FINISHED FILE

ASIA PACIFIC REGION INTERNET GOVERNANCE FORUM
TAIPEI 2016
A NEW INTERNET ERA

28 JULY 2016
ROOM 402 (C-D)
09:00
WORKSHOP 90
INNOVATION AT THE EDGES:
PROMOTING ALTERNATIVE ACCESS MODELS AT THE LAST MILE

***

This text is being provided in realtime format. Communication Access
Realtime Translation (CART) or captioning is provided in order to
facilitate communication accessibility and may not be a totally
verbatim record of the proceedings.
***

        >> NOELLE de GUZMAN: Good morning, everyone. Thank you for
everyone. Thank you for making it to this morning's session. I realize
it's quite early for everyone, and my apologies for starting a little
bit late on this. We are six minutes late, I think. But -- so the
topic, as you might have seen from the agenda, is really alternative
models for last-mile access. We are one of the few, if not the only
session on access in this APrIGF if I'm not mistaken, on access but
it's still a very important subject, especially now that we're moving
towards connecting what they call the next two billion, the next billion,
the next three billion who are -- who we expect to be more marginalized.
They will be poorer. These will be people who have double disadvantages
when it comes to connectivity, so we expect to encounter even more
challenges ahead, but it will be -- it's a very important topic to
explore, precisely because of this.
        Without further ado, I would like to introduce our panelists for
today. We have Mahabir Pun from Nepal. He is the founder of the Nepal
Wireless Networking Project. He's also -- I'm not going to recite
the whole Bible because you can read that on the website, but he's
-- he's been doing a lot of work for how many years, Mahabir?
        >> MAHABIR PUN: 14 years.
        (Laughter)
        >> NOELLE de GUZMAN: So really some -- a person to talk to if
you want to talk -- about rural connectivity.

Next we have -- sorry -- we have Paul Harwood from Google. He's the Asia Access Evangelist, the whole title is APAC -- Asia Access Evangelist, APAC Performance Solutions, and you can ask him about exactly what that means after the session, but he has a lot to say about access as well they're doing a very important project in Asia Pacific.

Next we have Mr. Vu Hoang Lien from the Vietnam Internet Association. He's the president of the Vietnam Internet Association.

And I'm not sure if we have -- we were supposed to have Ankhi here, but she's not around, but, okay, we can -- maybe she will join us. The other panelist is Ankhi Das from -- the public policy director of Facebook.

Okay. So let's start with Paul. Paul, if you -- if you don't mind giving us your presentation, and then we'll have -- oh. (Off microphone)

(Laughter)

>> PAUL HARWOOD: Good morning. Sorry. Good morning. That woke you up. I apologize that I present on my feet moving around a lot, so that will keep your eyes moving as well.

Good morning, and thank you for coming. My name is Paul Harwood. I work in what we variously call a group that works on the emerging markets access in Google, and I'm based in Singapore. I cover Asia Pacific. We do get to choose our own titles in Google, so I chose Access Evangelist, mostly because it gets everybody asking me what it means.

I'm going to go through a few -- discussion of a few things that Google is doing in terms of improving access in -- primarily in the emerging markets. I like questions, so if you've got any questions, please ask me as we go along or ask me afterwards or ask me outside.

So to start -- that didn't work. So what's the problem? What is the problem? What is the thing that we're trying to address? We look at it like this, and we kind of break access down into people who are not connected, people who've got kilobyte styles of access, which we kind of think of as 2G, people that have megabytes' style of access, which we think of as 3G, and people who have kilobytes style of access. And what we have do obviously is move everybody to the right. Ultimately, to get over the digital divide and to make a digital connected economy, we need everybody at the gigabit level, so we're talking 5G, we're talking -- we've got a lot of work just to get people across, so all the projects we work on are attempting to get people who are on the left over to the right. And 4.5 billion people is a lot of people to move. The problem is big.

And obviously in APAC, the markets have primarily traditionally been Mobile First, so a lot of the work we do is making -- a lot of the work that Google does is making our products more mobile aware and work better on slower connections and work better on less reliable connections. I'm not going to talk about any of that work, but there is a lot of work that Google has been doing to make, like, progressive web apps, so you can start using progressive web apps on things like Facebook without dialing in on the app with a slower connection and

it works just as well. We don't consider that to be access work, but it is important for getting the connectivity to people.

What drives growth? What drives people to use the Internet?

We are seeing a lot of take-up of broadband across the emerging markets, and we're seeing a lot of smart applications like eCommerce applications, like file sharing, and like content sharing starting in emerging markets, so there is a -- a startup of companies in Indonesia, there are startup companies in the Philippines, especially startups in a company in India who are becoming reliant upon a connected economy, so there is the -- there is the -- I've forgotten the word. Sorry.

(Laughter)

There is the demand for a connected economy, and we're seeing -- we're seeing locally produced applications, like SHAREit, like Go-Jek in Indonesia, which are based upon this. That's one thing that we need for our growth.

And in some economies, you know, the Internet economies 8% are GDP in some economies, and it's powering growth, it's powering jobs.

And are people willing to use it? We actually spent a lot of time studying this part of it, are people willing to use it and what's stopping people using it.

According to the studies that we've done and we've seen, 30% of people in emerging markets are willing to pay for Internet access. 50% of people would be willing to pay more for their connectivity if the speed was faster, and 60% of fixed line users would be willing to upgrade. This last one is interesting and important.

We've always said APAC is a Mobile First economy, and it is a Mobile First economy, but APAC in particular, like -- my focus is mostly on countries like Indonesia, Philippines, Thailand, Vietnam. The next step is fixed. LTE's been launched in many of those countries, if not most of those countries. The coverage needs to be increased, but the next step is going to have to be much more fixed connectivity.

