IEEE

INTERNET INCLUSION:
Advancing Solutions

New Dehli, India

15 September 2016

Executive Summary

On 15 September 2016, IEEE hosted *Internet Inclusion: Advancing Solutions –Delhi (IIAS-Delhi),* convening government officials and leaders from development institutions, industry, the technical community, non-governmental organizations/civil-society organizations (NGOs/CSOs), and others for a day of collaboration on expanding affordable internet access, especially in the South Asian region. (Please visit the event website at http://internetinitiative.ieee.org/events/conferences/internet-inclusion-advancing-solutions-india and the video showcase at https://ieeetv.ieee.org/event-showcase/iias-delhi-2016.)

The Delhi event built on an earlier, globally scoped IEEE Internet Initiative event addressing internet inclusion. At *IEEE Global Connect Stakeholders: Advancing Solutions* on 13 April 2016 in Washington, D.C., technology and policy experts gathered to explore real-world opportunities, challenges, and solutions for extending affordable internet access across underdeveloped and underserved communities and regions around the world. *IIAS-Delhi* provided a platform for a deeper dive into the challenges, barriers, and opportunities in that pursuit, *within the South Asian context and perspective*. The percentage of unconnected people is higher in the South Asia region—Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka—than the estimated 60 percent worldwide.

IIAS-Delhi featured interactive discussion and working sessions with a focus on finding sustainable solutions and models for digital inclusion, such as envisioned in "Digital India," a flagship program of the Indian government premised on the vision of transforming India into a digitally empowered society and knowledge-based economy. As explained by IIAS program chair Deepak Maheshwari, director of government affairs for Symantec across India and the ASEAN region, "Prime Minister (Narendra) Modi's visionary and ambitious Digital India program has the potential to transform the country through digital infrastructure, enablement, and empowerment. However, the challenges are aplenty. While India already has 300 million internet users, many of those are connected at low speed but more importantly, three-fourths of the population is yet to come online."

In his keynote address, Richard R. Verma, U.S. ambassador to India, spoke about the common challenges that the United States and India face in the digital revolution. He underlined the importance of bridging the digital divide and the role of the Global Connect Initiative, and he mentioned that the framework for the U.S.-India Cyber Relationship had been formalized.

In the next keynote address, J.S. Deepak, secretary of India's Department of Telecommunications, spoke about Digital India and outlined six challenges to be tackled:

- Broadband connectivity
- Digital literacy
- Content in Indian languages
- Availability of e-services
- Quality of service
- Cybersecurity
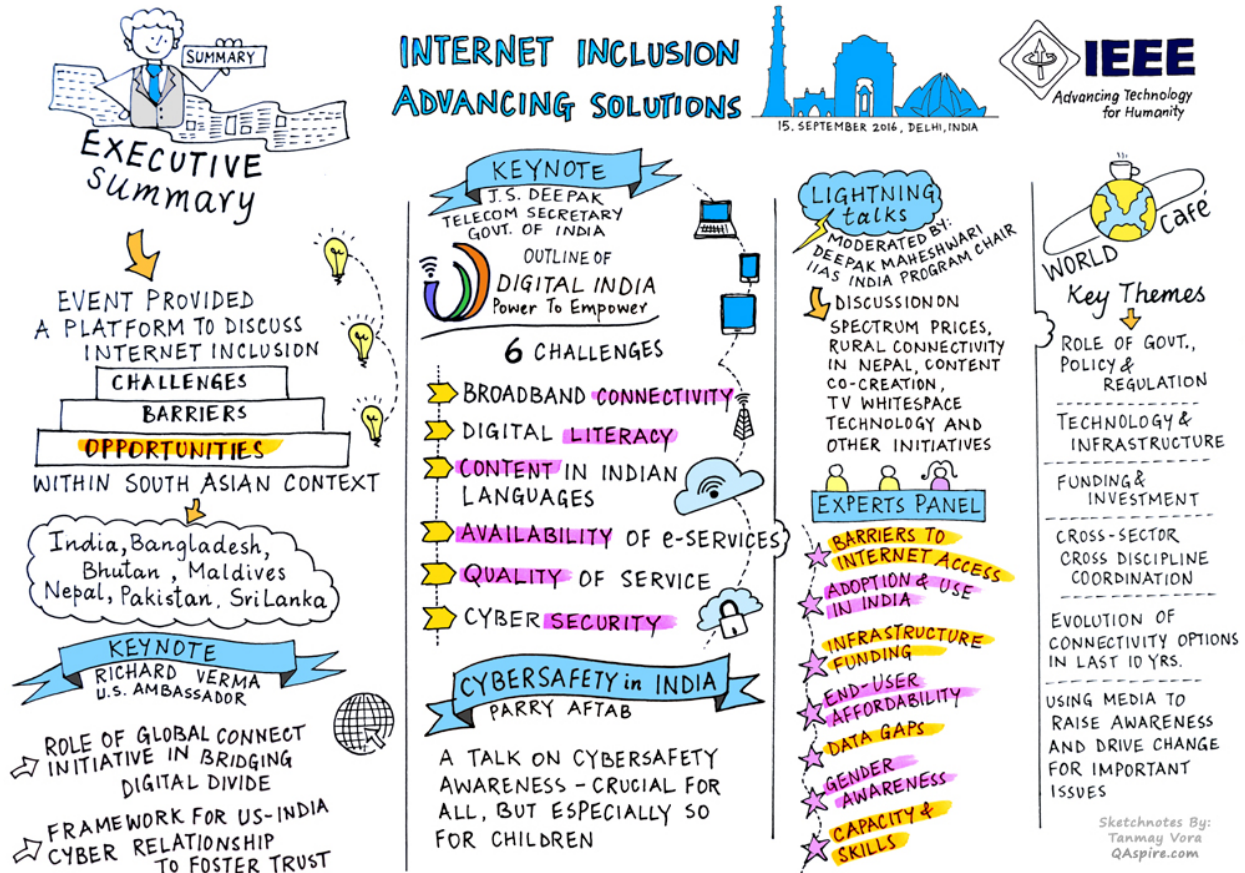
A panel of experts from Idea Cellular, IIT Bombay, Nepal Wireless, Qualcomm, and Swaja Labs examined the current internet landscape in South Asia. They highlighted projects and initiatives that are underway or being planned to provide meaningful access to the internet in the region. A separate panel of experts from Digital Empowerment Foundation (DEF), Observer Research Foundation (ORF), India's Telecom Engineering Center, and World Bank discussed barriers to internet access, adoption, and use in India, including infrastructure, funding, end-user affordability, data gaps, gender, awareness, capacity, and skills.

