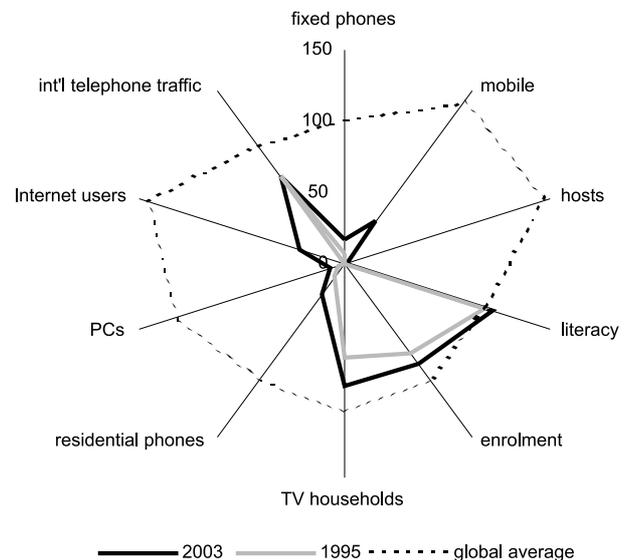


## Indonesia

Onno W. Purbo



Source: *Monitoring the Digital Divide*. © Orbicom 2004

### Overview

The World Summit on the Information Society (WSIS) held in December 2003, and the preparatory process leading up to the summit, has helped to focus the attention of Indonesian policy makers on the ICT sector. They have begun to review the policy and regulatory framework of the country to ensure that the objectives of WSIS are addressed, such as connecting half of the population to the Internet by 2015. Meeting the objectives is a daunting task. It will require revision of the current regulatory framework to create an enabling environment for the sector, which will include establishing an independent regulatory body and liberalising the telecommunications industry. Some of the required changes have surfaced as proposals for building community telecentres in rural areas and the adoption of a national strategy for universal service obligation. Most of these proposals are at the conceptual stage and under discussion by the authorities concerned. Not much government action or large-scale implementation of public projects is apparent.

A significant policy and regulatory change did occur on 5 January 2005 when the Ministry of Transportation and Communication Act No. 5/2005 was passed. It unlicensed the 2.4-GHz band used by WiFi equipment. Indonesians are now free to use such equipment without having to obtain prior approval or pay licensing fees. However, the 5.2- and 5.8-GHz bands are still restricted, and efforts are continuing to have these frequencies unlicensed as well. User groups have also begun to initiate activities to educate WiFi users on how to manage the frequency. Although the central government has unlicensed the 2.4-GHz band, user groups fear that local governments may now seize the opportunity to exercise their discretionary powers to control and levy fees on its usage.

In sharp contrast to relative public sector inaction are the many activities initiated by people's movement at the grassroots. Most of the initiatives are community based, funded by the members themselves with minimal outside support including that of the government. The following are some of the most prominent grassroots movements:

- Groups.or.id is a free mailing-list service supported by Indonesian ISPs. The online communities usually fund the servers used to manage these lists. The service was running more than 2,500 mailing lists with over 65,000 subscribers in March 2004.
- IlmuKomputer.com is a WSIS award winner. It provides free ICT information to the Indonesian society and is self-funded.
- VoIP Merdeka provides free VoIP services to the Indonesian people and is operated by its members. It is one of the largest free VoIP networks in the world and is managed by more than 200 gatekeepers.

The private sector has also significantly increased the application of ICT in their operations. This is evident in the usage figures: 40–60 percent growth in the number of URLs for content in the Indonesian language, 150–200 percent rise in the number of URLs for content about Indonesia in the English language, and about 150 percent increase in the number of ICT-related companies. In addition, there has been a rise in the number of Indonesian Internet users, bandwidth consumption and Internet exchange traffic. We can conclude that ISPs have all benefited from the growth of Internet usage in the country.

### Local online content

Using the Google search engine as the main tool, searches were conducted to determine the amount of content on Indonesia available in certain categories in both the Indonesian and English languages using at least ten keywords for each category. The results from this exercise are compared against those of similar searches conducted in the previous year, 2002. The extent of growth in content is evident from the comparison. Also evident are the significant differences in the amount of content webbed in the two languages.