You can imagine if everybody in California relied upon LTE to get the speed that they get in the moment -- California's not that fast -- the LTE in California would be saturated; therefore, you can't expect LTE in Indonesia to do what it can't do in developed countries, so we actually are looking much more on how we can support and encourage the development of more fiber-based fixed infrastructure into these tiger economies because that's the next step that's needed there. And the content providers, the OTT players, do spend a lot of money investing in the Internet infrastructure. You don't necessarily see it all.

We are -- we funded a number of joint investors. Sorry, we're joint investors in a number of submarine cables. Obviously, we do that for very, very good commercial reasons. We are big users of that capacity as well, but we do -- we are investing it, we are supporting, and we are building up the fixed infrastructure.

We obviously -- we do build data centers everywhere to reduce the -- reduce the loading on the fixed network. We do have a very big campaign of putting what we call GDCs which are caches, into emerging markets, again to reduce the demand upon the fixed infrastructure. So we're building up the fixed infrastructure, we're also reducing

the demand upon it, and that's part of our business as usual. We don't actually consider that to be, you know, access development, that's just us running our business, but it does support and enable emerging markets access.

So what are the barriers to people accessing -- what stops people -- we said there were 30% of the people in emerging markets willing to pay for data. What stops people willing to pay for data? There's a couple of things here, which we've seen -- we've done studies in Indonesia, Philippines. These are our own end user studies where we talk to people, we talk to people who have access and who don't have access, and we analyze why they make their decisions.

The big ones are, the really big ones are people don't know why they should have data, they don't know why the Internet could benefit them, and they don't see benefit from it, so there are -- there's a lot to be done in terms of local language content. Local language content -- we've supported a lot of language content in India, and this has increased the value of the Internet to people in the regions in India, and therefore, increased demand. There's a lot to be done in terms of local language content, there's a lot to be done in terms of providing examples within the community to what fast Internet can look like and what the benefits of that can be, and actually something that we do do a lot, we kind of work with some community organizations and some companies just to set up, you know, exemplars of what a fast Internet would look like to show what you can do in terms of education with fast video that doesn't rebuffer, even what you can do in terms of entertainment if you get fast video that doesn't rebuffer.

That's another step in the way. People see that you can get good video content, they start working out what they can do with it. At the moment, they don't think video can work, and therefore, they don't think about it.

There is another one here that I didn't put in the slide. It's addressing the stakeholders. I particularly know there's one in terms of India and Indonesia where usage inside the house tends to be controlled or Internet is bought and controlled by the senior female in the house, and they don't necessarily see the value of the Internet because they didn't -- it wasn't there when they were growing up, so the people who should be our leaders in terms of using Internet don't actually have control over buying it, so one other thing that we've done, particularly in Turkey, is a lot of education to the -- a lot of female education about the usage and -- how to use the Internet, how to use it safely, how to bring it into your family and use it within the family context.

We, for instance, have a focus on using video in the living room, bringing people back into the living room as opposed to seeing it as something that spreads people out across the house and, you know, teenagers using it in their bedrooms, how do you use it as a way of bringing family back into the living room.

Enough said about that. So what are we actually doing in terms of access? We've got a few projects. I've got a couple of slides, but there's some projects I don't have on the slide, so I'm going to

just talk through them. We have a project in Africa, it's called Project
Link. When we looked at the African market, what we decided in terms
of the African market was no one was building intercity and intracity
fiber loops because the return on investment for any single provider
wasn't big enough, and there's no history of shared infrastructure,
and there's no government impetus for shared infrastructure, so what
we did in Africa, starting in Kampala in Uganda, we've moved to Ghana,
there's probably a few more countries coming along, is we actually
just built the infrastructure. We formed the company, we went out,
we dug the trenches, we laid the cable, but on a wholesale basis, so
that -- that project is reselling backbone capacity to the existing
ISPs, and, therefore, on a shared infrastructure basis, they're
actually making the money back, so that's a case where we built the
infrastructure, we're actually operating the infrastructure.

One of the interesting things about this is actually because we've
set up shared infrastructure, we're seeing new ISPs starting in Kampala,
started by -- there's one ISP started by two brothers just serving,
you know, a couple of districts within Kampala, and then they're growing
organically, but because it's shared infrastructure, their capital
investment is low, so, therefore, they can do that.

The idea of shared infrastructure can release and enable
entrepreneurship within the communities. That's one of our biggest
projects.

The next biggest project is a (Inaudible) project in Africa --
India, RailTel in India. Wi-Fi coverage in India is relatively low
and the quality is poor, so we did a joint project with a company called
RailTel, who's owned by the Indian railways. They actually own the
fiber that runs up and down the Indian railways, so they have a lot
of backbone capacity, and we're up and running and operating high speed
Wi-Fi in a number of stations in India. I think it's currently about
40, planned to be about 100 by the end of the year, so at the moment
we're providing 30 minutes of free Wi-Fi and a higher tier or a longer
tier of paid Wi-Fi in the stations and it's high speed and its reliable
and it's -- it's good. It's actually Google marketed as well, so it's
called Google Wi-Fi. We've been doing this for about -- I think we
turned the first one up about six months ago.

Last time I looked, we are -- that project is now approximately
2% to 3% of Internet usage in India. We're getting that high usage
in the stations, and we're starting to see people -- we talk about
the virtual Internet cafe. We're actually starting to see people going
to the stations just to use the Internet, which has kind of plus and
minus implications, but it has positive implications if you see it
as a way of bringing people into the retail venues in the station;
therefore, the stations start to get a different ecosystem, but as
a way of getting access to people because these are public places,
these are places designed for high throughput. It's giving access
to people who couldn't get access before. So that's one project. We're
very interested in seeing how we can replicate that around the region,
so the idea of public Wi-Fi, high speed, high reliability, high
(Inaudible) is available to them.

