

Opportunities for WLAN and WISP in China

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Abstract

Public WLAN has been prophesised to take as much as 60 % of the profits originally expected for the 3G. Even if the final percentage is lower, more and more agree that public WLAN represents an interesting opportunity for both big Telcos and smaller new start-ups. WISPs are growing rapidly in the US; also many European countries now have at least one WISP up running.

In early 2002, China became the world's biggest market for mobile telephony with about 150 million subscribers. China maintains its economical growth and has entered the WTO, which is expected to fuel industry growth and foreign investments in the telecom sector even more. Restrictions for foreign investments in telecom and previously protected service sectors will be gradually removed. In combination, all these factors represent an interesting scenario for WLAN and WISP industry in China.

The Chinese indoor WLAN market is experiencing fast growth and players are striving to gain a large market share early. The outdoor market is expanding more slowly and is fully dominated by two companies. The WISP market will be a battle among Chinese Telcos to attract and retain high-end mobile and WISP customers. It is a tough market for new entrants, and existing competitors should focus on winning the important high-end segment and fighting wired substitutes.

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Intended audience

The intended audience for this thesis is professionals and academics who are interested in either China or Public WLAN or both. The report has a theoretical base but it is also written to contain much specific information about actualities for Public WLAN access in China. WLAN has been prophesised as the future technology for both plain WISP and Telcos and this thesis should be useful for both these two types of professionals as well as WLAN manufacturers. Personally, I consider that the timing for this thesis is right as WISP is spreading widely in the US and Europe but has only just begun in China. The historical context of China's accession into the WTO, which not only makes it substantially easier to invest in this industry in China, but also is boosting general interest in China, has drawn attention to my thesis from different directions.

Though the intended audience is assumed to have certain knowledge about WISP business, I have included explanations to acronyms, which can be found in the appendix or in the notes at the bottom of the page. One of the major challenges facing the WISP industry is to be understood by people outside the industry itself, for instance, venue owners and potential customers. To gain a deeper knowledge in this area, some of the earlier reports, found in the bibliography part of this thesis, will provide interesting reading.

Important notices

- The theme of this thesis is the WLAN and WISP industry in China. Different from other reports written on this subject, this thesis focuses on China only. If not stated otherwise, the analysis and comments concern the situation in China only.
- The term WISP (Wireless Internet Service Provider) is used in this thesis to denote companies that provide Internet access by Public WLAN and not in a broader sense, as any company providing wireless Internet access regardless of technology, for example 3G, WAP etc.
- Not all prices are stated in both US\$ and Chinese Yuan. Exchange rate as of May 27, 2002 :US\$ 1 = RMB 8,28, RMB 1= US\$ 0.12
- In this thesis the term cellular operators and Mobile operators both refer to companies operating mobile cellular telephone systems such as 3G, GSM and CDMA.
- In this report China refers to mainland China, excluding Hong Kong and Macao.

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Disposition

Introduction: Gives a general introduction to the subject of the thesis and a general problem statement.

Background: Introduces other works and research done about WISP industry: Contains information needed to understand the background of this thesis.

Approach and Methodology: Explains the approach made by the author and the methods and models used.

Analysis of the Chinese WLAN market: Explains the situation and analyses the situation in the Chinese WLAN market for outdoor and indoor products.

Introduction to Chinese WISP market: Contains a short history and presentation of the two existing WISPs.

Five forces of competition analysis of the WISP market in China: An analysis of China's WISP market according to Michel E Porter's five forces of competition model.

Expected market for WISP services: Analyses the affordability and the future market for WISP services in China, both high-end customers and a broader market.

1 Introduction

Wireless LAN was for a long time regarded as an unstable and unsafe technology that did have some practical properties but in all was too slow and too unreliable to really compete with wired solutions as the Ethernet. However, with the birth of the IEEE 802.11b, the world saw the first true wireless contender to the wired solutions for home and office use. Although some problems still remain, for example the much debated security issue, 802.11b alias Wi-Fi alias wireless Ethernet, WECA, has already turned into a success with sales reaching US\$1.47 billion for the year 2001[1].

Once offices and early adopters' homes were deployed with WLAN, the market was ready for the roll out of the first Wireless ISP (WISP). The business model of a WISP is to supply wireless Internet access usually using 802.11b standard products in public areas such as Hotels, Airports, Cafés, restaurants etc. Combining the offer of Internet access at these "Hotspots" into one service is a way of getting Wireless broadband access today, even though not completely ubiquitous, still available in key locations.

WISP industry is expanding more and more in the US with different business models, mostly targeting white collar workers but lately less expensive alternatives targeting more "ordinary people" have appeared. The prices for these services range from US \$20 per month to US \$150. In Europe WISPs are also popping up, but here they are mostly linked to the big Telcos as opposed to in the US where the WISPs are mostly new start-ups.

The European scenario of big Telcos as WISPs has meant more stability to the sector but has also resulted in more expensive services catering to the high-end customers, for example Telia Homerun (flat rate at 1500 SEK a month, US\$ 150). On the other hand this has allowed for a few small start-ups to focus more on ordinary people, as Swedish WISP Default City (250 SEK a month, US\$ 25). The main concern of these lower priced WISPs has been the business model. Most people do not want to pay a lot for Internet connectivity nor are they used to access the Internet in public locations; consequently, there is limited demand except from the early adopters.

In order to make the services more affordable, ideas such as venues taking a larger part in installations have appeared. Venues, such as restaurants and hotels, can gain competitive advantage by offering their customers the extra service of broadband Internet, so it makes sense for them to bear some of the investment costs as well as share part of the revenues. The actual operation of the service is passed to a WISP, as they are more able to perform the networking operations. More imaginary business model alternatives have also been put forward but very few have gone beyond the idea stage so far.

While ideas on how to make money and how to attract the "ordinary" segment are springing up, the battle for the early adopters is on. The players are being spurred by reports like BWCS's *"The Wireless threat to 3G"* and the ARC Chart report[2] which prophesise WISP to take a large part of planned 3G revenues and thus giving an additional reason for big telcos to join the battle.

A couple of years before the indoor WLAN 802.11b technology became popular in the US, outdoor point-to-point (PTP) solutions using older 802.11 technology had already gained popularity in China thanks to the technology's reliability and the swiftly deployed broadband connections in the country. Impatient for broadband connections, oilfields, universities and banks were the biggest cus-

tomers in this market. In 1999, the newer 802.11b standard replaced the older 802.11 and indoor WLAN grew rapidly in the US but it wasn't until 2000 that the Chinese indoor WLAN started to grow and in 2002 it is expected to represent 25% of total WLAN sales (outdoor + indoor) in China. However, the total WLAN sales in China is only about 1.5% of the sales in US market, indicating a large potential for further increase[3].

Another important event in 2000 was China's accession to the WTO, which will eventually lift restrictions on foreign investments in China's currently protected telecom market and finance services sector. It is widely expected that China's WTO entry will bring about more transparency, better legal protection and less regulatory involvement for businesses, thus creating a more dynamic market environment for the telecom sector.

In addition, in early 2002 China became the world's biggest market for mobile telephony with 130 million subscribers and a growth rate of five million new subscribers per month[4]. The market is showing no sign of maturity and mobile subscriptions are expected to climb to 250-300 millions[4] before slowing down. Internet usage has also skyrocketed from 22 million in December 2000 to 34 million December 2001[5].

These developments have been made exploring the WISP and Public WLAN market in China very interesting. One of the prerequisites for the development of WISP industry is the development of the WLAN market. If no one uses WLAN at home or in office or if WLAN manufacturers are reluctant to work with WISPs, there's little chance for WISPs to succeed. So examining the WLAN market is crucial for understanding WISP industry's conditions. Who are the suppliers and customers of WLAN in China? How has the market evolved and what will be the future outlook? Does the market have any special characteristics? Are there any Chinese WISPs? What are their strategies? How do they work with venues and WLAN manufacturers? What are the regulations concerning WISPs? How does the future look like for WISPs in China? What do the big Chinese Telcos think about WISP? What do Foreign WISPs think about China? Are the business models used in the US and Europe applicable to China? Are there any other business models used in China?

2 Background

What has been discussed regarding Public WLAN?

Though public WLAN is quite a new phenomenon, there have already been some works done about the industry and its business models. The first major report, BWCS' "*Wireless LAN and the threat to mobile revenues*" explained the raison d'être of WISP, with research suggesting that WLAN is cost effective because it increases efficiency. Results from surveys on mobile professionals indicate that it is very useful for them to be able to work "on the road" for example in Airports and Hotels. The report also presents WLAN's advantages over 3G in many applications for real broadband use and at the same time simply states the increasing interest for WLAN services compared to the scepticism surrounding 3G.

Academic reports about WISP business models have been published at Lund's School of Economics and at the Royal Institute of Technology (KTH).

The first one, published in May 2001, was "*3G Alternative*" written by three KTH students and three students from Stanford University USA. The report explained the advantage of mobile networks which integrate the WLAN with mobile telephone networks i.e. GPRS and 3G[6].

Their argument is that GPRS or 3G individually is not powerful enough to support high capacity applications. Thus GPRS or 3G can serve for roaming around and carrying out the normal applications, but whenever there is a demand for more capacity one should access a location equipped with broadband. This heavier traffic could also be automatic when the user passes by a hotspot and the transmission speed automatically goes up. In their opinion this model could either stop 3G development, if the combination of GPRS and WLAN provides a better service than 3G alone, or actually boost 3G if the combination of 3G and WLAN is used.

In this model WLAN can complement 3G by providing 11 Mbps broadband connections in bottleneck hotspots besides the basic 3G (384kbs) coverage. Naturally, it is also possible to have various combinations of these three technologies with different coverage and connectivity to serve individual demands in different regions. Typically, the whole country can be covered by GPRS, more densely populated areas by 3G and key buildings and areas by WLAN. Besides, the ARC report estimated that people in cities will spend 80% of their time in areas within the WLAN coverage[2].

In "*3G Alternative*" the authors also presented a favorite type of WISP, called the shared access point model. In this model an operator allows other operators to access through its access points to assure better coverage for everyone, a solution that is beneficial for the whole WISP industry.

A variation of the shared access points model is the operator neutral WISP, in which the administration is carried out by a neutral entity to assure the fairness of the competition among ISPs who want to access to the APs. However, the authors do admit the lack of such suitable neutral entities. An example of such an operator neutral net is StockholmOpen.net, where the neutral entity is the Royal Institute of Technology.

