

# **An Analysis of Municipal Wireless Broadband Coverage Models**

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Over the last two years, municipal wireless broadband coverage (WBC) has been exploding in the world, especially in the Asia-Pacific region. By the end of 2005, it was reported that over 40 cities in the world were already covered by wireless broadband. However, only six months later by mid-2006, more than 400 municipalities were reported to have implemented or in the process of implementing wireless broadband coverage. Early examples of municipal wireless broadband coverage include Taipei, and one of the recent remarkable developments is Singapore's announcement of its plan to provide FREE wireless broadband access nationwide this year.

However, unlike previous developments in the telecommunication sector by telecom operators (telcos), the recent wave of wireless broadband coverage is mostly initiated and driven by municipal government agencies. Treating this as the "fifth utility" for the city, their goals are to provide an infrastructure for social and economic development, and to provide an affordable service (preferably free-of charge) to all the citizens in order to narrow the digital divide. As profitability is not even a consideration, profit oriented telecom corporations, especially incumbent telecom operators, are usually left out of this picture or only playing a subordinating role. Furthermore, one of the suspected reasons for telcos' lack of enthusiasm is that, once the area is covered by free-of-charge wireless broadband with VoIP and all kinds of services running over it, their life-supporting stream of revenue will quickly dry out.

Currently, in the world there are roughly four models to fund, build, own and run municipal wireless broadband coverage:

- By municipal government agencies directly;
- By private for profit corporations;
- By a government contracted private corporation; and
- By commune-like sharing mechanisms based on "grass root" users.

Looking closely into each of these models from a government's perspective, however, we can see that they all have their pros and cons.

First, the model of municipal wireless broadband coverage financed, built, owned and operated directly by a government agency obviously provides the most direct control for implementing the government's social goals. However, this model also has its cons for not having a market mechanism to attract participation from either user groups or industry. Thus, not only it is subject to rigid government planning procedures which cannot respond quickly to usage demands, but also places significant burdens on the government agency financially, operationally, legally and sometimes politically. For example, because providing wireless broadband access has become a commitment of the government to all of its citizens, it is hard to answer the question of why the quality of access at one apartment is not as good as at its next-door neighbor.

Second, the model of municipal wireless broadband coverage being financed, built, owned and operated by private industry has its pros and cons just the opposite of the above first model. This model takes advantage of market incentives and relieves the government of its commitment and all burdens. However, the for-profit motivation of private entities obviously deviates away from the government's social goals and, whenever there is no potential for profitability, it is most likely to leave the entire task of providing wireless broadband coverage at nowhere. On the other hand, in the case of an attractive profit potential, the availability of bandwidth becomes an issue, in turn leading to the forbidding task of frequency allocation among a large number of competing applicants. Furthermore, since achieving social goals is the very reason for the government, it will be obliged to regulate the market, which includes the licensing of operators, the tariffing of prices of service, and the provision of universal service, etc. As past experience has already proved, each of these is by itself a Hercules' task.

The third model, wireless broadband coverage being financed, built, owned and operated by a single private entity contracted by the government, to some extent bypasses the problem of frequency allocation and provides a more assured method for achieving government goals. However, no matter what is the method or procedure of appointing or establishing, this model creates a market monopoly that is mandated to serve social goals. Thus, as the century-long case of the US DOJ and FCC vs. AT&T has already shown, the government is left with the impossible task to regulate a monster monopoly and force it to serve the public interest.

The fourth model, wireless broadband coverage built and operated by "grass-root" users and forming communes by resource sharing mechanisms, best takes advantage of the Internet's very nature of "Of the people, by the people, for the people". As the network is built by users themselves, any location that has a demand for access will likely have an access point (AP) built by the people at that location who need it, use it and shared by others, thus automatically and dynamically responding to demands. Furthermore, as the coverage is built by all commune members, it naturally becomes free-of-charge among all of its contributors. Therefore, once this sharing mechanism is established, there is no need for the government to invest in, build, own or operate anything for achieving its social goals. However, this model has one vital weakness, which is how to get it started and reach a "critical mass". Obviously, when the number of APs for sharing is few, it provides little incentive for others to join the sharing mechanism and thus expand the coverage over the entire area.

After analyzing the pros and cons of all the four current models for wireless broadband coverage, we realize that none of them are perfect. Thus, philosophically speaking and looking back into human history, we see that any great achievements can only be done by mobilizing the people. However, people always need a leader to point into the right direction and doing the first piece of job. Therefore, as the Beijing municipal government is actively planning the wireless broadband coverage for its own metropolitan area, a new model is devised. Characterized as "LED BY THE GOVERNMENT and BUILT BY THE PEOPLE", this new model tries to adopt and combine all the advantages of current models while avoiding all the disadvantages, and comes up with the following principles:

- An active leading role by the municipal government;
- An active participation by the general public;

- Shared network resources;
- To provide access to visitors and the general public; and
- To take full advantage of market competition.