Another thing we're doing in APAC, we've looked closely at the idea of what we call MicroEdge Caching. The idea here is to put the content as close to the users as possible, and by them -- by edge caching, I don't mean it's in the data center of the operator, I mean if you've got a Wi-Fi access point, the cache is literally underneath the access point, so in Philippines we've launched a project we call Accelerator. It's a set-top sized box that is in the same land segment as the access point. It's usually just actually underneath it. It has 4 terabytes of content on it. At the moment there's only YouTube content, but in most APAC countries, in the last study, YouTube is 25% to 30% of all Internet traffic, so that's the low-hanging fruit anyway.

We can put about 190,000 YouTube videos on that box. We can choose them programmatically, which means we actually get a 50% cache hit rate just by putting those 190,000 videos on there, which means we put that box on there, we're probably saving 15% to 20% of the back haul from that Wi-Fi access point by just having that one box there. The idea is we make that ubiquitous and that makes a big savings in terms of back haul, installing Wi-Fi is cheaper, and it also means people get a very fast experience, so they start to think in terms of high-quality Internet, fast video, and reliable video.

If you have one of these boxes in your Wi-Fi access point and you access one of the videos on it, you actually get that YouTube served faster than you do in the Google office in Singapore, and can you go forward, you can go back and play things without any lag at all. It's a very interesting experience.

We also are working with operators -- as I say, we're interested in making high-speed fixed Internet more attractive within the APAC markets, so we're working with operators. We've gone publicly with GIG in Indonesia to see how we can jointly package an experience to users and we monitor the quality of the network provided by them, so that's -- we kind of support ISPs to roll out fiber in that sense. We plan to do more of that.

That's pretty much what we're doing in APAC at the moment. We just put in some words about how policy can support high-speed access. I'm not actually sure I want to talk about that slide. I'll just talk -- we see some key enablers for high-speed access that could be put in place by policy people, by policy decisions.

The key one we see time and time again is shared infrastructure. Infrastructure is expensive, it's a long-term investment. The ROIs are difficult. The way to get around that is to put in shared infrastructure so you'll -- you know, everybody is contributing to the ROI and you're not duplicating networks, operators are not duplicating networks. I know that shared infrastructure has traditionally worked best when governments support it. Whether it's government funding or government supported, it works when governments support it. It doesn't work without it being pushed by government.

If you look at the speed and the innovation of the network in Singapore, if you look at the speed and the innovation of the network in New Zealand, these are good examples of shared infrastructure, and they're two totally, radically different examples. In Singapore it

was built and funded by the government. In New Zealand it was more a policy push to get private funding to go produce shared infrastructure.

Innovation. We need to unlock innovation to power the access business model. Shared infrastructure's one of these things. Let's say a typical example is in Kampala where we built the shared infrastructure. Small SMEs were able to start up and provide Internet access based upon our infrastructure. They were just leasing SSIDs, leasing backhaul, and selling this directly to the markets they know best.

This innovation in terms of pushing it into the local communities, innovation in terms of the business model and how they were paying for it, is the important thing that's going to unlock Internet access in emerging markets.

I think those are the two points I wanted to get across. That's it.

(Applause)

>> NOELLE de GUZMAN: Thank you very much, Paul. I'm afraid we're going to have do this traditionally and just go through the other two speakers first before we do the question and answer, but if there are any burning questions that anyone would like to ask within the next five seconds, then please do raise your hand. Okay. I guess not.

We now move on to the presentation by Mr. Lien. Mr. Lien, would you mind giving us --

>> VU HOANG LIEN: Thank you. Okay. Good morning, everyone. I want to talk about the topic concerning to the last mile. See, why I talk about the Internet for the rural?
Because the -- it's urban. I think there's too much compared with the rural area. With last mile, we have to show the solution for rural, that means good even for the urban, and when we talk about the rural area, actually we have studies the needs of the people in the rural, but concerning the Internet, I think we consider the difficulties.

In rural, we can think about the -- I think the -- I mean the physical difficulties and logical difficulties, so with the logical difficulties, even in the urban, we still have many people, I mean, the rural people in the cities, so I think Internet and information and communication can make the solutions -- a way to make the -- narrow the gap between rural and urban.

So just a glance. And as I -- I think the Internet can impact to the information, can make the knowledge for the people in the rural, and that's the -- like a level for the development for the evolution into the rural area.

And also, I think in the rural, actually, the demand quite high, then very potential, so why in the rural -- in the rural the demand for information is less than people in the urban, you know.

And also, I think based on the -- I think the -- with the very huge demand in the rural, so that's a really opportunity for the business and even for the charity.

I try to glance because not much time, so if you have any questions, ask me something, you can stop me.

So I think the solution, that's really what we have to think,

so firstly I talk about the infrastructure. I consider the infrastructure like a -- I mean the -- the hot, hot solution. So concerning to the hot solution that the people talk much about the technical issue, the technical solution, and too many thing. Actually, I got a technical background, I can talk much about that, but I think the issue, that's behind that, so we can talk about that, what we have to do, but people talk much about that.

So for the infrastructure, the way for running -- for set up the system, that's more important. That's the reason why I talk about the solution concerning to, like, barter or can get the cost -- I mean the budget from the advertisement and investment, and also we can think of some as a solution, so a technical solution can be the visibility.

And also, even with the solution concerning to the social -- socialize of the investment and social nonprofit enterprise, something in Vietnam, we have to think about that.