Two of the authors of "*3G Alternative*", Alvéén and Farhang, later wrote a thesis titled "*Does it take a WISP to manage a wisp of hotspots*"[7]. Here they list all possible types of WISPs and the advantages and disadvantages of their business models. The proposed classification is as follows:

- Mobile Carrier WISP - Mobile telephone operator acting as a WISP
- ISP WISP - ISP acting as a WISP
- Plain WISP - Company only focused on WISP
- Location specific WISP - A WISP who provides wireless access only in specific locations, for example only at airports or only in cafés.
- Single Point WISP - A company offering Wireless Access in only one spot, for example a hotel or an airport as a complement to another service or business.
- Franchising WISP - A WISP can allow a third parties to be a part of their network by franchising an entire concept. A shared revenue and

investment model can be used between WISP and franchisee to create an incentive for the franchisee to promote the existence of WLAN access.

- Virtual WISP - A WISP not owning any network of its own but leases it from an existing WISP

2.1 Developing WISP industry

Roaming among WISPs is considered an important factor to increase the footprint and thus the utility and success of the service. New payments methods, such as prepaid cards which only charges for actual time spent on the net, instead of one-day cards previously used, will also be necessary. Finally using the "Crossing the chasm" theory, Alvéen and Farhang proposed a strategy to target another segment than just the mobile professionals. This theory states that in order to cross the chasm one has to focus on one target group and make it across the chasm with that one. Once across with one group, the rest will follow just like the first bowling pin makes the other ones fall. An example of this strategy could be to convince a retail store chain to use WLAN for logistics, while at the same time the system allows for customers to connect to the Internet or to let the kids play free games online while their parents visit the store. When all the chains stores are deployed with Public WLAN, the phenomena of this type of service will start spreading to other venues such as cafés etc.

More research about the relationship between venues and the WISP was detailed in a thesis from Lund's University "*Public W-LAN, Interaction between venues and WISPs*"[8]. Real case examples, such as the San Francisco Airport (SFO), were used to stress the importance for venues to focus on providing the best long-term service for their customers instead of only emphasizing on short term financial returns. The venue should be partially responsible for the investments and consequently entitled to part of the revenues, while leaving the network construction and maintenance to a WISP. This is to ensure more venues participation which should result in a better service. However, conflicts of interest can occur when customers use WISP services instead of consuming the venues products. An example is at the airport where travellers could stay surfing instead of shopping at the duty-free stores. Many issues still need to be solved, for instance, How to enhance the public's understanding of Public WLAN services? How to define the added value to the venue? Who should have ownership of the customer? What is the value of the venues location?

One of the most debated issues for Public WLAN and office WLAN has been security. Research done by Berkeley University, California has shown that the built in WEP (Wired Equivalent Privacy) is not enough to secure privacy even with 128-bit encryption, although it later proved that this was due to users not setting up the WEP correctly or not even changing the default settings[9]. Users who attach great importance to security can set up a VPN with all access points outside the firewall.

3 Approach and Methodology

The goal of this thesis is to reach a good understanding of the Chinese WLAN and WISP market, including the market conditions, regulations and current competitive landscape. To achieve this I conducted both primary research,

i.e. interviews, as well as secondary research i.e. collected information from books, reports, newspapers and the Internet. In order to make correct analysis and to include all crucial information, a model, in this case "the five forces of competition" is established to analyse all information collected

3.1 Literature study

Two types of research have been conducted in order to collect necessary information, the literature study and the results of my own field research. The source of my literature study consisted mostly of books I found at the libraries of Stockholm School of Economics and Stockholm University. Because books usually are not recent enough to include the latest ideas and developments in a fast moving sector as WLAN and WISP, I utilized them to gain a better knowledge of Chinese economy, economical history and current business conditions. My aim was to form a foundation of knowledge from which I could benefit when performing my research on the WLAN WISP market in China.

Most of the literature focuses on how to manage foreign companies and joint ventures in China, covering issues such as how to deal with specific problems facing a foreign company doing business in China, as well as describing more common characteristics of the Chinese economy. However, because the information included in some of the books is no longer up to date, these books are mostly used as historical background for understanding current phenomena.

With a more solid knowledge in Chinese economy I proceeded to learn more about the WISP industry through published sources. This part of the literature study consisted of company reports and completed master theses. From these documents I gained knowledge about the current situation in the WISP industry in Europe and USA, its problems, business models and players. It also gave me a good view of what work had been done previously and thus preventing me from "reinventing the wheel".

3.2 Primary research

My own research focused on three main information channels

- Internet
- Interviews
- Reports

I planned a field trip to China to interview people at location to gain first hand knowledge of the market. I quickly started out looking for suitable interviewees at the same time I was familiarizing myself with the Wireless LAN market in China. Most of this initial information was found on the Internet. Furthermore, I received valuable help from my advisor Wu Jiang, who is familiar with China as well as Magnus Melander, Björn Thorngren and David Schelin at Brainheart Capital who help me out with contacts.

3.3 Information on the Internet

Information on the Internet could be either unreliable and obsolete, or very up-to-date and accurate. It is therefore extremely important to be critical since the

information often has no published date or author. Sometimes the information has been taken out of context or does not come from a known and trusted web site.

Pages on certain websites such as 80211-planet usually are very well-organized, while other pages do not belong to a known home domain and were found through a search engine. In China there are few well organized web sites and finding the correct information takes both time and some imagination. In addition, my knowledge of the credibility of different Chinese websites was limited and therefore it was difficult to determine how much confidence I could have in them. Consequently I treat the information I gathered from Chinese websites with great caution. As my research progressed, I gradually improved my knowledge of various the Chinese websites and could more easily separate trusted information channels from more dubious ones.

3.4 Interviews

My intention was to interview as many players as possible, but even more important was to obtain the opinion of different players and to include at least one company of each type in the five forces of competition model for WISP. These types were

- Present WISP
- Possible entrants (such as ISPs or foreign WISPs)
- Venues (hotels, airports)
- WLAN hardware providers
- System Integrators and Enablers

Finally, I wished to learn what level of involvement the Universities have in the development of Public WLAN services in China. The idea was to look for any project resembling the ones that have been carried out in other countries for example at KTH in Sweden or at MIT in the US, where students have been constructing different Public WLAN access networks. I was also interested to see if the Chinese universities have any projects running to enhance WLAN services, similar to the project for shared access points carried out at KTH. If the universities are interested in the Public WLAN industry, it will be a great asset as it can help raise awareness and also supply qualified workforce for the Public WLAN industry.

3.4.1 Getting the contact

Whether it's a medium sized company as Choiceway or a huge one as Ericsson, it is not always easy to find the right person to talk to. I mostly tried to talk to sales people or people in business development. As my thesis is more about the business aspects than the technological aspects and since WISP is not widely known, the question about who to talk to is resolved partially by finding someone in the company who is interested in the WISP opportunity. However, it is often difficult for one person to fully grasp the whole company's affairs, it is likely that for example, a sales person is not up to date with the technical issues

and vice versa. This sometimes posed problems when I switched from questions about business to more technical ones.

3.4.2 Preparing and conducting the interview

Before every interview, I prepared a list of questions according to the type of company I was going to interview. I constructed special sets of questions for WISPs, Venues, WLAN manufacturers and system integrators respectively. Besides some questions, I included company specific questions such as questions regarding specific projects that the company have been carrying out. This was meant to gain each company's view on common issues, at the same time to obtain the maximal amount of information from every interview.

Even though this interview technique was used it is important to be vigilant on the interviewees eventual hidden motives. Whenever I came across some information that needed to be followed up with new questions that I hadn't prepared, I tried to make the interview more informal so that the interviewee could speak more freely.

Most interviews were conducted between the interviewer and one interviewee. There were also several interviews in which a friend or colleague joined me as another interviewer, in such cases I was always the main interviewer and followed the prepared list of questions. My friend or colleague acted often as a translator when there were troubles of understanding one another.

3.4.3 Language

Most of the interviews and discussions were conducted in English, a few in Mandarin only, others in mixing English and Mandarin. As my spoken Mandarin is not completely fluent, I tried to keep the conversation in English as much as possible. There were occasions when I had a translator with me to facilitate the communication in Mandarin. Since most of the terms in this sector have original English names, the translation of certain terms such as WISP, Hotspot and AP into Chinese is difficult. The difference in language can be a challenge when conducting interviews between Mandarin native speakers and English speakers. One must especially be aware of getting the numbers right, as Mandarin native speakers tend to think in terms of 10000 and 100 000 000 when talking about bigger numbers. This is also a common source of errors in more official publications as I witnessed at CNNIC's homepage.

Finally I took notes at every interview. These notes were then, as soon as possible after the interview, added with reflections and comments.

3.5 Reports that were not included in the literature study

During my research I got access to several reports concerning different aspects of WLAN and Public WLAN industry. These reports were often interesting but of less scientific value as they do not cite their sources. However they served as inspiration and proposal as to where and what to look for.

3.6 Theoretical Framework

Michel E Porter's famous and widely used model "five forces of competition" is a tool to process the incoming information; at the same time it serves as a

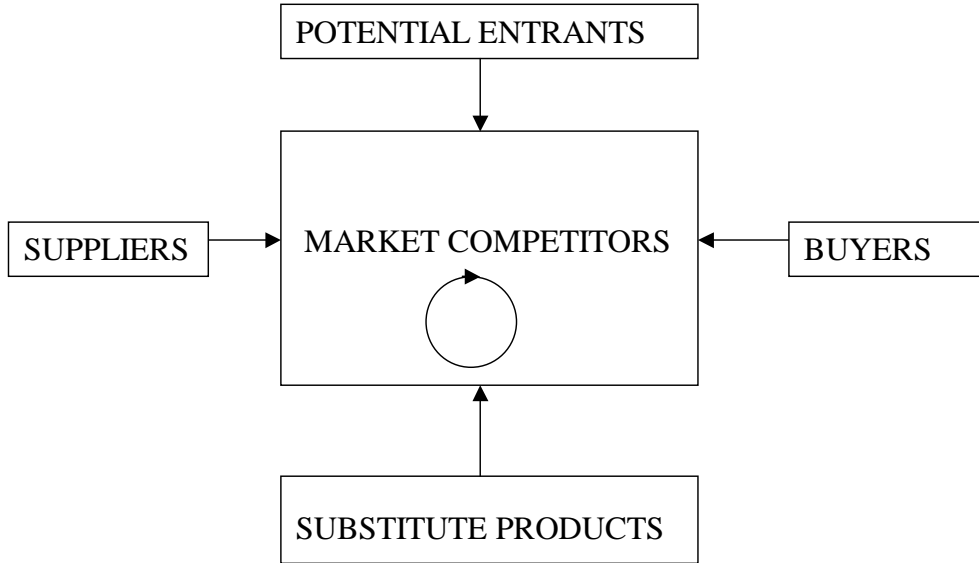


Figure 1: The five forces of competition

checklist to ensure all relevant information is included. The model has since its appearance in the early eighties been a very popular tool for market analysis and strategic decision-making. As all famous theories it has been subject to criticism. The main complaints have been regarding the difficulties of defining the market concerned, drawing its boundaries and separating it from substitute products. The adoption of the theory in this thesis also suffers partly from this drawback, though the model still is very useful and probably the most adequate there is. For anyone unacquainted with the model, here is a short presentation of the model shown in figure 1.