Content on technology formed the largest category in the Indonesian language with 2.7 million URLs found in 2003, representing a 53 percent increase over 2002. Technological content was followed by news/current affairs with 2.5 million URLs (68 percent increase). The third largest category was industry/business with 1.9 million URLs (about 76 percent increase). Content on civil society ranked fourth with 1.7 million URLs (about 66 percent increase). Both the industry/business and civil society categories improved in ranking from fifth and seventh places in 2002 to third and fourth places in 2003, respectively.

The ranking of other content categories webbed in the Indonesian language was as follows: education, 1.6 million URLs (36 percent increase); culture/literature, 1.5 million URLs (38 percent increase); government, 1.5 million URLs (43 percent increase); health/nutrition, 1.2 million URLs (58 percent increase); commerce/tourism, 1.2 million URLs (76 percent increase); rural development, 870,000 URLs (67 percent increase); political groupings, 770,000 URLs (81 percent increase); agriculture, 404,000 URLs (67 percent increase); and NGOs, 310,000 URLs (34 percent increase).

Indonesian content webbed in English, which aims to reach a broader audience on the Internet, was consistent between 2002 and 2003 in terms of ranking of the categories. However, the number of URLs was significantly different between the two years. There were large increases, in the range of 140–240 percent, in the content in English as compared with the 30–80 percent increases in the content in Indonesian. Thus, although there was an increase in the content on Indonesia in both languages, English-language content grew much more than Indonesian-language content.

Unlike the Indonesian-language content, the English-language content placed significant emphasis on commerce/tourism, which ranked first with 29 million URLs, representing a 205 percent increase from 2002. This was followed by industry/business at 27 million URLs (221 percent increase), civil society 23.5 million URLs (205 percent increase), culture/literature 18.6 million URLs (233 percent increase), government 18.5 million URLs (209 percent increase), news/current affairs 17.4 million URLs (224 percent increase), education 14.5 million URLs (188 percent increase), technology 14 million URLs (186 percent increase), political groupings 8 million URLs (139 percent increase), health/nutrition 8 million URLs (236 percent increase), NGOs 7 million URLs (199 percent increase), rural development 6 million URLs (151 percent increase), and agriculture 6 million URLs (161 percent increase).

Thus, it is clear that Indonesian content in English placed greater emphasis on commerce/tourism, industry/business, and civil society. The interests and information needs of surfers who use the Indonesian language are obviously different from those who use English. It should be noted that both Indonesian and English content places less emphasis on rural development, NGOs and agriculture.

The ratio of content in the Indonesian language relative to that in English is interesting. In 2002, Indonesian-language content accounted for 15.3 percent of all content on the country, while the ratio of technology-related Indonesian content webbed in the Indonesian language relative to English was highest at 27.1 percent; it was followed by health/nutrition at 23.7 percent and news/current affairs at 22.0 percent. It would appear that Indonesian techies produced the most content as well as enjoyed the best access to online content. Unfortunately, in 2003 the ratio of Indonesian content webbed in the Indonesian language had declined relative to that in English. For example, in commerce/tourism, it was 7.1 percent in 2002 but 4.2 percent for 2003. In industry/business, it was 11.6 percent in 2002 but 6.7 percent in 2003. Indonesian-language content accounted for only 6–10 percent relative to content published in English for the various categories in 2003, which was much lower than in 2002. The decline was due mainly to significant increases in Indonesian content webbed in English.

## Online services

### E-commerce and e-business

Indonesia has more than 13 million cellular phone subscribers. This large subscriber base has created an attractive market for mobile services, such as SMS. Businesses based on SMS are flourishing. At the rate of US\$0.05–\$0.10 per call, SMS services are quite affordable to most users. Indonesian subscribers send about 20,000 SMS messages each day requesting for various services. It is therefore not surprising to see some service providers earning US\$30,000–\$60,000 each month from rendering such services.