The solution -- we talk about the solution concerning to the accessibility because in the rural area, the cheap price that we pay is very important, so we are asking for the manufacturer, provider should have cheap devices for the rural area, and the secondhand, but we think in the rural area the TV screen is very popular, and so as a solution can adapt with television and with a screen in the rural it's very -- I think very, very important. We can think about the -- it can connect to TV, Internet-from Internet to TV, like smart TV. In the rural, not many people can pay for smart TV, so with TVs, they connect to the Internet and so we can think about that. Or some other thing like we can think about the -- (Off microphone) for the people in the rural.

Even the solution concerning to the warranty and insurance to keep the people in the rural and can -- can use the solution easier, and sharing resources -- I have some time I can talk with you about that, but I want to talk about the access points because the -- in Vietnam, the people -- the country -- the people prefers entertainment, people community sharing, people -- many people together, that's very important to the people in the rural, so that we -- we have some places with access. (Off microphone)

Also, we talk about the solution that makes it interactive. Interactive between the people, but I want to talk about the interactive with the media -- with the browser because I don't think the time not enough for me to explain, but I think the other people can understand about that. (Off microphone)

Oh, okay. So people can hear me. I think here the room is not too big and not too many people, so I think people can hear me. Okay.

So I think the type people have browser, that's to play, can mix everything with people, and I think the solution can mash the browser, media, or -- we talk about Internet, but there's an interconnection between the Internet and nonInternet. Media is very important, and also, I want to emphasize with the people that they're building a community because the community not just for the consuming, but they can contribute to the -- to the -- I mean the information sharing, even the support for the solution.

I try to glance because not much time. The information, I think the information we consider like sharp solution. We talk about the solution for infrastructure for access. I consider that the hot solution, so we say information as a sharp solution.

It's not a good arrangement for information, the people that have to deal with the difficulties to consuming -- for consuming, so with the information solution, I tried to list here the -- the easiest solution, I think. We don't talk much about that, but the thing we have to think about that, I want to make -- I want to focus to the reuse information on the database on the study and the structure of the database that makes it feasible for -- I mean the profit, benefit to -- for the user.

And also with the eGovernment together, that encourage the people for consuming the information, and also in the future, we think about the smart Veleage/IoT in the rural.

And as a solution, you can see as a smart solution, that is support, we don't support the people in the rural, couldn't join Internet, couldn't consume this information, so we ask to support -- in my -- I think the support is very important. It makes the feasibility for the project in the rural. To support, we should have the local support on-site and remote support, and also we need the experts to support that.

And I tried to list some solutions for support to people here. Here, see, I want to talk about the school model. School model is school boy, schoolchildren, they should be the people we have to support as a user consuming the information, but also, even the schoolchildren that the people can support the people in the rural, like their parents, their relative, their higher -- I mean older than them.

So first we should support for the schoolchildren to use Internet, so if we want to support the children, we should support the teacher. So teacher of schoolchildren will be the human resource, the people who support to have the Internet in the rural area.

And also, we talk about the volunteer, and also we have to support the student in the university and institutes, support -- decent support to the people in the rural area together with expert. And also, we look for support from the international organization.

Based on that solution, we think about the project for Vietnam and with the project, I think all the solution can be arranged and can put in the plan for the project. Too many things we can present, but I think the more important for the project concerning to the sharp solution, and that's the interactive platform, information, and support.

Model, the resources to do that. We try to have the chat, talk about that. Many entity can support for the project. And also, the management, that's the most important to win the project and can consider the feasibility for the project, and management -- I think the difference with the management, so here we have to manage even the beneficiary, so I try to -- and also, based on the project, I think that the association plays a very important role in the middle between the entity to run -- to set up -- to set up the project and running the project.

So in Vietnam, we intend to do that. We intend to have the cooperation with the -- Michael and also the people in the ICT for running the project I call the Internet for the rural in Vietnam.

And also here we ask for your cooperation, ask for your support. With your willing for the project in Vietnam, then I hope that the model of the project can be as a country because with the project, we need your support, your cooperation. We need the funding. We need the experts. We need the resources. So I think I have finished my presentation here. We are willing to cooperate with you. Thank you.

(Applause)

>> NOELLE de GUZMAN: Thank you very much, Mr. Lien. In the interest of time, I would like to move on to the last speaker, Mahabir Pun.

(Off microphone)

>> MAHABIR PUN: Thank you. And I'm glad to be here and share some of my work in Nepal. This topic was given at the website, Innovation at the Edges and Promoting Alternative Access Models.

Actually, the reason I got involved in this wireless networking project is because, you know, there was a problem, there was a, you know, need in the mountain, that's how I got involved.

I started, actually -- I got involved in this project around 2000, and that was the only equipment. That's the history. I'm telling the history how I got involved. That's the only equipment I had was an indoor wireless router I got from some of my friends in America, and I was planning to build a long-range wireless network using this device, this indoor device.

So in order to make this indoor router, you know, go too far, a long distance, we had to get innovative, you know. I started building, you know, different kinds of home-built antennas in different, you know, ranges, and finally, after trying for one and a half year, one and a half year like this, you know, in the mountains, what I did, we became able to make the first link, 34-kilometer link, from the nearest city to the top of the mountain and to my village. That is how it was started, and nobody believed this at that time, and still some people don't believe it.

So -- and after that, it became easy and the people got interested, and I started getting help, technical help and financial help, and the network started growing bigger and bigger.

Here you can see most of this work that I have been doing is in the remote areas where there are, you know, no Internet service providers. Actually, this time when I started this project, there were no mobile services. The mobile services came much later, several years later, you know, when I -- after I started these projects, and these are some of the pictures of glacial wireless networks. I'm showing just to make you understand just how difficult it is.