In the central square are the considered market's current active competitors. Upon them are forced pressures from the four surrounding powers; Threat from potential entrants, bargaining powers of the suppliers and buyers and threat from substitute products. (In this model the word products is synonymous to products and services) The fifth force is the internal force created by the competition among the market competitors. Sometimes an extra force from the market regulations is added to the model. In this case this force is imbedded in all the forces and especially in the potential entrants force. All these forces have significant impact on any given industries' competitive dynamics and industry attractiveness. This model is valid for a large number of different markets. Figure 2 shows the five forces in the WISP market.

The actual market considered in this model is strictly the WISP market using Public WLAN IEEE 802.11b products. Alternative technologies are categorized into substitute products, with the rationale that a change of technology would drastically change the conditions of the market, as most hardware investments are 802.11b specific.

In this model the venues are classified as Suppliers because they supply a

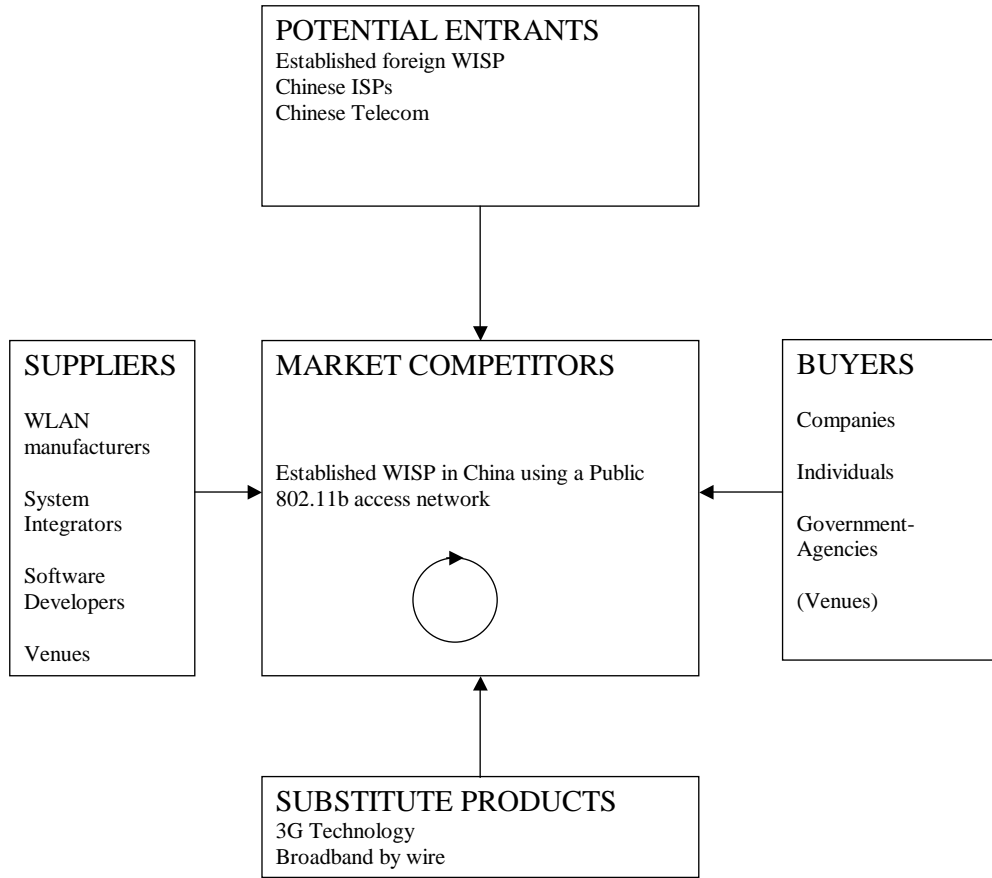


Figure 2: The five forces of competition applied to WISP industry

space or location to deploy a Public WLAN service. In cases when the venue encourages the WISP to set up their service in the venue by sharing investments and revenues the venue is arguably more correctly considered as a buyer. In fact, the position of the venues in this model depends on the business model chosen by the WISP. They remain, however, in both cases a very important force with considerable negotiating strength.

4 Analysis of the Chinese WLAN market

4.1 Classification

The WLAN is divided into two parts, outdoor and indoor WLAN. The outdoor WLAN are products being used for outdoor point-to-point PTP transmission using 802.11b technology in outdoor environments. It also includes point-to-multipoint transmission and antennas that spread signals in a wider angle if this is taking place outside, for example covering an oilfield or a port facility. The indoor products are used in typical indoor environments, such as home, office, hotels, restaurants etc. This division is based on the different use of

the products and on the difference perceived between the outdoor and indoor markets according to brands, prices and sales.

4.2 History

Chinese WLAN market is different to the US and European markets because of its high percentage of outdoor PTP systems. When IEEE accepted the 802.11 standard specification in 1997, WLAN market in China started to develop thanks to the great demand for broadband connections that are quick to deploy and relatively inexpensive. The Chinese data communication infrastructure was underdeveloped, therefore local banks, tax bureaus and government institutions which all demanded access to computer networks, saw outdoor PTP connections as the most suitable solution. In 1999, the upgraded 802.11b version came into existence and raised the transmission speed from 1-2 Mbps to 11 Mbps. The 802.11b technology remained popular for outdoor systems but now also indoor systems were being sold, though at first in a very modest percentage of total sales.

4.3 Outdoor WLAN

4.3.1 Competitors

In China, outdoor WLAN has several advantages but also disadvantages over its closest current competitors such as fiber, DDN, ADSL and dial up connections. The new wireless technologies LMDS and MMDS are still very new but have a promising outlook and the first licenses were handed out last year (2001). The competitors are summarized in table 1 and outdoor WLAN's main advantages and disadvantages are listed in table 2.

4.3.2 Main wireless competitors

- LMDS [10](Local multipoint distribution services) is a new wireless broadband technology using the 20+ GHz frequency spectrum providing point-to-point and point-to-multipoint connections with a typical transmission rate of 38 Mbps downstream, even if the theoretical top speed is between 1,5 and 2 Gbps. The range of LMDS follows the line of sight for up to 8 km. The allocated frequency spectrum depends on the country's frequency plan. In China the 24-26 GHz and 37-40 GHz bands will be used. Unlike in the WLAN spectrum at 2.4-2.485 GHz, a license is needed to operate in the LMDS bandwidth. These licenses were starting to be issued in 2001.
- MMDS [11](Multipoint Microwave Distribution System or Multichannel Multipoint Distribution Service) is also a wireless broadband technology but operates in the 3 400-3 430MHz/3 500-3 530MHz spectrum in China. The lower frequency compared to LMDS gives a lower transmission rate around 1-10 Mbps downstream but a longer range, typically 50km. A license is needed to operate in this spectrum.

4.3.3 Main wired competitors

- Fiber, DNN (Digital Data Network) - are expensive and takes time to deploy but have a very high transmission rate (typical several Gbps) and high security.
- ADSL (Asymmetric Digital Subscriber Line) - is a special technology that can make use of the coppers full spectrum and provide connections from 1 to 10 Mbps in a range up to 8 km. The further away the lower the speed. The technology uses the existing telephone (PSTN) copper cable and a special modem.
- Dial up connections - users connect via modems and the telephone network (PSTN). Dial up Has no range limits but the transmission rate is at its highest 56 kbps.

Table 1: Overview of the competing technologies to outdoor PTP WLAN in China. Disclaimer: The transmission ranges are theoretical and depend on individual installations. The theoretical transmission rates are often proved to be lower in reality.

Technologies	Range	Bandwidth	Advantages compared to WLAN	Disadvantages compared to WLAN
WLAN 802.11b	50 km	11 Mbps (real 5 Mbps)	-	-
LMDS	8 km	1,5-2 Gbps (real 38 Mbps)	Faster, less risk of interference	License needed, shorter range
MMDS	50 km	1-10 Mbps (real 4 and below Mbps)	Less risk of interference	License needed
Fiber, DDN	Cable	Very High (Mbps or Gbps)	High transmission rate, High security	Expensive, Takes time to deploy, needs involvement from operator or equivalent
ADSL	8 km in telephone copper line	1-10 Mbps	Less expensive	Only high downstream capacity, needs modem and involvement from 3rd part telecom
Dial up	PSTN network	56 kbps	Cheaper, easy to use	Low transmission rate

Due to the undeveloped data communication network in China, banks and government institutions outside of big cities, thanks to the widespread PSTN network and inexpensive modems, commonly use dial up connections. The 56

Table 2: Main advantages and disadvantages with outdoor point-to-point as expressed by interviewees(PTP) WLAN

+	-
Sufficiently high transmission rate, real broadband	Sometimes higher bandwidth is demanded
Less involvement from local authorities since there is no digging or hiring of state-owned cable involved	Maintenance can be a problem if the company is not familiar with the technology. Mostly solved by letting the company making the installation manage the maintenance with or without pay
Much less expensive than fiber and DDN	WLAN needs a line of sight
Quick to set up	Problems from lightening (rare)
Freedom of using private companies for installation and not being reliant on the often slow and unreliable state owned enterprises (SOE) to provide the connection	Security problems
Not in danger of the cable being accidentally damaged during land works, digging or construction	Unlicensed spectrum could be problems with interference
No license is needed	

kbps transmission speed is often not satisfactory for an office that needs to be connected to several networks. Reliance is also low as dial up connections can be interrupted using poor telephone lines. Fiber cable is becoming more and more popular, but the price is still high and is not expected to go down, as demand remains high. In a long term perspective the 4-5 Mbps supplied by WLAN PTP will not be enough for some offices but while waiting for the right moment to install fiber, WLAN is seen as a good substitute. Besides the high price, installing a fiber cable also takes both time and planning in order to dig and organize a way to get the cable through. Due to this reason, many companies or institutions demand broadband PTP WLAN while waiting for the nearest fiber hub to come closer or a cooperating company to share expenses with. ADSL is a less expensive cable alternative, using special modems over the existing PSTN network. By using all possible frequencies in the copper spectrum, it can get 1-10 Mbps of downstream connectivity. Unfortunately the upstream speed is only 16- 640 kbps (asymmetric transmission) and the range of the signals in copper lines is only 8 km. ADSL is a popular technology for home use, but for business use, two way communication and distance greater than 8 km, WLAN PTP is superior.