PlaySMS (<http://playsms.sourceforge.net>) is an open source implementation of the main software used in providing such mobile services. It was developed by Anton Raharja, an Indonesian. A PC running PlaySMS, and connected via a data cable to a Nokia 6110, will serve as an SMS service gateway to an intranet/Internet-based network. A Linux server running Apache, MySQL and PHP script will be able to run such services.

### Distance education and e-learning

The website IlmuKomputer.com won the 2003 WSIS prize for best practices in e-learning. It specialises in distance education and e-learning in computer science. Its mission is to operate a free online e-learning programme.<sup>1</sup> The site is accessed mainly by Indonesians, who account for 80 percent of its users.

IlmuKomputer.com is managed by Romi Satria Wahono and run by a team of over 20 people.<sup>2</sup> The website hosts

some 500 ebooks, tutorials and articles on ICT. It also includes scientific papers and theses. The content has not been fully indexed, but it is estimated to number about 100,000 pages in total contributed by about 130 authors. IlmuKomputer.com is disseminating its content not only through the Web but also on CDs. There are about 200 people spread across Indonesia who act as its CD distributors.

The website has a total of about 3,000 subscribers. It is also collaborating with 15 e-learning communities. It has 15 registered mirror sites to help cope with its high volume of traffic. In addition, there are numerous unregistered mirror sites hosted by various high schools and universities.

### Online communities

Indonesia launched its own community-based discussion platform and several free servers on open source development in 2004. Indonesian communities funded all these activities on their own. The free mailing-list discussion platform is running at Groups.or.id. The mailing-list server, which was bought with contributions from many people, was connected on 31 October 2003 and with that Groups.or.id was born!<sup>3</sup> It had more than 2,500 mailing lists with over 65,000 subscribers as of March 2004.

Work is currently underway to set up free webmail/popmail servers, development servers as well as other servers for the open source community in the country.<sup>4</sup>

The impact of Groups.or.id was evaluated after two months of operation using the pflogsumm application. It revealed some interesting figures: A significant amount of traffic had been generated by the list. Total traffic clocked was 581 Mb. The server had received more than 50,000 email messages and delivered more than 120,000. There were 319 sending hosts/domains with more than 31,000 recipients and about 3,500 recipient hosts/domains.

In analysing the recipient hosts/domains, it was clear that Yahoo remained the top email recipient with a daily average of about 1 Mb. CBN.net.id ranked second with about 200 Kb, followed by Plasa.com, TelkomNet and Hotmail with a combined total of about 160 Kb. The analysis showed that many users who signed up to receive the lists preferred to do so via a free email service. This was different with users who posted their contributions to the mailing lists, who preferred to do their postings via CBN, TelkomNet, IndoNet and IndosatNet. It would appear that those subscribers who did most of the postings were happy to pay for more reliable email services.

The most active mailing list at Groups.or.id is Genetika. Most Indonesian ICT activists interact with each other through this list. One of the most interesting phenomena is *Kebumen@groups.or.id*. Kebumen is a small city in the centre of Java island. It is amazing to see members of a community originating from such a remote area interact with

each other via the Internet. The initiators of the discussions on the list are people who have left Kebumen and are now dispersed across the country.

## Industries

### ICT

Data about the ICT industry in the country may be gleaned from the websites of the Indonesian Chamber of Commerce (<http://www.kadinnet.com>) and the Indonesian Yellow Pages (<http://www.yellowpages.co.id>). There were a total of 1,608 Indonesian ICT companies listed in the Yellow Pages in 2003, a 148 percent increase from 2002 when the directory listed only 649 ICT companies.

The biggest increase was among companies doing web design: from only 2 companies listed in 2002 to 19 in 2003, representing an 850 percent increase. IT-related companies ranked next with a 571 percent increase, from 24 companies in 2002 to 161 in 2003.

The majority of Indonesian ICT companies are found in the computer software sector, which registered a 362 percent increase (68 companies in 2002 rising to 314 in 2003), and the Internet services sector, which saw a 169 percent increase (133 rising to 358). Computer programming consultants increased by 163 percent (52 rising to 137); ISPs rose by 93 percent (90 rising to 174); computer total solution providers grew by 167 percent (27 rising to 72); Internet companies increased by 51 percent (59 rising to 89); and software-related companies grew by 68 percent (88 rising to 148).