You know, we were building in a relay station on the top of the mountains and we were using, you know, solar power, and this is hotspot, and we built hotspot in the mountain slopes, in the mountains, so people can get access to the Internet.

So this is how we work, and this is the solar power, because most

of these areas where we're building this network has no power from the grid line, so we have to rely mostly on solar power.

And just to give you an idea the area, see, this is very close to the Himalayas. Actually, some are in the remote Himalayan villages like that.

It's -- you know, it's very challenging to work, and I wish, you know, we had a, you know, Google loan over there so that we didn't have to build, you know, this relay station in the difficult mountains, but we didn't have a loan that time and we still don't have.

And the last, you know, 12 years, 14 years, we have been able to connect around 200 villages, over 200 villages in the remote mountain areas. Actually, these are the areas where there are no service provider. I built this -- I helped to build a wireless network in the areas only where -- in this area where there is no commercial service provider, commercial service provider, because the reason the commercial service provider, they don't want to go there is, they don't want to go there because financially it's not feasible to them to run a business there. So that's how I work.

And the villages are using the Internet mostly. Of course, they're using the Internet for communication, but our focus is in, you know, helping them to use the Internet for education in their schools. Their teachers, and their students are learning how to use, and they're using the Internet for telemedicine because these areas don't have any hospitals, any doctors there.

So what we have done is we have connected the health worker to the hospitals and the cities, and they are communicating with the doctors and they can get some help, which is better than having nothing. And we're using this for digital literacy program.

So in 2007, when I started building this network in the remote areas, I realized that Internet and computer will not be any -- won't be much useful if there is no content in the language that the people in that area understand, so we started with some of my friends, we started developing a content. We started organizing called Open Learning in Nepal, and they started developing eLessons for these students, interactive eLessons for the students, and in the villages we created eLibrary. We have over 6,000 books that's available for the villages, and they can understand.

So this is just a, you know, telemedicine setup in the rural areas. It's a rural communication center. And also, we have started in rural innovation labs. It's a pilot project. The idea is to use the Internet and -- it's a medical space in the remote areas where the Internet connects them that is going to help people to build something, whatever idea they come up with. So doing all these things, you know, just-we started this last year after we got some support from the, you know, Internet Society.

So technology. Of course, we're using 2.4 gigahertz for the last-mile connectivity and 5.8 gigahertz for the backhaul. That's what we're doing. And tools, we're using video conferencing tools, we're using some tools, you know, that can help track us in the mountain to trek. We're using, you know, to provide early warning system in

the landslide areas and some other monitoring system also.

So with the help of some grant from the Internet Society, this year we're, you know, doing a pilot project, you know, for testing TV white space and VHF technology. So these two frequencies here, you can see 560 to 578 megahertz in the TV white space and 192 megahertz to 202 megahertz in VHF technology. I'm trying very hard for almost six, seven months, you know, I have received permission from the government to use this frequency and for these pilot projects, and we're going to do it. The reason we're going to do it because it is very difficult, you know, to build the wireless network in the remote areas, mountain and mountainous areas, rugged areas. We hope this TV white space technology will make the work much easier and better to the people in the villages. This is what we're doing.

And our upcoming projects are, you know, we're trying to find ways to create the villages smart, a smart village project, and we are working with students and some other volunteers to make it work, and it's -- so we're working on it.

And this is dream project. It's not dream project, it's happening, actually. We're building drone. We're building drone to deliver medicine in the remote areas, very remote areas, where there are no hospitals, no doctors, you know, so this is a project. So for this project we'll be using, you know, wireless networks for some ways, somehow. So this is a kind of innovation we are doing.

And more than that, if you are -- I'm not going to talk about this, but I am working on, you know, building a National Innovation Center. The goal is to find ways to use the technology and make it useful for the people living in the rural areas. For that, actually, I have started this two weeks ago. I have started, you know, raising $5 million for one year, and I helped to do that, and actually in the last two weeks, nine, ten days, I have already started $60- or $70,000. It's coming. People are helping from all over, so if you are interested, you can talk to me later. That's my email and contact number.

Thank you.

(Applause)

>> NOELLE de GUZMAN: Thank you for your presentation Mahabir. Okay. Great.

We would like to move now to the interactive discussion. Are there any points that anyone would like to raise about what was discussed? Are there any questions?

>> AUDIENCE MEMBER: I think my question goes to Lien, and I think I heard you talk about socialization of infrastructures and solutions, and I want to make a more elaboration about that and how it is different from (Inaudible) about the socialization. Thank you.

>> VU HOANG LIEN: So normally the investment from the service provider, maybe Vietnamese government or something, that is the enterprise -- service provider is (Inaudible) the profit, so with the rural area, not that profitable, if that's the question.

And the government has the role for the benefits in the rural area, but the bureaucracy for the investment for the project, so still problem also.

So when we think about the socialized investment, we're thinking about the social enterprise office, nonprofit enterprise, even the people living in the rural can help pay for the investment together so that they can use together by their payment by their investment, from the people, from the family.

Even you consider the Wi-Fi, some families, they have the -- they can pay for the Wi-Fi, but they couldn't use all the capacity of the Wi-Fi, so they can share with the other people. So that family can consider a subinvestor, so I think when we open the ability for the people can funding for the project so they have not enough to pay for the monthly charge, something, but the important thing, that they can set up the accessible system for their area, for the villages.

>> AUDIENCE MEMBER: Thanks. I think my question may be to you and also Mahabir as well. Fantastic presentation, really enjoyed that and really learned a lot from your 12 years of work in this area. You had one slide that you very quickly passed through, and you talked a little bit about -- I think the slide had cultures and moral and something else, so I was wondering what you meant by that because I think a lot of conversation around addressing access issues often bypass that, often don't really look at cultural barriers potentially or cultural norms as potential things that needs to be unpacked.