During "World Café"-model conversations, participants considered a scenario in which almost all of India's population is ubiquitously connected by the year 2025 and the country is beginning to see economic prosperity as a result. Participants discussed driving factors, barriers to be overcome, and advancement of relevant solutions to realize the scenario with ubiquitous and meaningful internet access, leading to socio-economic inclusion and tangible economic prosperity.

Participants heard a presentation on cybersafety awareness, especially for children. An update was shared on IEEE Internet Initiative activities since the *IEEE Experts in Technology and Policy (ETAP) Forum on Internet Governance, Cybersecurity, and Privacy* in Delhi on 4 March 2016. White papers on operational challenges to universal access that resulted from the event are being developed to address fundamental issues of access and cost (affordable price points for

mobile devices and cost of connectivity at remote locations), as well as predicting internet traffic and taking into account various industry regulations. Finally, a road-mapping session collected ideas and thoughts about issues raised in the various sessions at *IIAS-Delhi*, and explored the way forward.

The effort to achieve universal, affordable connectivity depends on the shared expertise, experiences, and creativity of the *global* technology, technical, and policy communities in forging *locally* relevant solutions. *IIAS-Delhi* delivered important insights in understanding the particular challenges prevalent in South Asia.

Inaugural Session

IEEE senior director Karen McCabe welcomed all the participants and briefly stated the objectives behind *IIAS-Delhi*. Mr. Maheshwari welcomed and introduced the two keynote speakers, Richard R. Verma, U.S. ambassador to India, and J.S. Deepak, telecom secretary in the government of India.

To Be Unconnected Is To Fall Behind–Richard R. Verma, U.S. Ambassador to India

In his keynote address, Mr. Verma cast the advent and proliferation of the internet in historical context and surveyed the common challenges that the United States and India face in the digital revolution.
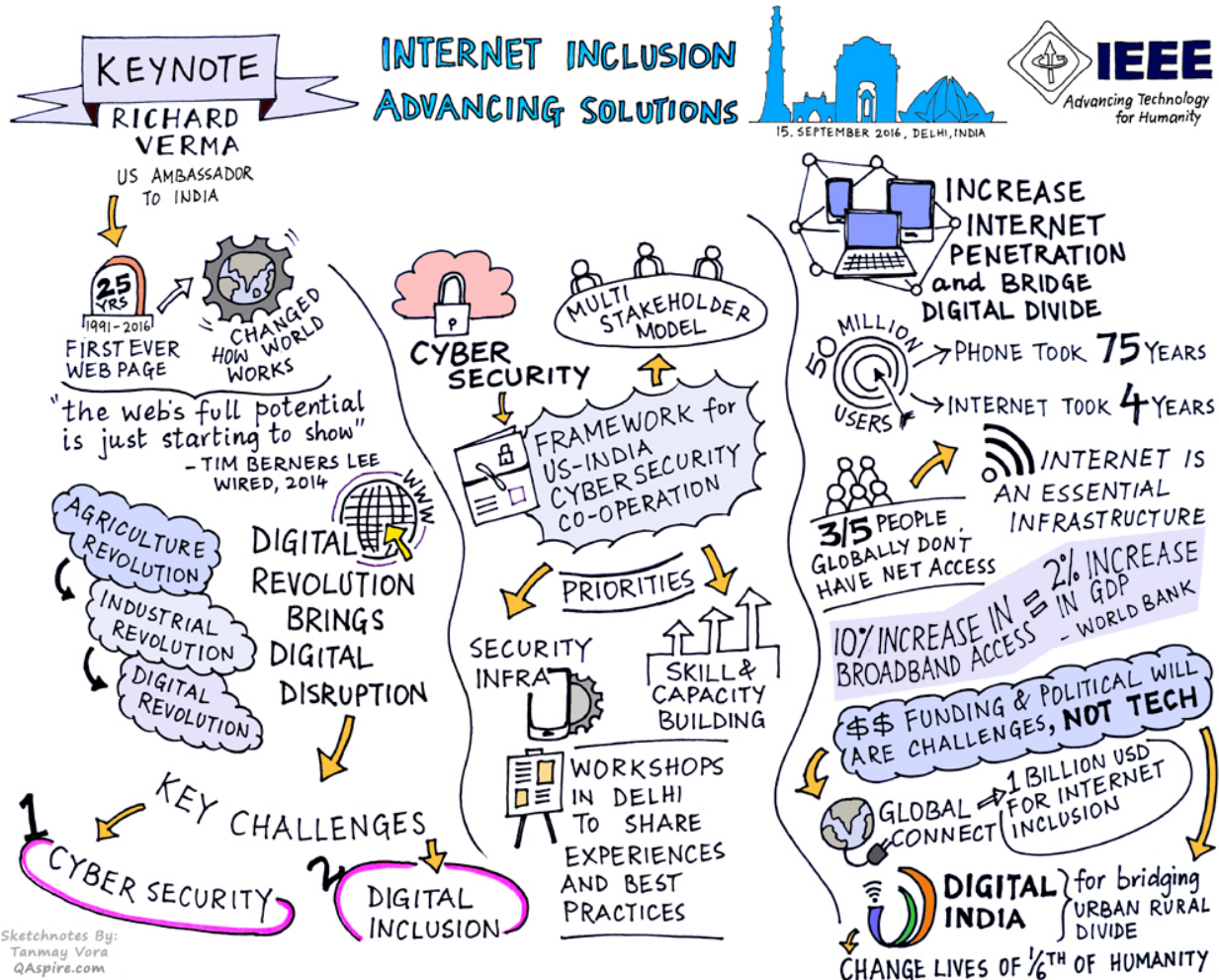
"(L)ike the agricultural and industrial revolutions of previous centuries, the digital revolution will be coupled with disruptions," he said. "The challenge before the United States and India, two democracies with 1.7 billion people, is how to minimize these disruptions and ensure the digital revolution enhances global prosperity and stability. This will require a meeting of the minds on how we manage the global commons—which includes a rules-based approach for cybersecurity and cyber norms—as well as greater cooperation on building cyber infrastructure, including internet connectivity, to ensure our citizens can take full advantage of the 21st century digital economy."[1]