Of the newly appeared and licensed wireless technologies, LMDS is the most promising with transmission rates that can actually compete with fiber and DDN. LMDS has just begun to be used in China and is prophesized to have an important role as backhaul to mobile operator networks. LMDS also looks promising in last mile solutions as a substitute to 802.11b. However, as the

LMDS is licensed and of great use to mobile operators, the licenses will therefore probably be mostly bought by mobile operators. Therefore 802.11b technology still has a competitive edge in PTP connections.

4.3.4 Main customers to outdoor WLAN are

- Oilfields
- Tax Bureaus
- Universities and Schools
- Banks and Financial institutions

Oilfields

Oilfields have been eager to use WLAN as it supplies them with excellent means for mobile communication within an oilfield. Workers move around the oilfield performing measurements, which can then be transmitted back to the control center in real time. It also allows for rapid and ever changing connections to machines, pumps etc. or for communication at sea where using cables is difficult. These communications often demand higher bandwidth over an area suitable to WLAN's range. Stability is critical for oilfield communication, because an interrupted communication could turn into a serious accident. It is therefore an indication of the stability of WLAN that many oilfields tend to use it. Oilfields do invest in top of the class equipment and are not very price sensitive. It is estimated that it will cost between 8-10 billion US\$ to equip the whole Chinese petrochemical industry range from [4].

Tax bureaus

The Tax bureaus outside of big cities still lack sufficient communications. They are one of the key institutions targeted by the Chinese government for improvement in order to facilitate economical expansion and to meet new demands brought on by the WTO. The Chinese government is now directing money to get the unequipped tax offices on-line, as a part of a bigger campaign to get government institutions connected to Internet and other communication networks. This modernization is crucial for further development and for decreasing administrative bottlenecks for Chinese economy. Tax bureaus are not price sensitive but are more concerned about reliability and security.

Universities and schools

PTP WLAN has been very popular for Universities to connect new buildings, student dormitories or different campuses networks to the University network. Chinese universities are expanding constantly in order to meet the ever increasing demands for higher education. Many prestigious universities feel that they must have modern broadband connections to keep their reputation as the country's finest; therefore they are very interested in this technology. The fact that it's wireless is seen as favorable since it gives them an aura of high-tech. A large number of the most prestigious universities have some kind of outdoor WLAN

system, for instance, Qinghua (Tsinghua) in Beijing, Shanghai Jiao Tong University, Beijing University (Bei da), Xian Jiao Tong University.

Lower educational institutions in China often don't have the necessary resources and economical strength to purchase outdoor WLAN products; though in some cases this technology has been prioritized by the local government therefore even lower educational institutions are sometimes given access to wireless broadband. One example to this is Shanghai high school.[18]

Banks and financial institutions

Banks and financial institutions also need to modernize along with the rest of China in order not to hinder economical development. More and more Chinese use banks and demand more advanced services, such as trading in stocks. It is also necessary for banks to link their local offices to their central systems. To meet this demand the banks outside big cities have to improve their communication systems and one of the most popular ways to do so has been adopting PTP WLAN. The transmission rate demanded by banks is high and expected to further increase as the current development continues. Banks and financial institutions also have the financial strength to fund this kind of investments, which can potentially improve efficiency and quality of services. Please note that this only applies for banks and financial institutions outside of big cities. Big city banks are almost all connected by fiber or DDN.

4.3.5 Outdoor WLAN manufacturers

Israeli manufacturer Breezecom and Lucent agent Avaya largely dominate the market. It is estimated that they together have almost 90% of outdoor WLAN equipment. Both Avaya and Breezecom produce high-end, high quality and reliable equipment. Avaya has profited from its relationship with Lucent, and in turn with AT&T, since Lucent used to be part of AT&T. As one of the first telecom companies to enter China, AT&T has a long presence in the country, and enjoys a special status among foreign telecom companies, for instance, AT&T and they have already been the first foreign telecom that was able to offer services on the Chinese ISP market[12]. Avaya has been able to capitalize on it's parent's high brand awareness, established sales channels and relationship with key people in the Chinese administration.

This early mover advantage has been crucial to the success of Lucent's wireless equipment. Already Lucent's 802.11 products were widely used in point-to-point connections. However, Breezecom remains the biggest of the two, especially in point-to-point connections, an area in which they excel. Breezecom is likely to increase their market share, as its target consumers are the ones most likely to continue investments in WLAN in short term[13]. Competition in the outdoor WLAN market is not as intense as in the indoor market since the two current players are very strong, and price sensitivity is lower as most of the equipment sold are high-end products, bought based on their stability and reliability. Aside from Avaya and Breezecom, Cisco is also trying to enter the market but has so far gained only a small market share.

4.3.6 Regulations

In China the spectrum 2400-2483 MHz is unlicensed and allowed for public use[4]. The 2400-2483 MHz frequencies belong to the ISM, Industrial, Scientific Medical band, globally set aside for industrial, scientific and medical use without requiring license for end users[7]. The allowed maximal effect for outdoor antennas is unclear and depends on the location of the antenna. According to some sources the maximal effect for antennas in cities is 10mW, while others say 100 mW or 500 mW. Sometimes local governments can enforce their own policy. However, 10 mW is so small there is a problem finding antennas with so low output[14].

So far Chinese authorities have not enforced this policy consequently companies don't care about them. The enforcement issue remains unclear, but the tendency has been to limit the maximal effect more and more. The maximal effect regulations do not seem to be a major worry in China and the PTP connections reaching 50-60 km reported suggest use of more powerful antennas[15].

4.3.7 Characteristics

Main characteristics of the Chinese outdoor WLAN market could be resumed to Chinese system integrators, who are usually located in the big cities using foreign hardware combined with homemade and foreign made systems, sell to the five main customers, oilfields, education, tax offices, banks and financial institutions mostly outside (oilfields, tax bureaus) but also in the big cities (to universities for example).

4.3.8 Outlook on the future for outdoor WLAN

It is estimated that the market for outdoor WLAN is far from saturation as the market has been growing with 80% per annum the last two years[16]. In the future outdoor WLAN is expected to grow slower than indoor WLAN. Although large parts of China are still undeveloped and lack last mile communications, it will take a long time to modernize these underdeveloped regions and they are not all likely to demand outdoor WLAN in the near future. For a majority of China's 1.3 billion population, more rudimentary living standard improvements are more urgent than access to computer or telephone networks. However, China's 8% annual GDP growth will create more demand from developing regions, together with demand from economically developed but unequipped regions, a stable demand is forecasted for the future.

With WTO entrance, more foreign companies will operate in China and the demand for wireless broadband will increase as these multi nationals will want to link their Chinese subsidiary's intranet to their world wide ones. Time will be important, and some will prefer the quickly set up wireless broadband PTP instead of cable installations. The on-going modernization of Chinese authorities and government institutions as well as private and SOEs will require more effective and modern ways of work, e-solutions etc, which is also expected to keep up demand.

4.3.9 Conclusion

The Chinese outdoor WLAN market is today still bigger than the indoor one, although the indoor market is closing in. As China still has undeveloped communication networks, the market for outdoor WLAN will continue to grow. This will mostly benefit the two current market giants Breezecom and Avaya, and their dominating position will be difficult to challenge. In this rather price insensitive market, buyers attach great importance to stability and reliability. Since cheaper products often have problems attaining a sufficient level of quality, buyers tend to stay with known products instead of switching to lower cost and quality products. Competition among the system integrators will become more intense; the integrators will try to specialize in making either more or less complex networks with or without added services. Main obstacles to growth will be the difficulty of finding a free line of sight in big cities, where high buildings are blocking the way as well as concerns for safety and stability and the high price.

4.3.10 Outdoor WLAN market's effects on WISP industry

PTP solutions are basically very different from solutions needed for WISP and the former usually only deal with providing the access solution. Its effect in the WISP market is less significant than the indoor WLAN market, and few companies that provide PTP solutions today can also provide complete WISP solutions. However, there have been companies, which started with out providing outdoor PTP solutions first, then moved into the indoor WLAN solutions market, and are finally looking into the possibility of providing WISP solutions. Two examples of such companies are Beijing Nodes and Brocomm[17]. PTP WLAN could also help in connecting hotspots in areas lacking Internet connectivity. At the moment this advantage is of little help as WISP is mostly expanding in areas that already have connection to Internet.

4.4 Indoor WLAN

4.4.1 Definition

Indoor WLAN refers to WLANs used in indoor environments such as offices, homes, hotels, restaurants, cafés etc. In this report, WLAN is used synonymously to 802.11b, as the later is the most widespread technology in China, following the way paved by its forerunner 802.11. 802.11b is a popular standard in most parts of the world and therefore the only technology that today can be an interesting support to a global WISP industry.

4.4.2 Competitors

Although the 802.11b standard has significant competition from technologies such as HyperLAN and Bluetooth, using the unlicensed 2.4 MHz band, the 802.11b is much more widely used and products for it have appeared in the market since 1999, which can't be said of the other ones.

It is possible that Bluetooth and 802.11a, for different reasons, later on will complement 802.11b, with Bluetooth as a less energy consuming lower capacity device-to-device (D2D) transmission technology and 802.11a as very high

capacity (56 Mbps) short range WLAN. The toughest competition for 802.11b in China currently doesn't come from rival WLAN technologies but from wired LAN technologies as Ethernet. Main advantages and disadvantages with indoor WLAN, expressed by people I interviewed in China, are shown in table 3.