And related to that, in the 12 years that you've worked in building this very awesome Wi-Fi access throughout the difficult areas in Nepal, have you seen any sort of -- have you observed any kind of agenda dimension in terms of, you know, whether women or men or girls and boys -- whether there's any difference in terms of need, in terms of adoption and use, and also in terms of innovation or how they would use it, which I also appreciate that, so connecting to the Internet for what, whether any of these kind of services and if it made any difference in terms of how you are rolling out your program.

>> VU HOANG LIEN: (Off microphone)

>> AUDIENCE MEMBER: So the second half of my question was to Mahabir. The first part of the question was for you. I was wondering what you meant when you had the slide -- I didn't see it very clearly, but it said something about morals and cultures. I didn't understand what you meant by that. And the second half of the question was to Mahabir.

>> NOELLE de GUZMAN: The second question is for Mahabir, for Mahabir, the on --

>> VU HOANG LIEN: Can you go back? I'm sorry.

>> NOELLE de GUZMAN: It's all right. It's good.

>> VU HOANG LIEN: Okay. So I think you want to explain something about this one?

>> AUDIENCE MEMBER: (Off microphone)

>> VU HOANG LIEN: First, the evolution for difficulty of life of people who are rural. There are many things you have to consider, like the -- it's a rural- --

>> NOELLE de GUZMAN: Sorry. It's the slide before that, please.

>> VU HOANG LIEN: Okay. This one. Yeah. Oh, everything, yeah, begins with the material for -- that's necessary for the people, of course, so the life better. That we have to think about to meet the

demand for the moral, for the knowledge, but based on what, how to come to here, so that I want to consider the role of the communication for the information.

So in the life we get enough for eating, for wearing, for housing, that's -- because we want to do that, but more than that, that's the, I mean, knowledge, and meets the demand for entertainment, for understanding, for sharing. Too many concerning to the moral needs, that we have to move from the material to the moral, and the role of the communication and information can do that, but each people can have better thinking, better knowledge, but just becomes a culture of the community that we can get the value, value for each people can be here, but the value for the community in the rural in the village, in the families, that's more important. We can -- we can meet the target, we can have the value, so that's the -- also with the culture, the people can do the better for their lives with the good -- with the condition for the life. I think so.   >> NOELLE de GUZMAN: Thank you very much, Mr. Lien. Mahabir, would you mind addressing the second part of the question.

>> MAHABIR PUN: Could you repeat the question, please? I got a little bit confused.

(Laughter)

>> AUDIENCE MEMBER: So I -- so in the entire time that you were working on the program, did you ever see any kind of dimensions? Is there any difference -- is there any difference between how, for example, women and men express their need, participate in the program, use some of the -- some of the access technology or -- because in your presentation, you also talked about the value of this, right, and developing sort of eLiteracy, telemedicine, all of these different kinds of programs, so I just wonder if there's a difference that you've seen between how men and women adopt this?

>> MAHABIR PUN: Now I understand. Okay. Let me tell it, frankly. You know, when I introduced computers in the rural areas around 2000, people had heard about computers. They had not seen any computers. They didn't know how -- when I brought a computer for the first time in the mountain, many people come just -- just come to see the computer and find how it looks like. That's the first thing. They had never heard the word "Internet" in the mountain, so afterward, you know, slowly people, you know, started, you know, realizing what computer is, how does it work, and later, after I introduced Internet, I had to explain them, the people, how it works, how can it be useful.

So in terms of, you know, the interest and -- all the people were interested, because even if they didn't -- they had not heard about the computer and they had not seen computers in the mountain villages, they had heard about computers a lot, you know, so that's why they were so interested to see how a computer looks like, so now, and especially the womens are using it more for the -- the telemedicine, especially, because most of the health workers we have in the mountains are womens who have some, you know -- a little bit of education, and medical education or more than high school education they have, and we have provided them informal basic health training, you know, and

they are the one who are using the Internet to communicate with the doctors and the hospitals in the cities. And the men, especially, most of the men in the mountain, in Nepal, actually, they are not there in the mountain anymore because they have to leave villages to work somewhere else, so what we do is after we introduce the Internet in the -- in the villages, we asked these people, young people who are leaving the villages to work somewhere else to learn how to use the Internet, at least to learn how to use Internet to use in -- to communicate with their families, so after they go back -- after they go to work somewhere, they communicate with their, you know, families using the Internet.

So both men and the womens are using a lot, especially for communication and for health and for education, you know, at least the teachers -- we have both women teachers and male teachers, you know. They are using it. We have a training -- when we develop the eLessons and eLibrary contents, we have, you know, teachers training methods for the teachers to teach in the schools, so they're using it a lot that way, and we're also trying to make it useful for -- to provide more information about the products, things like that, so that's why we're trying to put as much, you know, materials, learning materials as much as possible, so it has been, I mean, working quite well.

Still, you know, people are, you know, learning how to use, but those villages where we introduced first, like -- before 2010, and they're doing quite good, and the new villages are learning. The new villages where we built the Internet, they are learning step by step, but it takes time for them to learn how to use the Internet and how to use the computer, and now mobile, smart mobile phones are reaching also in the villages, and the people have started using the, you know, mobile.

And so it has been useful that way for both men and women. Thank you.

>> NOELLE de GUZMAN: Thank you very much, Mahabir. Asha, would you like to ask your question?

>> AUDIENCE MEMBER: Yeah. Thank you, Noelle. So I'm -- Mahabir, I really enjoyed your presentation, so I have a question for you, and then after that, I have a question for Lien, and I will ask them separately.