The growth in nearly all sectors of the industry indicates that demand for ICT-related businesses remains strong. However, it is interesting to note that companies listed as providing e-commerce services are diminishing. It is a logical consequence of the untrustworthy conduct of many Indonesian users, who used stolen credit cards to buy goods over the Internet.

Indonesian ICT companies are distributed unevenly across the country. Most of them are located in Jakarta, which is home to 1,114 companies (139 percent increase from 2002), followed by Surabaya with 143 companies (472 percent increase) and Bandung with 120 companies (60 percent increase). Only a small number of companies are located outside Java island: Medan (43), Bali (32), Palembang (4) and Makassar (6). The 76 companies operating in Yogyakarta in central Java in 2003 represented a 443 percent gain from the previous year. Its sultan has declared the intention to develop the place as a cyber city. Yogyakarta is known as a city of students with many universities and colleges. The presence of this rich pool of talent should contribute towards the realisation of the sultan's plans.

## Internet infrastructure

A commercial ISP operation was launched by IndoInternet, which is also known as IndoNet (<http://www.indo.net.id>), in 1994. The easiest way to trace the development of the Indonesian Internet infrastructure after this historic year is by monitoring the expansion of the activities of Indonesian ISPs. Much of the status of the commercial infrastructure can be investigated through the Indonesian Internet Service Provider Association, or Asosiasi Penyelenggara Jasa Internet Indonesia (APJII) in Indonesian (<http://www.apjii.or.id>). It had 124 members as of third quarter 2003. Out of this total, 93 ISPs were holding operational licences. Only 73 of the ISPs were connected to the Indonesia Internet Exchange (IIX). The ISPs provide services to more than 90 cities.<sup>5</sup>

APJII provides its members shared facilities with IIX, the Indonesian Network Information Centre (IDNIC) and the Asia Pacific Network Information Centre (APNIC) in interconnection, domain registration and IP resource allocation. Not all APJII members require services such as IP address allocation and interconnection to IIX. Internet cafés and neighbourhood networks serve about 60–70

percent of all Internet users in the country. These activities are all privately driven with no government involvement.

The latest estimates of Indonesian Internet users and subscribers can be obtained from APJII's annual report.<sup>6</sup> Generally, the total number of Internet subscribers registered with Indonesian ISPs accounts for only 10–20 percent of the actual total of Internet users in the country. There has been an average annual increase of 50 percent of both Internet subscribers and users. The estimated number of Internet subscribers in 2003 was 800,000. The estimated user population was 7.5 million. The 2003 figures represented significant increases when compared with 2002 totals of about 670,000 subscribers and 4.5 million users. A detailed study of the user profile was done by APJII. It reveals that the majority of users are male, young (25–35 years old) and educated, comprising high school graduates, university students and young professionals.

Most Indonesians prefer to use international domains, such as “.com” and “.org”, because of the ease and convenience of registering such domains. However, there has been a recent growth in new registrations under the Indonesian domain, “.id”, with 3,700 new domains registered in 2003 to bring the total number of domains to more than

## The cyber café and telecentre in twilight zone

A posting dated 30 January 2004 by Heru Nugroho ([hn@apjii.or.id](mailto:hn@apjii.or.id)), secretary-general of APJII, to several major Indonesian mailing lists with the subject title “Stop Press: Pengguna Internet di Indonesia” (Stop Press: Indonesian Internet Users) shocked many people. The writer shared his insights into the latest Indonesian Internet user statistics in his posting. The most shocking observation was the dramatic reduction in the number of Internet users surfing from cyber cafés. They accounted for less than 3 percent (or 200,000) of the conservatively estimated total of eight million Indonesian Internet users. Two years earlier, Indonesian cyber cafés were the major means of access to the Internet serving about 42 percent of the estimated two million Indonesian Internet users. The estimated total number of cyber cafés in 2003 was only 1,724, significantly less than in previous years.