The ambassador emphasized the need for cooperation between the United States and India to counter cyber threats and highlighted the framework for the US–India Cyber Relationship, signed by Ambassador Verma and India's national cybersecurity coordinator, Dr. Gulshan Rai, on 30 August 2016 during the bilateral US-India Strategic & Commercial Dialog (S&CD) in New Delhi. "Never before has the United States signed such a document with a foreign partner. The Framework outlines priority areas for US-India cyber cooperation, including strengthening critical internet infrastructure and undertaking skill development and capacity-building programs. The Framework also reiterates the basic values our two nations share with regard to the internet, including the multi-stakeholder model of internet governance and respecting fundamental internet freedoms."

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[1] Full remarks are available at https://in.usembassy.gov/remarks-ambassador-richard-r-verma-advancing-cyber-norms-internet-inclusion-global-connect-initiative-regional-stakeholders-workshop/.

Mr. Verma also spoke about bridging the digital divide. "(T)he fact remains that three out of every five people in the world are still without internet access. This is unacceptable, because in today's digital economy, to be unconnected is to fall behind. That's why the United States launched the Global Connect Initiative (GCI) last year. To put it simply, we view internet connectivity as essential infrastructure, the same as roads, bridges, and ports. At the inaugural GCI meeting in April, Secretary of State John Kerry and leaders from all over the world announced $20 billion in investments to help bridge the digital divide and bring an additional 1.5 billion people online by 2020."

Mr. Verma said that India has important lessons for the United States, particularly with respect to the digital divide between rural and urban areas, as well as for other nations working to connect unconnected people.

"India stands as a stellar example of a country that is working hard—and creatively—to expand internet connectivity. Prime Minister Modi's Digital India initiative highlights India's commitment to enhancing digital capacity, across a variety of sectors, and bridging the divide between urban and rural communities. India understands that when we talk about infrastructure today, we have to include the internet right alongside roads, bridges, dams, and power grids. This

comes as no surprise given the critical role the internet and technology have played in India's economic rise, whether it is through e-commerce, IT services, or product and software development."

***A Need to Leapfrog Stages of Development**–J.S. Deepak, Telecom Secretary, Government of India*

In his keynote address, India's telecom secretary, J.S. Deepak, highlighted India's economic progress, opportunities, and resources. "India is the fastest growing economy in the world. We have a very young population. The education levels are increasing … As far as trade is concerned, we are one of the most open economies; the trade deficit is, perhaps, the largest percentage of the GDP (gross domestic product) of all large economies. (We are) very open to investment, to innovation, and to private enterprise. In the telecom sector, for instance, we have 100-percent FDI (foreign direct investment) in telecom services and manufacturing."

Despite these advantages, however, India is "still a digital have-not in many ways." Mr. Deepak cited estimates that, more than half of the next billion users of the internet globally would be from India. He cited a recent NASSCOM® report projecting 730 million users in India by 2020.

All the same, he invited attention to six key challenges to digital inclusion in India:

- ***Broadband connectivity***—India ranks around 100th in the world in terms of the number of households that have access to the internet; low broadband penetration is stifling India's GDP growth.

- ***Digital literacy***—He cited a December 2014 survey that identified only 16 percent of rural households in India as digitally literate (at least one member of the household is able to access a computer or mobile apps).

- ***Content in Indian Languages***—Most digital content is in English, he said, and that language is understood by only 300 to 400 million people in India.

- ***Availability of e-services***—He noted that citizens must physically visit government offices to access government-to-citizen (G2C) services, as municipalities and other government bodies have been slow to digitize processes.

- ***Quality of service***—Service providers are unable to keep up with the huge demand for voice and data services in India, he said, leading to choking of networks and, hence, poor quality of service. The reason, he said, is the expense and scarcity of spectrum.