The model is composed of the following pieces:

First of all, it was estimated that the Beijing municipal government needs around 2,000 to 3,000 wireless APs for its own usage, including traffic control, police surveillance, emergency handling, etc., and covering all the main streets and public areas of Beijing. This wireless coverage is to be built anyway and requires a relatively small amount, roughly USD \$2-3 million, already funded by the government's own operation budget. However, the 54 Mbps bandwidth of Wi-Fi's 802.11g access points is far beyond the need for daily usage by government agencies, and this surplus bandwidth can be made open to the public. By doing so, not only the government's own needs are met, but also lays the foundation of "Beijing Wireless Commune", a publicly shared wireless broadband network.

Second, Beijing has a large number of universities, government agencies, hospitals, corporate headquarters, etc. Many of these already have Wi-Fi coverage for internal use. Thus, the Beijing government will encourage these entities to open their surplus capacity to the public. By doing so, these entities become members of the Beijing Wireless Commune and will be entitled to free access at the government's thousands of access points as well as those of other members. For example, currently BUPT already has its campus covered by Wi-Fi access points, but can only be used by its own personnel and only on campus. After joining the Beijing Wireless Commune, BUPT's students and staff will enjoy free access throughout the city via access points of the government and other members, while government officials and personnel from other member entities will be able to freely use access points whenever they happen to be on the BUPT campus. Thus, without any additional costs of any kind, the benefit of providing on Wi-Fi coverage at their own location is magnified substantially and obviously provides a strong incentive for all these entities to join the commune and share their access points. By hundreds of entities like BUPT joining the sharing, the initial few thousand access points by the government could easily expand to tens of thousands.

Third, for individuals who have broadband access at home or office, the similar mechanism will be applied. That is, any individual who makes his/her access points available to other members will also be able to enjoy the free access at access points of the entire Beijing Wireless Commune throughout the city. Once they have access to the Internet, they will be able to enjoy all the services available, including free VoIP phone calls provided by Skype and alike. In effect, after joining the Commune, the monthly telecommunication bill will be shrunk to the single expense of broadband access at their own home or office, eliminating all the phone bills, mobile charges, etc. This tremendous saving not only will attract hundreds of thousands to join the sharing, but will also motivate people to setup access points if they did not have one before.

Forth, to visitors of Beijing, free access can be provided for a limited period of time upon their arrival. To people who do not have or cannot afford an access point to join the Commune, free access to the Internet will also be provided but at a lower speed and priority, unless a nominal fee is paid to the Commune's administration. The difference in speed and priority will be used at the beginning stage to discourage

entities or individuals taking a “free ride” without making their fair share of contribution, thus to stimulate the expansion of coverage, and will be gradually reduced and eliminated as the network of access points reaches its full coverage and capacity.

Fifth, all access points need terrestrial connections to the Internet backbone. As all members of the Beijing Wireless Commune, including the municipal government, are responsible for setting up their own access points for sharing, they will also be responsible for providing these connections as well. However, as there are multiple telecom operators as well as metropolitan CATV who have plenty of optical cables underground, they will be forced to compete for selling their bandwidth and connection. By taking full advantage of market competition, the highest quality and lowest cost can be ensured.

Comparing the above model with current models, it can be seen that it

- Fully achieves the social goals of the government;
- Minimizes the financial, operational, legal and political risk and burdens of the government;
- Takes full advantage of public participation;
- Most dynamically respond to demand;
- Takes full advantage of market competition.

Therefore, this model is most likely to bring rapid expansion of the municipal wireless broadband coverage in Beijing, estimated to reach 50,000 to 100,000 shared access points in 5 years. It is also expected that this model will become the mainstream model for wireless broadband coverage throughout China and many other places in the world.

Meanwhile, rapid deployment of municipal wireless broadband coverage will likely bring significant impact to the entire telecommunication sector. On one hand, it will transform current telcos into “hollow pipes”, providing little else but optical bandwidth underground. On the other hand, it will introduce a new player into this sector, which is the municipal government. However, these will be the topic of another research.

### **Prof. Kaili Kan**

Prof. Kan received his Ph.D. from Stanford University in 1984, after which he worked as manager of Strategic Technology Assessment at Pacific Bell in the US, Special Advisor to ChinaSat, and consultant for the World Bank. Since 1987, as Executive Deputy Director of the Economic & Technological Development Research Center (ETDRC) of China's Ministry of Posts & Telecommunications (MPT), Dr. Kan was responsible for the research, recommendation and formulation of China's telecommunication policy and development strategy for over a decade. Dr. Kaili Kan is currently Professor at the School of Economics & Management and Director of the Policy & Development Institute of Information Industries (PDIII), both at Beijing Univ. of Posts & Telecommunications (BUPT). Dr. Kan also holds a number of other positions, including member of the advisory committee for drafting China's telecommunication law.