On 12 March 2004, Michael Sunggiardi ([Michael@sunggiardi.com](mailto:Michael@sunggiardi.com)) posted a comment on the mailing list [telematika@yahoogroups.com](mailto:telematika@yahoogroups.com). In it, he shared his experiences in serving the Internet community in the city of Bogor, about one hour's drive from Jakarta. He reported that in 1998 there were 129 cyber cafés in Bogor. There were 40 left in 2003, of which only 20 enjoyed good patronage. The survey, which was conducted in early 2004, revealed an even worse condition for cyber cafés.

Discussions in the various mailing lists blamed high telecommunications tariffs for the sorry state of Indonesian cyber cafés. Other explanations included the conversion of cyber cafés into gaming centres, illegal tariffs imposed by local governments, and some local governments requiring cyber cafés to apply for a licence to operate as an entertainment centre.

An interesting posting by Heru Nugroho on 31 January 2004 revealed that there were more than 5,000 educational institutions connected to the Internet, including schools, universities, *pesantren* and *madrasah* (informal educational institutions). They accounted for more than 32 percent of the estimated total of Internet users, a big jump from 4 percent in 2001. Clearly, the education sector will contribute the most new Internet users in the future. Furthermore, this sector is able to self-finance its Internet access for as little as US\$0.50 for each student per month, and it is able to recover its investment in one to two years. Unfortunately, the success of these educational institutions may also have contributed to the downturn in the business of cyber cafés.

18,200. This number of new domains was slightly higher than in 2002 when 3,200 were recorded. The number of new domains actually declined in 2001, which Budi Rahardjo, administrator of the top-level domain for Indonesia, believes was due to the worldwide collapse of the dotcom sector.

The number of IP addresses and AS numbers is growing steadily in Indonesia. A total of 2,377 IPv4 blocks with 69 AS numbers were allocated to Indonesian ISPs in 2003. An important change was seen in the allocation of 131,073 IPv6 accumulative blocks in the same year. No IPv6 allocations had been made previously. The allocated IPv6 blocks enable ISPs to begin building the next-generation Internet in the country.<sup>7</sup>

APJII has established several IIXs in Jakarta in order to help reduce the volume of international traffic. The IIXs interconnect all ISPs based in Jakarta without any charges. Similar IIXs are planned for various other cities, such as Surabaya, Bandung and Yogyakarta. These new exchanges are required as most intra-city traffic is now routed through Jakarta. The multi router traffic graph reports issued by Johar Alam, the IIX administrator, show significant increases in the peak bandwidth transmitted through the various exchanges. The increases are due to the rising number of corporate subscribers. They are also due to users adopting Internet applications that require high bandwidth, such as MP3 file transfer, multimedia applications and online gaming.

Johar Alam of IIX and Heru Nugroho of APJII reported in early January 2004 that the peak bandwidth of all the IIXs in the country had been recorded in excess of 1.2 Gbps. This figure was double the peak traffic registered in March 2003 at 620 Mbps. Since the international traffic is normally about three times the local bandwidth, the peak Indonesian international bandwidth is estimated as about 3 Gbps. The peak local bandwidth is normally about 70–80 percent of the maximum bandwidth of the country. Thus, it may be estimated that the maximum bandwidth is about 2 Gbps. The ratio of incoming to outgoing Internet traffic is about 10:1 as Indonesians continue to consume much more information than they produce.

APJII data show that the government grants a large number of ISP licences. There appears to be minimal restrictions placed on the issuing of these licences. Licences had been issued to more than 190 ISPs, 29 network access providers (NAPs) and 24 multimedia providers by the third quarter of 2003, compared to 180 ISPs, 18 NAPs and 24 multimedia providers registered in 2002. It is interesting to note that there were only 2 licensed ISPs in 1994 when the sector was born. Out of the 2003 total, only 124 were members of APJII, comprising 111 ISPs, 6 NAPs, 4 multimedia providers and 3 providers of research and educational network services.