So Mahabir, the first -- the question I had was related to your -- the good news you shared with us about the 500 megahertz band. You said you managed to get permission from the government to use about 18 megahertz for TV white space.

What's your intention to do with that? Is it meant to be used for super Wi-Fi, and what sort of end user equipment are you using? Thank you.

>> MAHABIR PUN: Yes. The -- especially, you know, after I spent so many years building wireless network in the mountain villages and trying to connect, you know, the schools and communities, I had a problem. We had a problem. The problem was line of sight, you know. In order to make the -- this Wi-Fi technology work, we need a line of sight, so if there are big trees in the way or something, small mountain,

something -- big house -- there is no big house in the mountain, excuse me -- a big mountain, something, it's a problem, so in order to overcome that, we have to build a relay station. So the number of relay stations will decrease if we use TV white space, because for this TV white space technology, it will go through the trees, you know, the small mountains, and it is much better. The coverage will be much better, actually. The coverage of the TV white space will be much better, and it will make, you know, the network more efficient, and also the cost -- that's the intention for using the TV white space, especially. Also in the plain areas, in the mountain it is okay to use Wi-Fi also, because in the mountain, from one mountain slope you can see another mountain slope, but the line of sight is very clear in the mountains especially, but in the plain areas, where there are a lot of trees, especially in the southern part of Nepal, in India also, I tried to help build some wireless network also and in -- the problem was the trees. There are tall trees in the plain areas that makes, you know, the line of sight impossible, so that is why -- that's the only reason, you know, I'm trying to see how, you know, effective this TV white space technology will be, and I think it will be much more effective and easier to use TV white space technology than using this, you know, Wi-Fi band for the last-mile connectivity, so that's --
          >> AUDIENCE MEMBER: And end user equipment.
          >> MAHABIR PUN: End user equipment, you know, I tried to find the user equipment that is valuable in the market. There are not many, actually, right now. There are actually two companies, one is Six Harmonica, and another is Carlson's Wireless Technologies. Both are based in the U.S. So after discussion with the -- you know, my friends in Germany and in Singapore and -- you know, we have decided to use Carlson, so we have ordered the Carlson's equipment, and we'll be using that. Carlson's Wireless Technology. That's the only --
          >> AUDIENCE MEMBER: Okay. Thank you. Mr. Lien, I have a similar question for you. Do you see the possibility of potential, rather, for TV white space networks in Vietnam?
          >> VU HOANG LIEN: So I think the TV in Vietnam now, the (Inaudible), it's good in the city, and I don't think we have to face any difficulties concerning to the frequency spectrum, even for the digital television now. In the city now, the government have a policy of moving from the analog television to the digital television, and -- but the opportunity for the Internet can ask for the moving -- for the -- for the television to the Internet TV, so I think the potential for that is so good in Vietnam because the technology development and application for the service provider so good in Vietnam.
          I think with that television now in Vietnam has the potential and very good development concerning to Vietnam, concerning to television to -- I think to make the demand for television very, very huge in Vietnam because I think it captures people. Cable TV, so not really cover -- coverage not -- but it meets the demand because now there's a mix between pay TV and Internet becomes the trend to development -- for development in the City of Vietnam, and I think the service provider good preparation and demand very high in the future.

>> AUDIENCE MEMBER: Thank you, sir.

>> NOELLE de GUZMAN: We have a question from one of our remote participants, Kent. Thank you for your question, Kent, for Mahabir. What is the method of backhaul for wireless connectivity in Nepal?

>> MAHABIR PUN: Okay. In the network where I built, there's no support from the government, and also the -- like I said, the mobile operators, our telecom operators, they are not coming in these areas to provide Internet, so we have to build the backhaul by ourselves. We use this 5.8 gigahertz equipment point to point from one mountaintop to another mountaintop. The longest, you know, point-to-point link we have is 60 kilometer and like, 20, 30, 40 kilometer is just the normal. We have several relay systems that are, like, 40, 50, or particular meters point to point, and all these relay systems, like I said, I know they are using solar power. All of them are relying on solar power to do that, so that's how the, you know, backhaul -- that one has been built, so we are building the back one by ourselves. There's no way, no choice, and also we are doing the last-mile connectivity, both.

>> AUDIENCE MEMBER: (Off microphone)

>> MAHABIR PUN: It depends on the equipment we use. The equipment we are using right now is at least getting, like, 20 to 25 -- to MPBS, uplink and downlink aggregate.

>> AUDIENCE MEMBER: Uplink and downlink?

>> MAHABIR PUN: Yes, aggregate.

>> AUDIENCE MEMBER: Thank you.

>> NOELLE de GUZMAN: are there other questions? Okay. I have a question. All of you touched upon common access points, so everyone's talking about mobile. Mobile is from the end user perspective, mobile are individual devices, they're personal devices, but we're talking about connecting people in rural communities and remote communities, and we see the value of access points where people can come together and connect through shared devices and shared places.

What is the -- what is the extent, what is the importance -- how important are these to the communities and to the areas that you are aiming to connect or you are already connecting now? And I guess that would be a question for all of our speakers.

>> MAHABIR PUN: What is the importance; right?

>> NOELLE de GUZMAN: Yes.

>> MAHABIR PUN: Actually, many people think, you know, even my friends, they say that, you know, why are you doing all these things? How can the Internet and computers be useful for the remote people who are -- all of them are farmers. Many -- all of them are -- I mean, some of them are some educated, but most of them are illiterate. How can it be useful for the communities? People are asking that.