- ***Cybersecurity***—Hacking and denial-of-service attacks have led to disruption of services, both in the government and the private sector, he said. Banks in particular face increasing security breaches. To counter this, the government set up a national coordination center to ensure that major networks are not only monitored but capacity is built within organizations.
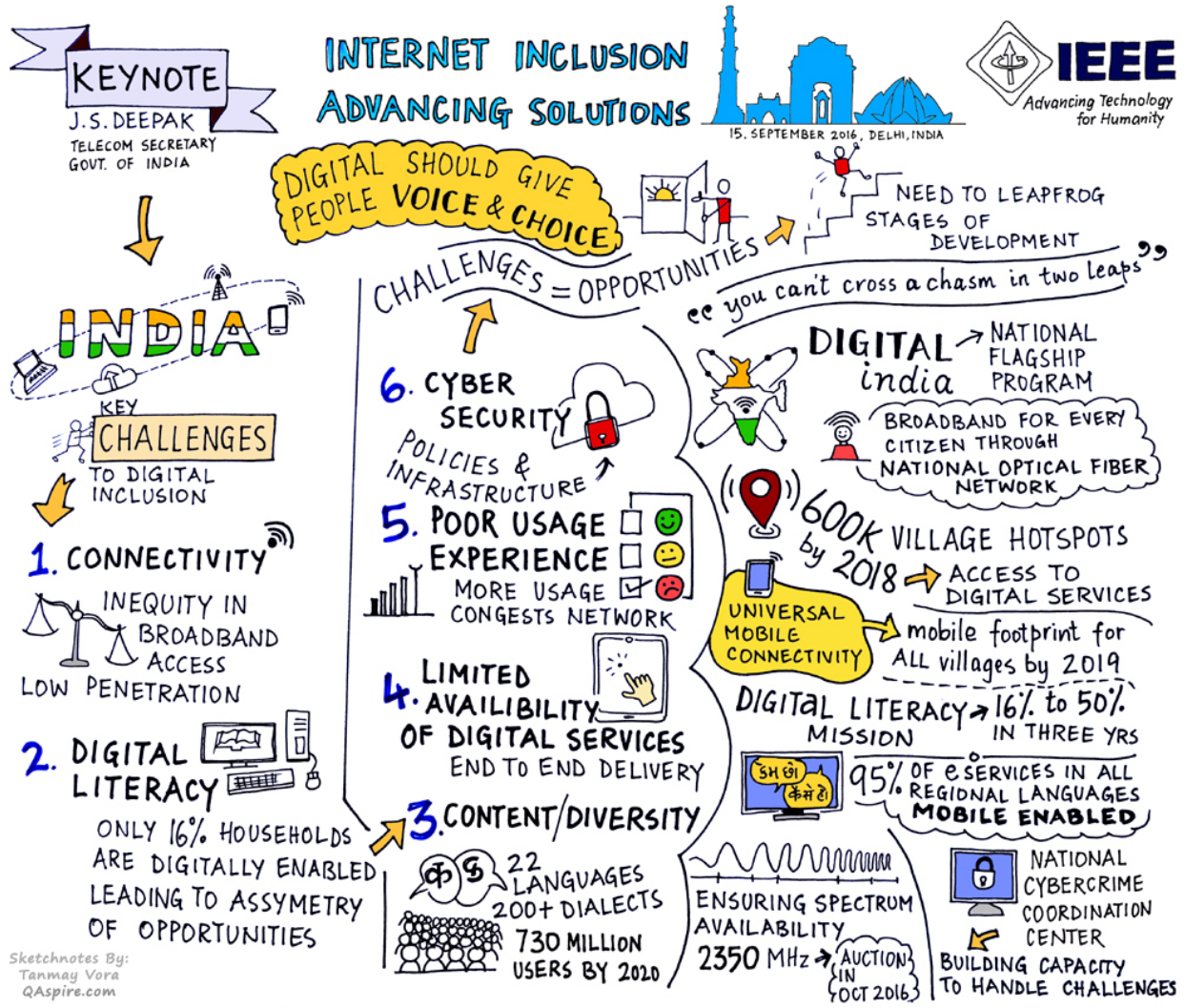
"The prime minister's vision for Digital India seeks to address some of these challenges and leverage some of the opportunities that we seek for us," Mr. Deepak said. "… The objective in India is to ensure that very soon every citizen has access to the internet, if not from their homes, then through common service centers and hot spots. The internet should transform from a network of communication to one for service provision and empowerment of the citizen. The idea is not just to give the citizen access to services, but also to various applications to enable them to participate in the government. Ultimately, it is about giving a voice and a choice—a choice of accessing services to multiple means including electronic platform and a voice to tell the government, through feedback on the internet, as to what he needs and what are the applications and services that he considers beneficial."

Mr. Deepak updated the audience on what the government of India was doing to counter those challenges through programs launched in the past two years: the National Digital Literacy Mission; an upcoming auction of spectrum; and initiatives to make government-to-citizen services paperless, "presence-less," and cashless. He also spoke about the government's vision to make 95 percent of all of its online services available in all of India's 22 official languages within the next two years. He discussed the Bharat Net project—earlier called the "National

Optical Fiber Network," or "NOFN"—which aims to extend connectivity to each of India's quarter million *gram panchayats* (elected village councils).