## Key national initiatives

The VoIP Maverick Network, or VoIP Merdeka in the Indonesian language, was launched in cyberspace at *genetika@yahoogroups.com* on 12 January 2003. It was started in response to the increase in telephone tariffs on 1 January 2003. MaverickNet is a community-based VoIP network operating on the Indonesian Internet infrastructure. It is free and one of the most complex countrywide Internet telephony infrastructures ever implemented.

An open source gatekeeper (<http://www.gnugk.org>) was adopted as the main gate-keeping software. The MaverickNet architecture is based on a VoIP gatekeeper cloud that acts as the main switch. The VoIP softswitch forms quite a complicated tree structure comprising more than 200 public gatekeepers.<sup>8</sup> RootGK normally acts as the highest-level gatekeeper in the infrastructure and is located at IIX. The second level is a stand-alone gatekeeper on the Internet used by the public and often referred to as an operator gatekeeper (OGK). The third-level gatekeeper is located at the proxy server. It is basically a proxy gatekeeper and often called the local gatekeeper (LGK).

A numbering system has been set up for MaverickNet. An endpoint (EP) with the number, say, 62888881234567 must register with a public gatekeeper that handles the prefix 6288888. If this EP should register with some other public gatekeeper, other EPs will not be able to call EP 62888881234567. There were a number of major public gatekeepers serving MaverickNet at the time of writing. There are two machines acting as RootGK located at 202.155.39.157 and 202.53.224.172. There were also others acting as public gatekeepers serving specific prefixes: 218.100.4.194 for area code 62 88 888, 202.43.162.189 for area code 62 88 999, and 202.150.8.15 for area code 62 88 925.

Some friends of MaverickNet are contributing their gatekeepers for public usage. Some of them are identified at <http://gk.vision.net.id> and <http://voipmerdeka.net/gkregistration>. A total of 147 regional/operator gatekeepers are listed. In addition, there are unknown numbers of gatekeepers running at numerous proxy servers. The typical daily traffic comprises more than 2,000 calls serving thousands of users. It is interesting to note that some users make calls lasting several days.

Efforts were being made at the time of writing to integrate MaverickNet with other international gatekeeper networks. The integration is done through gatekeeper neighbours settings. There are several active gatekeeper neighbours in Singapore, Japan, England, Germany, Canada and Sudan. These neighbours are not the formal telecommunications gatekeepers but are run by volunteers in these countries.

The basic strategy adopted in building these free and low-cost VoIP networks was to educate the communities, with the mailing lists at *voipmerdeka@yahoogroups.com* and *gk-admin@yahoogroups.com* serving as the main vehicle.

## The future community network

I have connected the LAN in my home as well as in my neighbourhood to the Internet for 24-hour access at 11 Mbps at the cost of Rp 330,000 (US\$30) per month. In other areas, the cost for a similar connection may be as low as US\$15 per month. Such low-cost 24-hour Internet connections would not be possible without the existence of neighbourhood networks.<sup>a</sup>

Unlike a normal community telecentre or cyber café that connects several computers within a room or a house, neighbourhood networks extend LAN cables (RJ-45 UTP cables) to adjacent houses and buildings. Basically, a WAN based on Ethernet LAN is deployed. Since the maximum length of a UTP cable is normally 100–200 metres, a hub is used to relay the signal beyond this distance to the next 100–200 metres to form a tree-structured LAN connection. To protect the cables from rats and water, they are usually run through plastic pipes laid along the neighbourhood drains. As more houses and computers in the neighbourhood get connected to the network, the installation cost per house can be reduced to around US\$50–\$80.

An analysis of the cost of running such an Internet infrastructure clearly showed that much of the cost of access arose from the rental of telecommunications lines and other tariffs charged by Telkom Indonesia. This drove us to seek a solution which bypassed Telkom. The next task was to find a low-cost broadband connection. We found it in off-the-shelf WiFi equipment. WiFi is basically wireless LAN equipment operating on 2.4- or 5.8-GHz frequency at speeds of 1–11 Mbps based on the IEEE 802.11 standard. It was originally designed for indoor installation and came with an antenna with a range of 100–200 metres. We often replace the factory-installed antenna with high-gain flat panels or parabolic antennae designed to operate at either 2.4 or 5.8 GHz to extend the range to 5–8 km.