What I have found is, you know, Internet and the technology can be as useful as -- for these rural people or people living in the rural areas, as useful as it has been for the people living in the urban areas, you know. They have schools there, you know, their children need to learn how to use computers, how to use Internet, how to get information from the Internet, and they have -- these people, like

I said, many of these young people have to leave the country to work somewhere, and they have to learn how to, you know, use -- at least how to get -- how to use the Internet or computers before they leave the village.

So that's why what we're doing is we're running -- whenever we build a link, we are running a digital literacy program for the villages, and we invite them to come and learn to use the Internet, the computers, before these young people leave the -- you know, the country. Many of them are doing that, so that's why it is important for them also.

Like I said, for the -- for the health program, the womens are using it. Actually, we have developed a mobile app also now, what we call Mother's Love. This app provides information to the pregnant womens, you know, during the pregnancy period, so they're also using it.

Also, the -- some of the farmers, we have created -- I didn't show that, I forgot to show that -- we have created a bulletin board in the Internet in the local server, you know, where people can post the -- the materials or the products, mostly the animals, you know, the agriculture products they want to sell. It's a bulletin board where they can put it, this news or information in the board.

So also, some villages, the villages -- like one place, the villages are, you know, different places. They have created these remitting services, money transfer services, just to get money sent by the relatives from abroad because it is possible if they have the Internet. Once they get the Internet, anybody with Internet who is interested to, you know, start the service for the village -- for the people, they can do this.

There are several places that, you know, started remitting services so that, you know, the people can get the money at their villages, so they don't have to go -- the villagers don't have to go to the cities to get the money sent by their, you know, families from abroad.

So these are some of the examples, but we are doing much more than that, you know. Like in the area where we have built a network, you know, we have put this trekker tracking system, also, which is to track the trekkers who go hiking in the mountains, you know. We are doing, like I said, landside warning systems. We use the technology, wireless network, to provide these early warning systems, and we're doing a lot of things, and like I said, we're developing a drone there to deliver medicine. This drone system will be using the wireless network or the Internet a lot in order for the villages to communicate. That's why it is very important, even for the people living in the rural areas, it is as important as it is for the people in the urban areas, living in the urban areas. Thank you.

>> NOELLE de GUZMAN: Thank you, Mahabir. Mr. Lien, you mentioned earlier in your presentation Internet cafes. Are these present as well in the rural areas, and whose initiative is it? Is there government participation in it?

>> VU HOANG LIEN: Concerning to the solutions for the people in the rural or even in the urban to the Internet, I talk about the Internet cafe, that's based on the country of Indonesia, so it prefers

entertainment, so they showed interest with the information first so they can -- there's an ability -- opportunity to access the Internet, so in the Internet cafe, they -- it's easy for them to have the equipment, to have the feasibility of the -- the equipment to access the Internet, so they have people -- they support them to use the Internet, and even the payment is much cheaper than the -- it's based on one they can share and they have to pay less.

Concerning to the government, the government, of course, support to the Internet cafe, but I don't think the priorities or policy for the Internet cafe, but the government consider Internet cafe like a game board or something. The government still control so much about that because -- less for the Internet, so even the government not allow the Internet calf nay near the school, so I think, anyways, the Internet cafe becomes very popular for Vietnam and I think that the good solution for the rural area also.

>> NOELLE de GUZMAN: Thank you. Paul, going back to the common -- the shared access points, how important is this -- are these facilities to what Google is trying to do for the communities in Asia Pacific?

>> PAUL HARWOOD: Well, obviously, we in Google believe that access to information makes people's lives better. That's kind of fundamental to everything that we do, so I -- getting access to information, access to data and to information to -- informatic services available to everybody is important. It gives a level playing field so everybody is getting the same quality of life.

As for shared, it's just the easiest and quickest way of getting access to people in rural areas. It's -- it avoids -- we don't believe -- we don't believe in walled gardens, and lock-in, shared access avoids all of these things, gives freely available access to everybody in the village, and it provides the best return on the investment available, so it's just the quickest and easiest way of doing it.

>> NOELLE de GUZMAN: Okay. Great. We are running out of time, I realize, but there is really one question that I really, really want to ask, and if you could just answer for one minute each.

Is your job -- so you're all working in the area of expanding access. Is your job getting easier or is it getting harder?

>> MAHABIR PUN: For me, it's getting easier and easier because like I say, like I showed in the beginning in 2002, when I was starting to use the technology, it was just emerging technology, it was not improved well. Now, the technology improved so much, a lot, and it has made me to work much easier.

>> NOELLE de GUZMAN: Thank you very much, Mahabir, for sticking to the one minute. Mr. Lien.

>> VU HOANG LIEN: I think the -- so make everything better, easier for user Internet. I think that's the most important in concern -- my concern, and I think I want to work on the project that they can support for the user rather than talk much about the technology solution or system or networking. Even that's very important, I work for that before, but now is the time we should think about the user and support user by many -- many way, and together with the many organizations.

>> NOELLE de GUZMAN: Thank you, Mr. Lien. And Paul.

>> PAUL HARWOOD: Quickly. It gets easier from one point of view because the things we can do with technology now are quite miraculous compared to what we could do 20 years ago, and more difficult from another point of view because the expectations that we have to meet keep getting higher and higher. You know, people want more and more, and the places where we want to bring it to are harder.

>> NOELLE de GUZMAN: Great. Thank you, Paul. Well, instead of summarizing the session, I would just like to thank everyone for participating, for asking questions, for listening, and, of course, I'd like to thank our speakers, and if we could please give everyone a round of applause. Thank you very much.

(Applause)

(Session concluded at 10:37 a.m.)

***

This text is being provided in realtime format. Communication Access Realtime Translation (CART) or captioning is provided in order to facilitate communication accessibility and may not be a totally verbatim record of the proceedings.

***