"High-speed broadband as a digital infrastructure for every citizen, even the farthest of villages, is one of the objectives of this program," Mr. Deepak said. "We hope to reach every village by 2018 and 100,000 gram panchayats by March 2017 through high-speed connectivity and, as a last-mile solution, set up hot spots in all of the 600,000 villages. So every citizen will be able to access government-to-citizen services on the go, ubiquitously.

"However, looking at the challenges, there is a need to leapfrog stages of development, as happened with the mobile telecom revolution." He added that India is going from a nation with almost no connectivity to a nation of ubiquitous mobile connectivity. Connectivity on the go has become a norm, including for data.

Lightning Talks: Current Internet Landscape in South Asia

Mr. Maheshwari, the *IIAS-Delhi* program chair, moderated lightning talks by representatives from Idea Cellular, IIT Bombay, Nepal Wireless, Qualcomm, and Swaja Labs, who examined the current internet landscape in the region. They highlighted projects and initiatives, underway or planned, to provide meaningful internet access in rural and other remote parts of the region, and touched on issues including policy, regulation, investment, public-private partnership, political will, technology innovation, crowdsourcing, affordable pricing, and new business models.

Speakers discussed how limited spectrum availability and usage in the region pose a major challenge and how the price of spectrum has increased over time. Panelists agreed that the Indian government needs to manage the allotment of spectrum in a more efficient manner. Panelists also talked about advancements and research in the domain of wireless technologies such as TV whitespace utilization. Many Indian homes have cable and satellite TV (even in villages), and these media could be used for delivering internet services, they said.

Parag Kar, vice president, government affairs, India and South Asia, Qualcomm, elaborated on the challenge by pointing out that spectrum licenses expire after 20 years in India, and service providers need to reapply for it through an auction. Consequently, spectrum in India is fragmented because it is allotted to service providers in non-contiguous blocks.

Rajat Mukarji, chief corporate affairs officer, Idea Cellular, said there is no doubt that wireless is the best way to provide access in the shortest time with the best bandwidth and the required quality of service in India and South Asia. He said he was optimistic that an upcoming spectrum auction in India with 2,300 MHz on offer would help alleviate the situation.
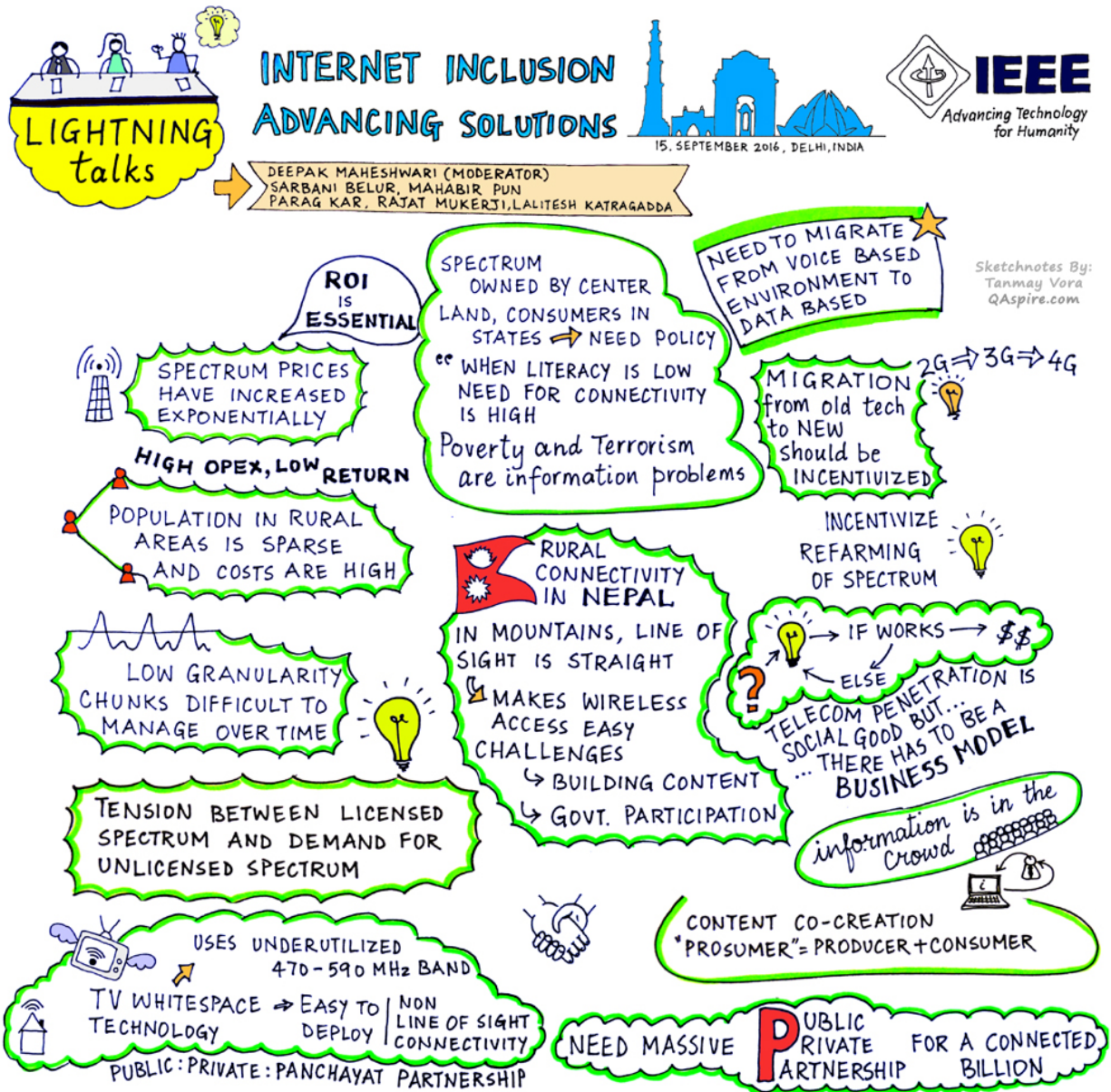
Lalitesh Katragadda, founder, Swaja Labs, expanded on this discussion to point out that different stakeholders own different parts of the infrastructure. The spectrum is owned by the central government, he said, while the Right of Way (RoW) usually is vested with the state governments, thereby creating a challenging situation.