Table 3: Main advantages and disadvantages with indoor WLAN expressed by Interviewees

+	-
Higher degree of flexibility in office	Safety
Increasing efficiency of workers	Unstable
Quick set up	Interference problems from other transmitters
Installation costs about the same price as wired	Expensive end-user equipment (cards)
Less installation work required	

4.4.3 Main customers to indoor WLAN

Main customers to indoor WLAN solutions in China are

- Government institution
- Oilfields
- High-tech companies
- Financial institutions
- Warehouses and logistic centers
- Conference centers and top end hotels

Government institutions

China's entry to WTO has brought about significant challenges to Chinese governmental institutions, such as city and local authorities, tax bureaus and agencies. They need to be ready for the heavier workload, faster handling and higher transparency that WTO accession demands. Consequently, the Chinese government is trying to get its institutions online and to make them more effective. The government has the funds to install WLAN and at the same time appreciate its swift installation.

Oilfields

Oilfields are big users of outdoor WLAN but they are also a significant buyer of indoor equipment. The indoor equipment complements the outdoor equipment by providing stable and semi mobile solution for broadband connectivity. Oil industry is among the first to discover the advantages of outdoor 802.11 and

is therefore familiar with the technology. The industry demands high connectivity, stability and flexibility, is not very price sensitive and prefer quality.[16]

High-tech companies

High-tech companies, predominately located in big cities, use WLAN to increase their efficiency and to improve work environment. They have the financial strength for investing in WLAN equipment and are used to spending on high-tech products. Efficiency is important for their workers as they usually have a heavier workload than ordinary Chinese workers. High-tech companies also have the highest laptop computers penetration, which is ideal for WLAN usage. These companies have been targeted by the first WISP in China, Netcom's "Mobile office" and represent a very attractive customer group.

Financial institutions

Financial institutions have realized the need to get connected to computer networks in order to meet the demands from their clients whom want more and faster services such as on line trading etc. They are already big consumers of PTP solutions and this makes them natural customers for indoor WLAN, as they need to connect their back office staff too. Similar to the high-tech companies, they are also used to pay for high-tech equipment and also have the funds for doing it. For these institutions real time transactions and information are crucial. With the further development of the economy, the financial institutions will demand more modern communication solutions. This is in line with the Chinese governments intentions to modernize Chinas financial landscape.

Warehouses and logistical centers

Warehouses and logistic centers use WLAN as support for different systems for managing logistics and stock. This makes system integration more complicated and it is a specialized market that demands the specialization of manufacturers and system integrators. Although several huge companies such as retailers Carrefour and K-mart, car manufacturers VW and GM already have installed systems of this type, the Chinese market for these products is still undeveloped.[19] The utility and functionality of the systems have two key advantages. An example of the utilization of this solution is barcode scanners which are used to register incoming and outgoing goods while communicating with logistic systems; in addition, it is also possible to connect the scanners with customers' networks, providing powerful solution for controlling stock input and output.

China, an important trade and manufacturing country with huge port and train transportation centers, has a great need for this type of vertical market systems. As more multi national companies make their way into China and with the WTO accession further boosting trade, the demand for vertical market systems will surely increase.

Conference centers and top end hotels

Many of the main conference centers in Beijing, Shanghai, Shenzhen and Guangzhou, for example the World Trade Exhibition Center in Beijing and Shanghai International Convention Center, are equipped with WLAN, either as a part of a WISP footprint or standalone. These centers, as well as top end hotels are interesting potential customers, as they often have to cover a large area such as an exhibition hall or all the floors of a downtown hotel. Since the number of these centers in China is limited and some of them are already covered; they represent more a short term than a long term potential. Nevertheless, they are of important strategic value due to the high traffic and high profile of these locations.

4.4.4 Indoor manufacturers

There are more players competing in the indoor market than in the outdoor market. The market leader in indoor products is Avaya who, just as in outdoor equipment market, benefited from the long presence, strong governmental relationship and high brand awareness of Lucent and AT&T. Other serious competitors in the market, include world leader Cisco¹, telecom giant Nokia, 3Com and Intel, all eager to increase their market shares.

With the indoor market recently picking up speed and still far from maturity, to gain initial market shares is going to be a fierce competition. Once the market stabilizes it will be harder to take market shares from other manufacturers. For this reason, manufacturers give free trial periods to big potential customers.[20] As the consumer segment still is very small in China, the WLAN producers are all targeting high-end equipment for business use. In the future, with the arrival of less expensive Taiwanese or Chinese brands consumer market is expected to grow. Price is today one of the big growth obstacles in indoor WLAN market. The dominating customers in today's market are companies who are prepared to pay a higher price for a good product/service, at the same time, there is a lack of affordable products targeted to individual customers.

Chinese manufacturer Tsinghua Tongfang recently launched new products that are significantly cheaper than the top-end ones but with an acceptable quality. Previously producing Lucent cards, but suffered from competition from Avaya and Agere (also selling Lucent), Tongfang is now targeting a lower segment of the market with a competitive product²

4.4.5 Outlook on the future for indoor WLAN

Indoor WLAN is rapidly developing in China. The sales grew, admittedly on a very modest level, around 500% between 2000 and 2001 and is expected to grow another 300% in 2002[16]. However, even with fast growth, the Chinese indoor WLAN market is still less than one percent of the world market, which grew over 150% in 2001 to reach an impressive US\$ 1.47 billion[1] in sales. The Chinese indoor WLAN market is expected to reach 10 million US\$[4] in 2002. In the US, the SOHO/Home (Small Office Home Office) consumer market products, a segment that is almost inexistent in China, now represent 50% of the worldwide WLAN sales. This important segment is likely to develop in China, as prices

¹According to Synergy research group, Cisco held 35% of US Enterprise market 4Q01

²In PC World China no7 2002 TongFang's card was given a lower grade than Avaya and Intel but higher than Samsung

on low-end equipment will fall due to reduced tariffs after WTO accession, consequently, the Chinese market can expect even faster growth rates. The enterprise market is still far from saturation in China and will continue to grow in near term, according to estimations from manufacturers³. However, it is not certain that we will see development in the SOHO market as soon. Though China today is the world's biggest mobile telephony market, it will lag behind the US in Internet services for a while. China has, compared with the US, a lot less services that are available on the Internet and the estimated 148 million Internet users in the US largely outnumber the 34 million Chinese Internet users.[21]. Nevertheless, these 34 million users represent an interesting market as they often belong to the most desired customer market segment, young, early adopters and well-off. The number of Internet users have grown rapidly in China from 700 000 in 1998 to 22 million in January 2001 and 34 million in December 2001[5]. Most connections in China are still of "Dial up" type[5], which makes WLAN less useful. Customers can still enjoy the WLAN attributes of flexibility and 11 Mbps speed within the home, but only 56 kbps to the Internet, which is definitely not broadband.

4.4.6 Conclusion

The future looks bright for indoor WLAN products in China. The market is experiencing fast growth with no sign of saturation so far. The enterprise segment is already developing and though it will take some time, SOHO products will grow rapidly once launched. The main inhibitor for the enterprise segment is the lack of knowledge about WLAN efficiency, stability and safety. For the SOHO segment the lack of less expensive, less advanced products and broadband Internet connections at home are main inhibitors. Major international manufacturers are already in the market and cheaper Chinese and Taiwanese brands are about to enter or bound to enter soon. The competition is already hard for gaining an large early market share in the enterprise segment and free trial periods have been given to operators. The SOHO segment is still waiting to take off but it will not happen before significantly decrease. There are enough companies to handle installation and system integration and will not become a bottleneck for the market growth.

4.4.7 Indoor WLAN market's effect on WISP industry

The lack of a SOHO market in China makes WISP for ordinary people less interesting today. (Here ordinary refers to relatively well-off Chinese living in cities but not mobile professionals) The growing enterprise segment is more promising as WLAN is being installed in places where people are more likely to appreciate the services due to their mobile lifestyle, for example in professions such as finance, bank, high-tech, and consulting.

4.5 System integrators for outdoor WLAN and indoor WLAN

System integrators unite hardware equipment with software network solutions, manage installations and often provide after-installation service. The offered

³Avaya, Cisco, Nokia, Tongfang, Symbol

solutions differ among companies, with some providing added services as VPN and IP phone and others providing only network access.

The quick growth of outdoor and indoor WLAN is also reflected by the increasing number of system integrators providing solutions uniting hardware with software and managing installations. The fierce competition between system integrators has driven many of them to offer free after-installation service[14], a service that is typically priced at 5-15% of total price. At the same time there is a trend of specialization among system integrators whom either choose to do vertical market systems, smaller installation or bigger ones integrating roaming and supplementary functionalities. This specialization has even made some system integrators propose WISP solutions⁴.

System integrators most concentrate around the areas where WLAN deployment is the highest, i.e. Northern and eastern China, Tianjin, Beijing, Shanghai, Shenzhen, Guangzhou and Changsha.

5 Introduction to Chinese WISP market

5.1 Major milestones in China WISP development

Chinese WISP is said to have started with China Netcom providing Wireless Internet Access for participants at the APEC meeting in Shanghai October 2001 with its newly launched "Mobile Office" service. Shanghai Telecom followed suit in December the same year by launching a WISP part of its "Tian Yi Tong" service. Other companies that have been performing trials so far include, Beijing Telecom and China Unicom. Smaller Telecom such as Nanjing and Jitong telecom have also bought WLAN equipment with the intention of providing Public WLAN service in near future[22].

Mostly ISPs and telecom companies have shown interest in the WISP market so far. The two owners of a mobile telephony GSM/CDMA/3G license, China Unicom and China Mobile, stay a little passive behind China Netcom, which is largely an ISP, as well as Shanghai Telecom, an ISP and fix telephony player.

5.2 Presentation of existing players

The current two largest competitors in the WISP market are China Netcom and Shanghai Telecom.

5.2.1 China Netcom (CNC)[23]

Main target customers of Netcom's Mobile Office service are mobile professionals from large international or Chinese companies, referred to as "Key Accounts".

