

Lukman, Student,
Government School, Karendra

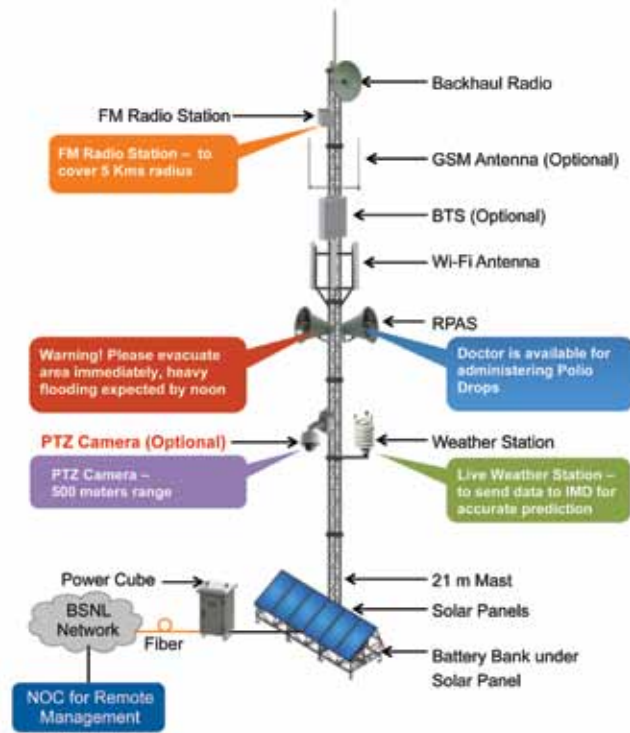
How can a Digital Village be set up?

Devices including computers, tablets and smartphones that are capable of connecting to the Internet are fast penetrating into the deepest interiors of the country today. So the issue with turning a village digital is less to do with devices but more to do with connectivity.

Digital connectivity often stops well short of rural and remote areas not because of technical infeasibility, but because of business reasons. Telecom operators, both fixed and mobile find the business case of providing connectivity in such areas unprofitable because of large Capital Expenditure (CAPEX) for laying fibre, erecting towers and installing expensive base-stations and high recurrent Operational Expenditure (OPEX) for fuel for generators, security etc.

In such a scenario, alternative solutions must be employed to make the business case viable for extremely sparsely distributed and small populations. Solutions such as VNL's WorldGSM™, for example, make this not only feasible but profitable for subscriber populations as low as 300 (which means that villages with a total population of less than 1000 now become viable for setting up mobile and broadband networks). The hallmarks of such a solution are

- 1. Wireless technology instead of fibre:** Fibre is not only expensive, but takes much longer to lay, especially when terrain is challenging, like in the hills or deserts. Wireless radio networks, on the other hand, can be effectively deployed for backhaul, picking up signals from last-mile fibre, or via satellite, and transporting them over appreciable distances



Schematic of a typical Digital Village site solution

- 2. Easily transportable and erectable towers:** Towers meant to beam signals to small populations do not need heavy machinery to transport and erect. They can be 15 to 30 metres tall, depending on the topography and coverage required. In many cases, when tall structures or elevations are naturally available, towers may not need to be erected at all.
- 3. Solar panels with battery backup for ensuring always-on, low-powered base-stations:** Because remote areas often have no or erratic electricity, solar-power can be used to generate and store the low amounts of power that are required by our base-stations. The base-stations themselves are capable of supporting 2G and 4G (LTE) technologies as maybe required.
- 4. Remote controlled configuration and monitoring:** Even though towers and base-stations are located in remote areas, once setup, they don't require any manpower to configure, secure or operate them thereafter, obviating any requirements for man or machine in those locations. Remote monitoring and correction takes over, and software including subscription-billing systems ensures that the only number-crunching you need to do is analyze traffic data as it flows in.
- 5. Broadband through Wi-Fi:** The VNL towers create Wi-Fi hot-spots around them, beaming broadband into community locations such as schools, primary health centres, and of course, homes, ensuring that all connected devices can password-connect instantly to the Internet. A special feature of the VNL solution is the e-Classroom, complete with a powerful computer and projector, for experiential learning in connected schools.

6. Surveillance and Public Address (PA) system:

That's not all. Mounted on the same towers are two more pieces of equipment, which help the village community in more ways. The first is a Remote PA system that can be used for community-relevant programming like *Mann Ki Baat*, and announcements including weather-related warnings, calls to congregate, etc. The other is a Pan-Tilt-Zoom (PTZ) camera that can scan all sensitive areas around the towers.

7. Interconnect arrangements with incumbent state operator:

Though the rural/remote network so setup is completely self-sufficient within itself, and internal calls can be made for free in the village, interconnect arrangements are needed to connect with outside networks. Typically, such arrangements are provided by incumbent government owned operators, thereby creating a win-win partnership.

VNL has successfully indigenously designed, manufactured, and setup such solutions in LWE-affected Indian states, the deep interiors of Bhutan, Indonesia and remote areas of Africa and Latin America. The number and diversity of our deployments easily puts VNL ahead of any comparable solution provider, anywhere in the world.