Sarbani Belur, professor and senior project research scientist, IIT Bombay, presented research findings from field trials of TV whitespace in the five villages of Maharashtra state's Palghar district, through a public-private-panchayat (PPP) partnership model to take services to the last mile.

Mahabir Pun, team leader, Nepal Wireless, spoke about his experiences in building IEEE 802.11™ "Wi-Fi®" networks in Nepal and delivering e-education and e-health in its hilly and

remote areas. He urged the governments to disburse funding support from the under-utilized Universal Service Obligation (USO) Fund for introducing broadband in the rural areas.

Panelists shared ideas on making the business model for operators more viable in the South Asia region by making spectrum more affordable through techniques such as managing the relationship between reference price. They also affirmed the need for education of users migrating from voice- to data-based environments.

### *World Café: Envisioned State Of Internet Connectivity In India*

During "World Café"-model conversations at *IIAS-Delhi*, participants dispersed among four tables to jointly imagine India's internet connectivity in the year 2025. They were asked to consider the following scenario:

It is the year 2025. During your morning breakfast you scan through your news alerts from your smart gadget and see an influx of news headlines from around the world heralding that all of India's citizens are meaningfully connected to the internet, and the country is starting to see success and growth in economic and social prosperity. When you call up one article and begin to read it, you see that it talks about the driving factors of policy and regulation, technology and infrastructure, funding and disruptive innovation, and new stakeholders.

Participants were asked to imagine what the article might say, how it describes driving factors, how the factors helped address connecting the unconnected, and barriers overcome on the way to innovation and advancement of solutions. Among the various thoughts envisioned by the participants at the World Café were

- Timely and coherent policies and regulations are being developed and implemented in an inclusive and consultative process with all stakeholders by a single converged ministry in charge of information and communication technologies (ICTs).

- Bharat Net has reached all villages, and public places like post offices, public healthcare centers, schools, railway stations, and bus terminals have been converted into wireless hotspots throughout the country, achieving ubiquitous internet access for anyone, anywhere, anytime.

- Tax benefits encourage rollout of better infrastructure. The "dig once" concept—in which underground fiber links are installed as an integrated element of any major infrastructure program, such as building or renovating roads, railways, pipelines, utility infrastructure, and energy distribution channels—has been firmly established along with easing of RoW norms. PPP models are flourishing in the last-mile access.

- Government services have moved completely online. People recognize and reap the benefits of online engagement—including but not limited to reduction in corruption, duly aided by affordable devices and services, electricity for all, universal digital literacy, robust cybersecurity, and enhanced cybersafety awareness.

- India has a world-class regime for fostering innovation in various areas such as the internet of things (IoT) and machine to machine (M2M) through meaningful partnerships across government, academia, and industry that see an increase in research and development (R&D) from 1 percent of India's GDP to 3 to 4 percent of GDP.

- Unutilized bandwidth is transferred to the underprivileged, and content delivery at the edge nodes leverages satellite technology in addition to optical fiber and terrestrial wireless.