CNC acquires customers through directly contacting companies meeting certain criteria and actively try to categorize and sign up these customers. Sometimes CNC also provides other services in the IP-communication area to these customers. Examples of this kind of customers are Motorola, Cisco and Microsoft. These key-accounts are CNC's main customers. There are also individuals who subscribe to the "Mobile office" but they are very limited in number and are not targeted by CNC. The price is currently 1 Yuan per minute (April

⁴Beijing Nodes and Brocomm

2002) and several payment options are available, prepaid, flat rate and monthly. Pricing is every time subject to negotiation and is handled individually. Netcom's hotspots are found at the most exclusive hotels and buildings in Shanghai, Beijing, Guangzhou and Shenzhen.

In general CNC says that they are open to trying new types of cooperation and speaks warmly about the idea of co-marketing, for example, signing deals with computer manufacturers to offer Mobile office subscription at the same time when a customer purchases a computer. They also believe the possibility for venues to take a larger part of the installation costs in return of more revenues and better customer service.

CNC cooperation with the venues mostly follow the pattern of CNC buying, installing and owning the equipment, taking 90% of the revenues and leaving 10% to the venue. CNC believe that future expansion of their footprint will be according to their customers' demands. Key account-customers who also cooperate with hotel chains for the accommodation of traveling employees are the most likely to be included in the Mobile Office footprint. Netcom, which is one of the hottest contenders for a third 3G license, sees the Mobile Office as complimentary to 3G.

5.2.2 Shanghai Telecom

Shanghai Telecom is also targeting mobile professionals with coverage in large hotels and conference centers. They have also installed Public WLAN in all Starbucks, a local Shanghai café, a shopping mall, a gym and a stadium in Shanghai, taken a step outside of the traditional hotspots of airports, hotel and conference environments. This could have resulted of that Shanghai Telecom's position as a more local player compared to Netcom, and therefore it has to attract local Shanghai people in different ways, getting closer to their everyday life, than for example Netcom's focus on airports. Customers can also connect their homes or offices with WLAN. While outside of home or office, they can use the Public APs. The "Tian yi tong" service's pricing is complicated but in general more reasonably priced than "Mobile office", charging no more than 100 Yuan for 60 hours connectivity per month per AP for individual users (not counting sign-up fees or card). Every additional Public AP costs 20 Yuan per month. For the business customer with unlimited, guaranteed 1 Mbps access the service costs 2600 Yuan per month. This time using additional Public AP costs 100 Yuan per AP per month.⁵

Other WISPs are very small or in early stages of development; therefore do not have confirmed business plans so far.

6 Five forces of competition analysis of the WISP market in China

6.1 Note

WISP is a young industry and the few players are at start up stage. There is not yet a semi stationary market situation for which the five forces of competition

⁵See appendix A for more information about Tian yi tong pricing

analysis is most suited. Therefore, although my analysis concentrates on the current situations I have also tried to look ahead and give some assumptions about the future. The "threat from potential entrants" section is attached extra importance as the market is in start up stage and we will surely see more entrants. This section can give some of the more important indications as to what to expect from the future.

This analysis does not adequately represent the situation of a single point WISP but focus on larger WISPs or WISPs that bind together many single point WISPs (Virtual WISP). The envisioned new entrants are WISPs who aim to provide a larger footprint in cities or at a national level.

6.2 Intensity of rivalry among existing competitors

Table 4: The table shows factors that increase and decrease the rivalry among the existing competitors in Chinese WISP industry

Increases rivalry in WISP industry	Decreases rivalry in WISP industry
Advertisement campaigns	No sign of price competition
Lack of differentiation and switching costs	Presumed fast growth rate
Strategic stake	Few and unequal competitors
Moderate to high fixed costs	Low storage costs

6.2.1 Prices

Firstly, there is no sign of price competition in WISP market in China today. WISPs are targeting early adopters and similar price-insensitive groups; therefore service providers have no incentives to reduce prices to attract customers. The price levels are, by international comparison, quite high. The competitors expect a fast growth and there is no immediate reason for service providers to compete for customers with lower prices.

6.2.2 Few players

The two existing players propose two somewhat different services; China Netcom aims to provide a more national-wide service and Shanghai Telecom focuses on providing service concentrated in Shanghai, serving both local residents and travelers. Shanghai Telecom is a subsidiary to China Telecom and is therefore very likely to cooperate or enable roaming with Beijing Telecom as soon as the former sets up its service for serving its customers outside of Shanghai. China Telecom has also large subsidiaries in Guangzhou and Shenzhen that could join such a WISP network. To complicate the situation, China Netcom is said to merge with China Telecom and to be split into a Northern and a Southern part. The details of this restructuring are still unclear, so is what will happen to the two existing WISP services. It is possible that, in not too far future, the two current WISPs will belong to the same company, which will lower the rivalry of the market even further.

There are also smaller players whom so far only have single hotspots or smaller trial installation. Examples of these are Sunway Parallel Computer Engineering Co, which has provided three hotels in Beijing with trial Public WLAN and Romman, which supplies Public WLAN in Tsinghua University Library.

6.2.3 Fixed costs

Typically, moderate to high fixed costs are associated with WISP industry. This results in increased competition. For example a building installed with WLAN will need a certain number of customers to use it in order to make the APs profitable. If there are not enough users in the building, price competition is possible in order to cover the fixed costs. The same calculation could be made regarding a larger area. On the contrary storage costs remain low for WISP industry.

6.2.4 Differentiation

The services supplied by the WISPs are all essentially the same and the quality of the service similar. Examples of added services that can be used to differentiate are VPN and IP phone. Most WISPs will recognize the cost effectiveness of buying WLAN products with high stability, so as not to risk customers' dissatisfaction or heavy maintenance costs. This lack of differentiation among different services and low switching cost will, once the period of rapid expansion is over, make competition harder.

6.2.5 Strategic stake

The strategic importance of WISP business, both in terms of reputation as well as economics, will discourage competitors from withdrawing. WISP business is prestigious as it gives the operator the reputation for adapting new services and providing new means of communication. Economically, the early adopters and their close followers represent a very attractive customer group. Take the mobile market as an example. Research shows that top 20% customers account for almost half of the revenue and over half of the profit[24]. This distribution is shown in figures 3 and 4. In other words, these customers are very important for the mobile operators; but they are also likely the most demanding customers when it comes to new services and functionalities. These 20% customers are usually the early adopters and their near followers. There is no mobile operator WISP so far in China but with competition expected to become fiercer in the mobile market, mobile operators will have to leverage all their strengths and advantages in order to retain these customers. Combining their mobile subscription with a Public WLAN subscription could be one option. Fundamentally the two services are not the same, however it is likely that the economics will be similar in WISPs as well with a 20% of customers representing a large part of the revenues and profits. This gradually growing customer segment, is center to the Chinese mobile Internet battle, and players will fight for this segment with all possible weapons such as, GPRS services, 3G and Public WLAN. Whether a WISP is also a Mobile telephony operator, an ISP or just WISP, they will fight for this segment, although the reasons might differ. More about this is discussed in the "threats from substitutes" part.

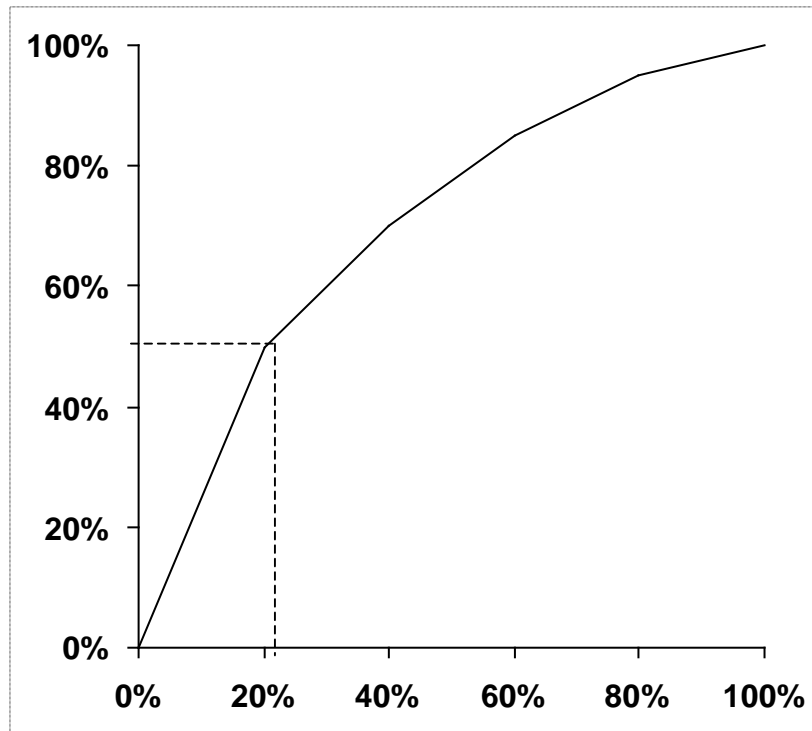


Figure 3: The diagram shows percentage of revenues (vertical) and percentage of customers for mobile telephony (horizontal). Source: Boston Consulting Group case experience with Chinese mobile operators.

6.2.6 Conclusion

In conclusion, the current intensity of rivalry in the WISP market in China is low. There are too few participants to create real competition and as exponential growth is expected, competitive pressure is likely to be kept down. However, several factors may lead to more intense competition in the future, for instance, low switching costs, lack of differentiation and high strategic value of the market.

6.3 Threats from new entrants, potential entrants

Michel E Porter lists in his book *Competitive Strategy* seven major barriers to entry.