The external high-gain antenna is connected to the WiFi card via a short 0.5-metre pigtail cable. Such a cable normally comes with an SMA connector and an N-type connector for connecting to the WiFi card and the external antenna, respectively. It is easy to build a low-cost 2.4-GHz antenna using a tin can measuring 90 mm in diameter and 215 mm in height. Such a home-made antenna can reach 1–2 km and costs approximately US\$5–\$10 each. Since WiFi normally operates at a very low power of 30–100 mW, we normally place the equipment in a plastic container and install it on top of a tower that is 20–30 metres tall so as to reduce signal loss. In this way, the distance between the antenna and the WiFi equipment is shortened to 0.5 metre. A LAN cable is then run from the back of the WiFi equipment on the tower to the neighbourhood network.

So with a US\$100–\$300 investment, we are able to enjoy an 11-Mbps broadband connection with ISPs within a range of 5–10 km. The cost for dedicated 64-Kbps 24-hour Internet access in Indonesia is about US\$400 per month. If this monthly cost is shared among 20 to 30 houses in the neighbourhood network, the cost per house is reduced to an affordable US\$15–\$40 per month (which includes other operating expenses such as electricity and salaries for technicians to maintain the network). The same applies to school, office and other types of networks. It is therefore not surprising to see that there are now more than 5,000 outdoor WiFi nodes installed in Indonesia.

Having found the solution for building an alternative high-speed metropolitan area network, we need to now think of how to build alternative regional networks. Two main technologies can be considered:

- *Satellite backbone:* The cheapest solution currently available in Indonesia is the DVB-RCS (Direct Video Broadcasting–Return Channel via Satellite) backbone, which costs about US\$200–\$700 for 64 Kbps, depending on the arrangements with the satellite ground stations.
- *Fibre/microwave backbone of cellular phone operators:* The excess capacity of cellular backbones may be used to relay data traffic between cities. Local ISPs are already doing this for their operations.

Another controversial technology is Internet telephony. All of these options will be available to emerging network-based communities, which may challenge many paradigms underpinning today's regulatory and policy framework.

<sup>a</sup> The detailed technology for setting up such networks can be obtained from <http://sandbox.bellanet.org/~onno>. Those who need further advice and technical support can join the English-language mailing list [wifi4d@dggroups.org](mailto:wifi4d@dggroups.org).

## Notes

1. <http://ilmukomputer.com/populer/romi-elearning.php>.
2. An overview of the website, a summary of its activities and accomplishments, and information about the working groups associated with the site may be found at <http://ilmukomputer.com/project/romi-ilmukomputercom.php>.
3. The logbook of the Indonesian mailing-list server project is posted at <http://www.ictwatch.com/milisproject>. The first mailing-list server is a 600 MHz Pentium III PC. It was bought with contributions from many members of civil society: Onno W. Purbo, Irwin Day, Bona Simandjuntak, Donny B.U., David Sudjiman (leader of KPLI Jakarta), Rio Martin (an ITENAS student), M. Ichsan (administrator of Visionnet), Nies Purwati (secretary general of Mastel), Rusmanto (editor of Infolinux), I Made Wiryana (a professor at Gunadarma), Mas Wigrantoro R.S. (coordinator of GIPI Indonesia), Heru Nugroho (secretary general of APJII), Anton (manager of Telematics Indonesia), KPLI Jakarta, Nona, and others.
4. The majority of Indonesian open source developers may be contacted at [developer@groups.or.id](mailto:developer@groups.or.id).
5. <http://www.apjii.or.id/layanan/lokasi.php?lang=ind>.
6. <http://www.apjii.or.id/dokumentasi/statistik.php?lang=eng>.
7. The working group for IPv6 may be reached at [ipv6@apjii.or.id](mailto:ipv6@apjii.or.id).
8. The list of gatekeepers can be found at <http://voipmerdeka.net/gkregistration>.