- Concepts of net-neutrality and crowdsourcing evolve.
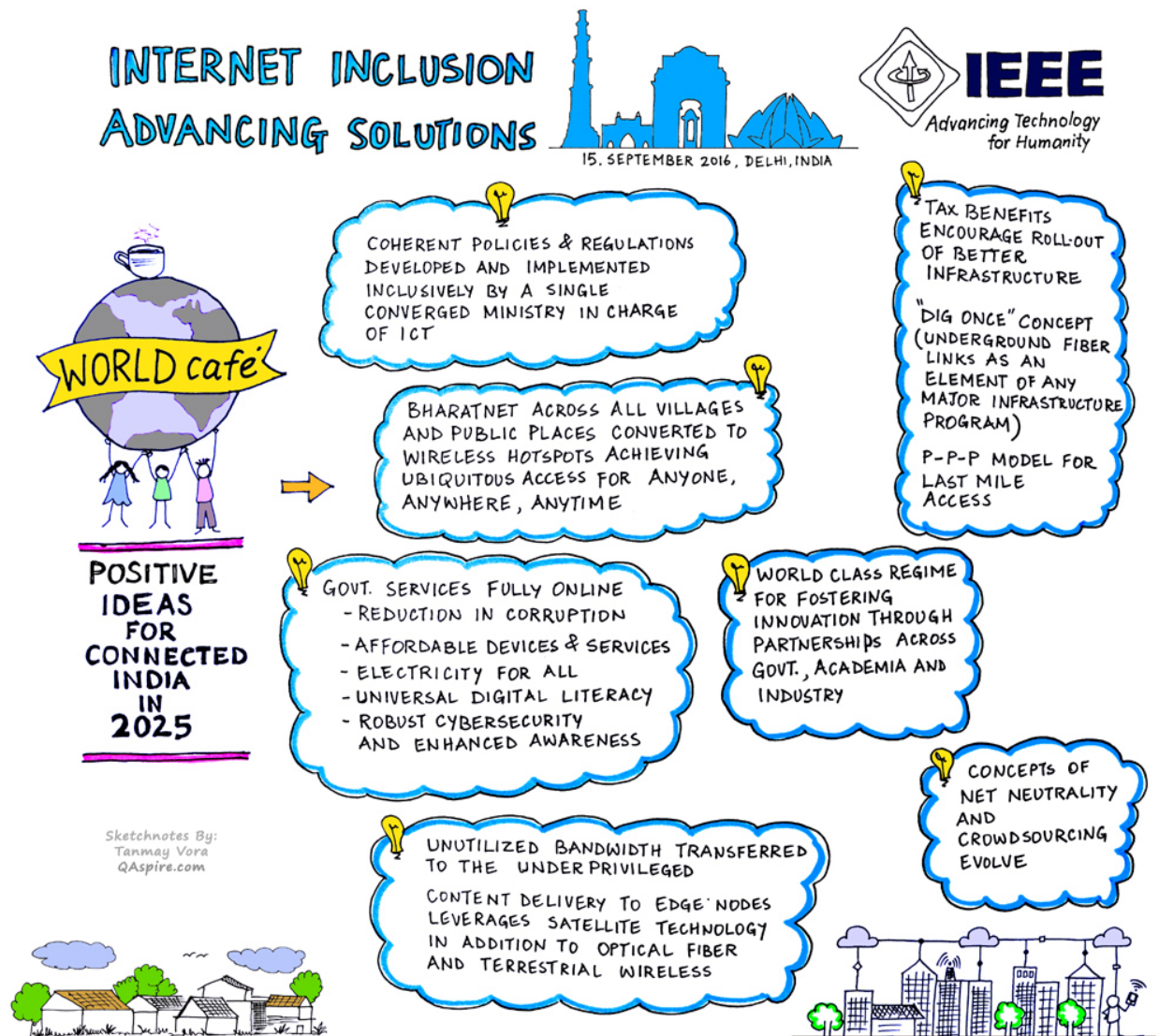

Cybersafety Awareness

Parry Aftab, a cybersafety pioneer globally and founder of Cybersafety India, delivered a luncheon talk highlighting the need for baseline online safety for all, especially for children. "If

we can't guarantee they're safe and private and secure, they shouldn't be there—whether they are our senior citizens and our parents or they are our youngest children."

Experts Roundtable: Barriers to Access, Adoption, and Use in India

Leslie D'Monte, technology editor, HT Media Ltd. (Mint), moderated a roundtable of experts from Digital Empowerment Foundation, ORF, Telecom Engineering Center, and World Bank. They discussed barriers to internet access, adoption, and use in India, including infrastructure, funding, end-user affordability, data gaps, gender, awareness, capacity, and skills.
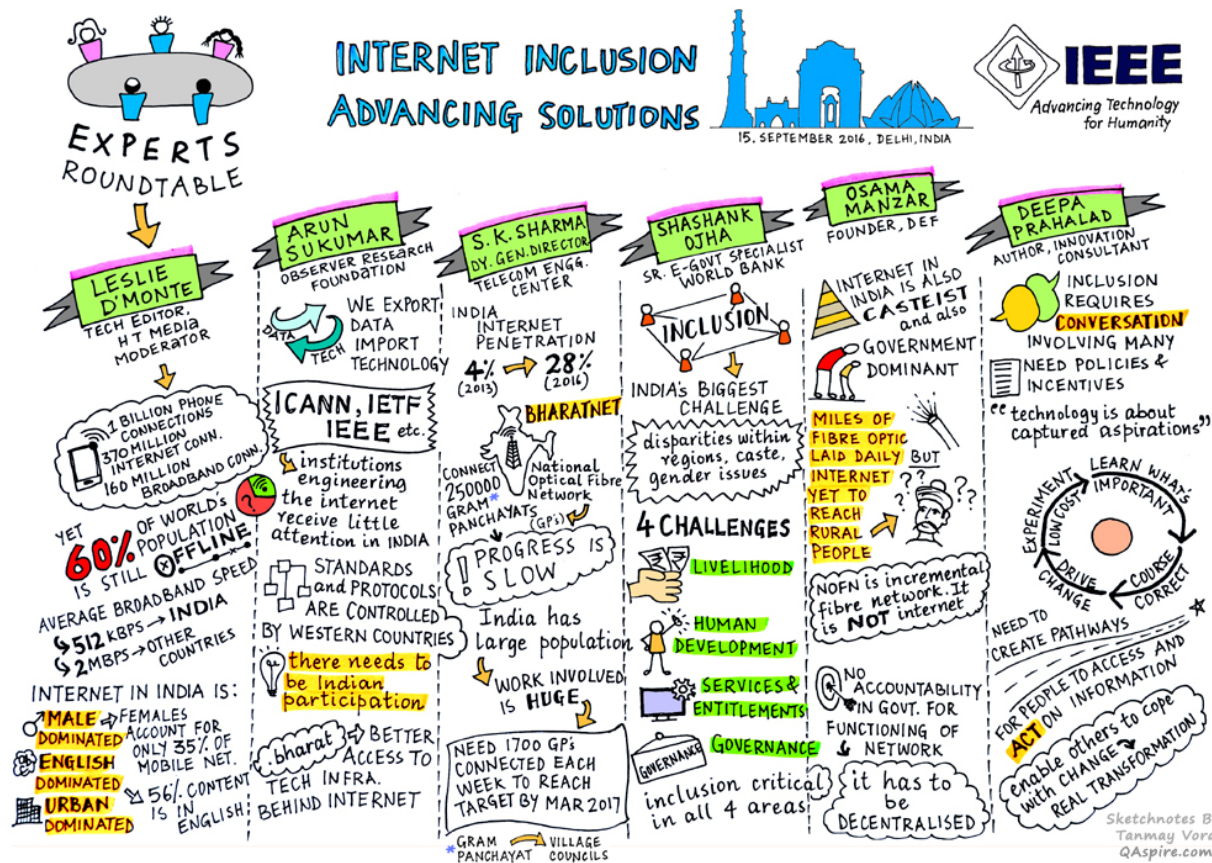
Mr. D'Monte opened by reviewing positive aspects of the Indian economy such as the growing banking industry, government-to-citizen services, digital locker, massive open online courses (MOOCs), and how text, voice, and video communications are being leveraged to assist people with disabilities. While technology and the internet have indeed enriched the lives of Indians, he said, many Indians still are not participating in the digital economy. He cited a March 2016 report from IAMAI stating that females account for only 35 percent of the mobile internet in India. He cited multiple reasons for the nation's limited internet usage, such as lack of content in local languages and the broadband benchmark in India of 512 Kbps compared to 2 Mbps elsewhere.