1. Economies of Scale (a low added cost per added production results in a difficulty for a new entrant to reach the same level as existing players and reaching the same profit levels)
2. Product differentiation (Differentiated products supplied by the existing players make it more difficult for new entrants by forcing or making old customers to be loyal to the existing player)
3. Capital Requirements (Requirements of large capital investments funds to enter the market with a competitive product/service represent evidently

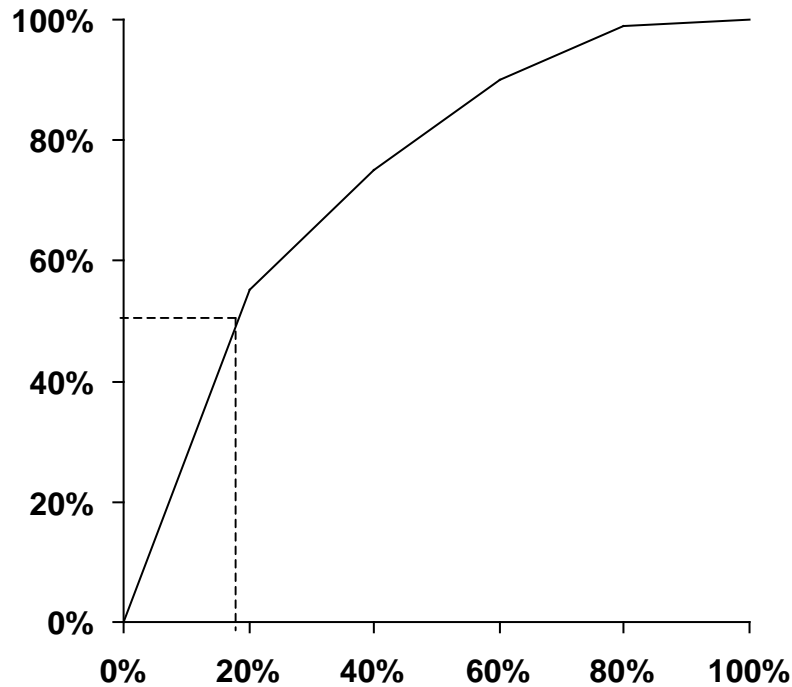


Figure 4: The diagram shows percentage of profits (vertical) and percentage of customers for mobile telephony (horizontal). Source: Boston Consulting Group Case experience with Chinese mobile operators.

a major barrier of entry. Includes capital need for Advertisement, R&D, Customer credits, Start up losses)

4. Switching cost (The cost for existing customers of existing competitors to switch and become a customer of a new entrant)
5. Access to distribution channels (The new entrants need access to distribution channels to reach the customers or suppliers)
6. Cost advantage independent to scale (For example proprietary products, government subsidies and favorable location)
7. Government Policy (The government can be restrictive, for example the number of competitors or how to set the prices)

6.3.1 Economies of scale (High barrier)

Main reasons that economies of scale exist for WISP

- Easier to negotiate lower price for hardware and software

- Easier to negotiate favorable contracts with venues
- Lower unit costs for Marketing and support services
- Low added cost per added user/customer once an installation has been made

How the economies of scale will affect WISP market depend on the predominant business model in the market. A business model in which investments are shared by venues i.e. a distributed investment model, will be less sensitive to economies of scale. In this model venues share investments and responsibility and therefore lowering the fixed costs for WISP. A WISP main task here is to combine the services and provide roaming between venues and to create an entity for billing and support. Consequently, economies of scale are less important to WISP under this model. This model has been proposed as the most promising for the industry in research reports[7].

On the other hand, the centralized business model used so far, for example by China Netcom, is significantly more affected by economies of scale. A large operator is more interesting to WLAN manufacturers and can negotiate better price for equipment. Also when purchasing installation and software systems, both needed to set up WISPs, a larger WISP would have a stronger bargaining strength. In larger communication companies, the after-sale support can be integrated with other support services without substantial cost increase and is thus also subject to economies of scale. A third important reason why economies of scale exist for WISPs is marketing. WISP is still a relatively unknown technology and communication solution even among mobile professionals. Therefore marketing will be needed initially to attract and inform potential customers. Big companies, active in provisioning similar services can enjoy the benefit of joined marketing costs. For example, China Netcom can use their sales department to contact companies in order to get new customers to their "Mobile Office". In bigger marketing events they can propose their "Mobile Office" solution integrated with other services in the same event.

The final question will be which business model will eventually prevail in the industry. Even though the "distributed" one has been judged to be more appropriate, the centralized one is the only one that is use currently. This analysis emphasizes in the market as it is today and sets the Economies of scale rating to high, meaning economies of scale is a major barrier to entry.

6.3.2 Product service differentiation (Low to medium barrier)

Main differentiation to WISP services

- Brand name, earlier loyalty
- Coverage area
- Added services, VPN etc.

Most customers attach great importance to quality and coverage of the service. However, to achieve sufficient quality (stability and speed of the transmission, service & support) should represent no major challenge for an entrant as all players normally use equipment from top manufacturers. It will therefore be

difficult for a WISP to create a competitive advantage of differentiation by focusing on quality and service. The main differentiation is the coverage area which will be taken into account under 6.3.1 Economies of scale and 6.3.3 Capital requirements.

Another way to differentiate one's services would be to offer additional services such as VPN or IP phone to customers. But the level of differentiation for WISP services that can be achieved through this remains low due to the possibility for customers to acquire these services from elsewhere. Though it might be practical to have the same supplier for all services, it represents no main competitive advantage. Possibly, the customer already has a VPN or doesn't need one.

The most significant differentiators for established Telco operators are their brand names and the loyalty of their existing customers of other services. Certain companies, notably China Netcom has made a name for itself of being an innovative Telecom provider mostly focusing on IP communication. China Telecom has many loyal customers from its monopoly days and it is still the far biggest IP backbone operator.

In conclusion product service differentiation presents a low to medium barrier to entry. If the considered entrant is a well-known Telecom, for example China Unicom or a subsidiary to China Telecom the barrier will be even lower accordingly. The barrier to entry of a less known company would be medium, which is a result of the lack of both brand name and existing customers for such a player. However, considering the basic service there is little to differentiate a new entrant from existing players except for the coverage area, which is taken into consideration under 6.3.3 Capital requirements.

6.3.3 Capital requirements (High barrier)

Main items that require Capital

- Workforce salaries
- Hardware (APs and Cards)
- Software (Network management system, roaming system, added services)
- Rent to venues (if paid)

Creating a nation wide network in China, covering hotels, conference centers and airports in the biggest cities is a huge investment. The question is how large footprint a WISP has to have in order to be profitable? There are many types of WISP in the world and one is the so-called Virtual WISP which does not owe any APs at all⁶. In China, there is only China Netcom who has hotspots in more than one city while Shanghai Telecom has hotspots only in Shanghai. Other WISPs have so far limited their activities to small area in a city or a block of buildings mostly for evaluation purpose. In the near future we are likely to see some of these operators, positive to WISP industry, expanding their footprint to cover at least the most important spots in one city. Regarding nation-wide networks, there are probably fewer contestants that are interested. China is a huge country and the necessity for nation wide coverage for WISP

⁶For example American operator Boingo

is questionable, especially for WISPs who are targeting a lower segment than the mobile professionals. For a WISP targeting the mobile professionals, the corridor Beijing-Shanghai-Guangzhou-Shenzhen accounts for 80% of travels, and telephone and data communication traffic[25]. Covering these four main cities and their surrounding areas should construct a sufficient footprint for attracting a large majority of mobile professionals⁷.

Similar to the "economies of scale" barrier, the capital requirements depend on the business model chosen. In the distributed investment business model, where venues contribute to part of investments, less capital is required than in the centralized one.

In conclusion, the capital requirements for WISP industry in China are very different depending on the chosen business model and the planned coverage area and targeted customers. More generally the WISP industry must be considered as an activity requiring high investments; APs, card and network management are all expensive. As the distributed investment model is not in use today and the fact that "ordinary" people who would be interested in a service with smaller coverage area, are not interesting customers today, the final estimation must be that capital requirement is a high barrier to entry.

This is confirmed by the current situation; only two big Telcos with large funds have so far a larger footprint.

6.3.4 Switching cost (Low barrier)

Main switching costs for customers

- New WLAN end-user card (if the prior WISP paid for it)
- New AP at home or office (if home-AP included in service and WISP paid for it)
- New entrance fee to be paid (if practiced)

The switching cost for customers to change WISP is low. The technology used is the international standard 802.11b and there is nothing to stop customers from changing WISP if they have their own card and do not have any APs owned by a WISP at home or in office. Existing WISP are worried over the low switching costs and are trying to find ways to raise them in order to retain customers. To charge customers an entrance fee when supplying them with a WLAN card for their laptop but not letting the customers own the card is a way of raising switching costs. When a customer wants to change WISP he or she has to pay a new entrance fee or card rental to the new company. The entrance fee can be made compulsory to discourage the customers from buying a card of their own. The same tactics can be used when installing APs at customers' homes or offices.

This kind of tactics is not always disadvantageous to customers, as it also is a way of attracting potential customers who are hesitant to sign up due to the high prices on WLAN cards in China. A way of attracting customers, who want to be free to change WISP but are sensitive to initial costs, would be to promise a partial refund of the initial fee when the card is returned. This type of deal is less interesting to operators but could occur with increasing competition.

⁷A strategy confirmed by China Netcom's current footprint

If the operators don't own the cards, a model where the customers can buy their cards to a reduced price in exchange for signing up for a longer subscription period, much like the mobile telephones and subscriptions are sold, is unlikely to happen due to several factors. At present, existing WISP customers are financially strong enough to buy at least the end-user cards themselves. Customers will also own more and more of the APs in homes and offices, as prices on APs fall and as the SOHO segment develops. Furthermore, a comparison with the cellular market is interesting. Prepaid subscriptions currently represent 90% of the sold mobile telephony subscriptions in China, and the percentage is expected to reach 99% in three years.[26] In China, unlike the situation in Europe and in the US, cellular phones are rarely sold with subsidies from cellular operators who want to attract customers to their networks. If the same situation were to develop in the WISP industry, most customers would have prepaid subscriptions and owning their own card. As WISP industry in China so far only has attracted early adopters and corporate customers, package solutions with APs and end users cards have so far been used to attract customers. However, according to the predictions made above, a situation where the customers own at least the cards is likely to develop in the future. Thus the corporate customers, who today are using the WISPs' equipment and experience moderate switching costs, will in the future have lower switching costs as more and more prepaid cards will be sold and more and more customers will own their own cards and APs. In conclusion the switching cost is set to be a low barrier of entry taking into consideration the price insensitivity of current customers, who have moderate switching costs today and the low switching costs in the future.