How much does it all cost?

While the cost of the final solution varies on account of various factors including location, size of population to be covered, backhaul scenario, the solution configuration, and so on, it is certainly more cost effective than traditional fixedline, mobile or fibre-based solutions.

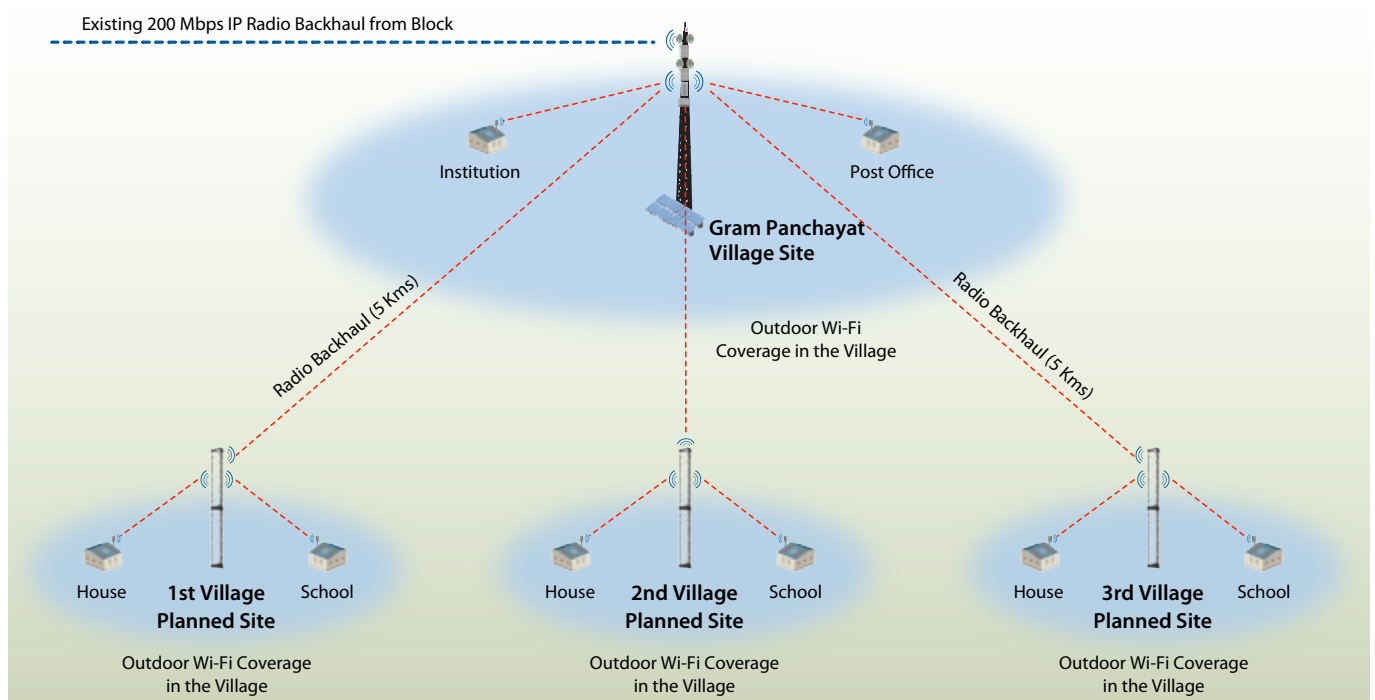
How does it benefit the nation?

It has been demonstrated that growing the ICT sector translates into growing the economy with a multiplier. There are not only direct benefits created by the sector by way of job creation and boost to GDP, but many indirect ones that include

emergence of new services and industries, productivity improvement, human welfare, workforce transformation, and business innovation.

But the vision of an India composed of a multitude of Digital Villages goes well beyond the economic arguments. Digitalisation can be a huge leveler, bringing the benefits of development to the last mile far more quickly than investment in any other infrastructure.

VNL believes that it can contribute in a substantial way to the Digital India program by helping extend its reach into rural and remote corners of the country. We believe that we are uniquely positioned to take forward the task of making digital technology extend from the 250,000 digitally connected Gram Panchayats, into the villages, using our innovative solutions. This will not only help villages realize their true potential, but will likely transform the Indian hinterland into a powerhouse in the coming years.



Network connectivity schematic for connecting Blocks with Digital Villages

About VNL



VNL makes the award-winning WorldGSM™ system, a sustainable, turnkey GSM and broadband solution specifically for rural and remote locations. It also makes a range of privately owned and managed GSM & broadband network solutions for specialized applications such as secure communication platforms for homeland security, communications for remote industrial centres and rapidly deployable networks for disaster and emergency situations.

VNL's pioneering work has been widely praised. During Mobile World Congress, 2010, in Barcelona, VNL was the recipient of GSMA's 2010 'Green Mobile - Best Green Programme Product or Initiative' Award. VNL was also named a 'Technology Pioneer 2010' by The World Economic Forum. In addition, VNL was named the third most innovative company, and the most innovative telecom company in the world, in the Wall Street Journal's annual Technology Innovation Awards in 2009.

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