Arun Sukumar, fellow, Cyber Security and Internet Governance Initiative, ORF, pointed out three institutions—IEEE, The Internet Corporation for Assigned Names and Numbers (ICANN), and Internet Engineering Task Force (IETF)—that are critically involved in the fundamental engineering of the internet. There needs to be enhanced Indian participation in the group, Mr. Sukumar said. He said the technical infrastructure behind the internet could be made more accessible to Indians.

S.K. Sharma, deputy director general, Telecom Engineering Center, acknowledged the growth of the internet in India and its progress in a short span of time: Internet penetration was only 4 percent in 2013 but in three years since it had grown to 28 percent. He said Bharat Net aims to connect 250,000 gram panchayats (village councils), mostly using optical fiber, and he suggested that India use its vast network of 150,000 post offices as "common service centers" for e-services.

Shashank Ojha, senior e-government specialist, World Bank Transport and ICT Global Practice, examined internet inclusion from a developmental perspective: "There are many disparities within regions. There are states doing very well and those that are not. There are caste-related, gender-related, region-related issues, and there is a large chunk of the population that is excluded from this development process." Through various educational initiatives in India, the new generation will be more educated and more skilled, he said, but it is important to address the challenges of internet inclusion if India is to benefit from all this development.

Osama Manzar, founder and chief executive, DEF, spoke of corruption in government and the dominance of various factors on the internet (caste and wealth, for example). He said many miles of fiber are deployed every day to unconnected villages, and yet, people in the remote areas still are not utilizing the internet. He said making the internet operational on a scale in India is not possible through the government's efforts alone, especially in the last mile. Mr. Manzar proposed that the government partner with private sector, NGOs, institutions, and panchayats—and that significant training is needed for local users.

Road-Mapping Session

Deepa Prahalad, author and consultant in innovation and business strategy and an *Arogya World* board member, led a road-mapping session, recapping the goals of *IIAS-Delhi* and encouraging participants to think about "small, fast, meaningful tests we can do to help us test some of our hypotheses and understand where to move forward … and who could possibly fund some of these." She stressed the need for contributions from last-mile providers and users especially in ongoing collaboration.

She lauded the progress toward digital inclusion that has been achieved in India thus far. "Transformation has not just been about the bottom of the pyramid; it has created a middle class and it has caused a transformation at the upper end, also. I think all of us can feel better about India," Ms. Prahalad said. "We have more possibilities as a result. … We have never had to do this kind of transformation in the history of the world—and certainly not in a democratic framework."

IEEE White Paper: Options and Challenges in Universal Access

Prasad Mantri, principal engineer, Oracle, and senior member, IEEE, presented some initial findings from an IEEE white paper, *Options and Challenges in Universal Access*, that is being developed via the IEEE Collabratec™ Internet Technology Policy (ITP) online community. The Collabratec ITP community (https://ieee-collabratec.ieee.org/app/community/65/activities) facilitates follow-through on common issues identified across the IEEE Experts in Technology and Policy (ETAP) Forum events. He highlighted the need to address fundamental issues of access and cost (affordable price points for mobile devices and cost of connectivity at remote locations), as well as internet traffic predictions and industry regulations. "We need people who can talk about their experiences—for example, we would love to get input from people who have no access. If you know people or have experiences in these areas, we would love to get your input on this," he added.

Conclusion

In wrapping up *IIAS-Delhi*, an update was shared on activities since the *IEEE ETAP Forum on Internet Governance, Cybersecurity, and Privacy* in Delhi on 4 March 2016, where the principal issues discussed were universal access and biometrics.

Mr. Maheshwari and Ms. McCabe thanked everyone for their passion, participation, and partnership. They said that the *IIAS-Delhi* is not the end; rather, it is a very important milestone in the long and arduous journey of bringing the multiple stakeholders to a common platform of understanding and appreciating each other's perspectives and priorities.

IEEE is eager to expand the conversation about internet inclusion, prioritize next steps, and further explore the opportunities for extending affordable internet access to more and more people in South Asia and around the globe. Please visit http://internetinitiative.ieee.org or email internetinitiative@ieee.org for more information.