6.3.5 Access to distribution channels (Medium to high barrier)

Main problems to gain access to distribution channels

- Backbone owners are competing WISPs
- Venues are customers of competing WISP's Telecom services which could cause conflict
- Venues already have exclusive contracts with existing WISP
- No prior established relationships with companies
- No obvious channel to reach individuals

The problems related to access to distribution channels in China are as much about reaching the customers as about reaching the suppliers. One of the most obvious supplies a WISP needs is IP backbone connectivity. The Chinese ISP market has been heavily regulated, but is becoming more and more free. Today there are many hundreds of registered ISPs in China[27] but the influence exercised by the huge state-owned IP backbone operators and ISPs is tremendous. Without good relationship with major ISP, obtaining a sufficient bandwidth is very difficult. In April 2002 was reported that a dispute between China Unicom and China Telecom resulted in an employees actually going out to cut off the other part's cable⁸. A conflict of interest of the same type could occur, though

⁸News taken from <http://www.sohu.com> in May 2002

less directly, if the venue uses a telecom operator that is also a WISP for other telecom services. The existing Telecom operator/WISP can then try to expel the new entrant by offering package solutions including both Telecom and WISP. The third barrier is that some of the key venues have signed exclusive contracts with existing WISPs. For example the airports of Shanghai (Hongqiao) and Guangzhou (Baiyun), very important venues for mobile professionals, have signed exclusive contracts, for a limited time[23], with China Netcom. Other main sites and buildings such as the Kerry Center in Beijing, the Hyatt and Shangri-La hotels are already included in China Netcom's footprint. Roaming agreements between WISPs could take away this barrier and there are still many possible attractive venues to be equipped with Public WLAN.

As far as one can see today, WISPs' main customers will be businesses. To reach these companies it is very helpful to have established a prior relationship already, for example by selling other telecom services to these customers. Relationship or *guanxi* is a decisive factor in China's business world, if one is to create trust between partners. Companies starting from zero without any earlier customer relationships will certainly encounter difficulties in selling services to and creating this trust with new customers. New entrants also lack the information and customer base needed for targeted marketing.

Another issue is that if WISP becomes a more popular phenomenon, attracting more and more ordinary people, there is no suitable way of selling subscriptions to them at present. The big Chinese telecom, who are active in either mobile telephony or fixed lines, normally have extensive retail network to sell these subscriptions; their new WISP service can easily be sold through these outlets. However, a newcomer would have to negotiate its way into existing sales networks or create its own. Using a chain of existing stores to sell subscriptions is feasible but the first one to try is bound to encounter some problems and difficulties since WISP subscriptions have never been sold before. People are familiar with buying prepaid cellular phone cards but not WISP ones. Will the store be interested in selling them? Will the customers know where to buy them? Will the customers demand support from the selling store? In conclusion access to distribution channels is considered a medium-high barrier to entry. Of course, the barrier is lower for an established Chinese telecom with extensive sales channels and its own backbone; but for a new entrant without any existing structure for sales or IP backbone the access to distribution channels is a major challenge.

6.3.6 Cost advantages not related to economies of scale (Low barrier)

So far there are no real cost advantages not related to economies of scale in Chinese WISP industry. The learning curve, for the companies that have entered already, is not longer than nine months (since October 2001 at the earliest) and though they already have some experience, this has hardly reduced the costs. One possible cost advantage could be that known companies with good reputation and long history of doing business in China will be able to obtain favorable terms with both venues and banks more easily, as the latter will have more confidence in getting paid in time. Getting paid has been a major problem for many companies doing business in China and companies are forced to be extremely cautious seeking ways of being guaranteed payment or getting paid in

advance. Overall these possible cost advantages are relatively small and should be considered as no major barrier to entry. The barrier is set to low.

6.3.7 Government policy (Low barrier)

The Chinese government regulates both ISP market and the telecom market. The regulations concerning WISP are so far a gray zone and the MII has not yet decided what to do.[4] In a venue equipped with an AP belonging to a WISP but then connected to a fixed line held by another ISP, only the ISP is regulated today. MII could either maintain the status quo, just regulating the ISP, knowing that sooner or later a WISP will need backbone connectivity. They could also decide to regulate WISPs as well. It is likely that MII's decision will depend on how successful the Public WLAN providers will be. If it becomes very popular, MII could feel obliged to control it. This raises the concerns for laws with retroactive effects for WISP industry even though MII hopefully will move in time in order to avoid such problems. With regards to the WTO accession and the expected greater openness and transparency of Chinese regulation the barrier is finally set to low.

Table 5: Results to barriers to entry

Barrier to entry	Level
Economies of scale	High
Product/service differentiation	Low to Medium
Capital requirements	High
Switching cost	Low
Access to distribution channels	Medium to high
Costs advantage not related to economies of scale	Low
Government policy	Low

6.3.8 Conclusions to barriers of entry

In the 6.1 section is stated that the barriers to entry have been estimated for a company who wants to set up a service larger than just a single point WISP, i.e. serving several hotspots in a city or nation wide. It is clear from the analysis that the barriers depend greatly on who the entrant is, for example in the "access to distribution channels", a Chinese public telecom company with its own backbone and distribution channels to reach customers would have much lower barriers. However, besides the Chinese public telecom operators, and with regards to the summarized barriers to entry shown in table 5, the overall barriers to entry must be set to high. Few other companies have the financial strength, the market knowledge, the experience of providing services in China and the access to distribution channels needed to provide such a service. On the other hand barriers to entry for Chinese telecom companies are low to medium, as new knowledge and large investments in installation and marketing will still be necessary.

Finally, with high barriers to entry for ordinary companies, their threat as a potential entrant is low. On the other hand Chinese Telecom's are dangerous

future competitors because of the low to medium barrier to entry and the expected important strategic value of a WISP service.⁹ Chinese Telecom's are a medium to high threat as potential entrant.

6.3.9 Who are the potential entrants?

- Other subsidiaries of China Telecom besides Shanghai telecom. China Telecom is one of the telecom companies battling for a 3G license and will, if granted a license, have to take customers from the existing mobile operators 2G networks. At the same time, these existing operators will try to migrate customers to their own 3G networks. One way of attracting customers away from the existing operators could be to offer a differentiated service of WLAN and 3G. It is possible for China telecom to gain advantage by combining the new subsidiaries networks with the existing one(s) (at present just Shanghai) by roaming or simply uniting the networks. China Telecom has both national and international backbone, knows how to provide communication services in China, has the funds needed, existing customer relationships, distribution channels and a known brand name. The threat from new subsidiaries to China telecom entering the market is high and trials have already taken place in Beijing.¹⁰
- 2G Mobile telephony operators, China Unicom and China Mobile. Both of them have backbone, funds, experience of providing communication services in China, existing customer relationships, distribution channels, known brand name and a strategic mission to retain profitable 2G customers currently and during the migration to 3G networks. The threat from Unicom and Mobile is high.
- Other Chinese Telecom companies, for example Jitong or Railway communication. They have IP backbone, experience of providing communication services in China and customer relationships, but so far a less extensive distribution channels and much lower brand awareness (Than China Telecom, Unicom, Mobile). Questions have also been raised about the financial strength of Jitong. The threat is low.
- Chinese ISPs, have either access to backbone or relationship with backbone operators, they have also experience of providing communication services in China, existing customer relationships and access to distribution channels, though most of them are not national players. Their financial strength is generally weaker than the Telecom competitors. The threat from ISPs is therefore low.
- Other startups, no backbone, no experience, no record...financial strength? The threat is low. To set up a local small scale WISP might be possible, but difficult to be a national player.

⁹See the "Intensity of rivalry among existing competitors" section or the "Substitutes" section

¹⁰According to China Telecom's Feng Yingsheng

A summary of the potential entrants' conditions is shown in table 6. Several foreign WISPs have expressed interest in the Chinese market¹¹ but how this interest will be translated into action is unclear. Post WTO entry, foreign WISPs can invest in China's telecom market, bringing in funds, technology, experience, strategy etc. However, when it comes to providing services in China they are sure to need help from more experienced companies. Foreign WISPs are also limited to 25 % owner ship directly upon China's accession, 35% after one year and 49% after three years.[28] Already in November 2001, China Netcom joined the GRIC's worldwide network for wireless broadband via 802.11b¹². Other members of GRIC broadband alliance network are Australian WISP Skynet Global and American WISP Wayport. GRIC worldwide network makes it possible for Skynet Global and Wayport customers to connect via Netcoms APs. In this way foreign WISP and GRIC members don't need to enter China to serve their customers there. However, GRIC and Netcom will then share profits.

Table 6: The table shows the possible entrants' conditions for successful entrance in WISP market. Entrants' conditions are estimated between 0 and 5, where 5 are maximal favorable conditions and 0 are unfavorable conditions

Entrants	China Telecom subsidiary	Mobile & Unicom	Other Telecom	Chinese ISP	Other
Backbone	5	4	4	2	0
Experience	5	5	4	3	?
Funds	5	5	?	2	?
Existing customer relationships	5	5	3	3	0
Distribution channels	5	5	2	2	0
Nationwide	5	5	4	2	0
Brand name	5	5	3	2	0
Strategic value	4	5	2	2	?
Total	39	39	22?	18	0?
Threat	High	High	Low	Low	Low

6.3.10 Conclusion to threat to entry

The threat from China Telecom, China Unicom and China Mobile is imminent. They have the means to enter the market and the question is whether they have understood the WISP business and the stakes involved. Can they, with all their advantages, implement a winning business model and strategy? Their possible weakness is perhaps the real strength of eventual newcomers or foreign WISPs,

¹¹For example PC home from Taiwan, Wayport, US and Skynetglobal, Australia

¹²for more information look at GRIC's website, <http://www.gric.org>

who have found a good business model or have experience from providing WISP services abroad, but with their lack of experience in China, backbone and access to distribution channels the threat from them is low.

6.4 Negotiating powers of suppliers

The main supplies needed for WISP industry are

- ISP or/and IP backbone
- WLAN equipment
- Software for network and customer management
- Venues

6.4.1 ISP and IP backbone (Medium bargaining strength)

In order to connect all the APs and hotspots to the Internet, the WISP will need the services of an ISP or a backbone operator. It is possible that the ISP can be a backbone operator itself. Both the ISP business and the IP backbone will be opened to foreign investments after China's WTO accession. The market can, however, stay regulated for some time as every country entering WTO has time to adjust to the new conditions and protect the countries own key industries.

IP backbone

The former monopoly operator, China Telecom's Chinanet, still largely dominates the IP backbone market in China with some competition from younger state-owned Telcos such as Netcom, Unicom and Jitong. There are also more and more small operators.

Table 7: The table above shows the total China to foreign country bandwidth for Chinese ISPs (2001).[5]

Operator	Total capacity to foreign countries (M)
Chinanet (China Telecom)	4580
CNCnet (China Netcom)	510
Uninet (China Unicom)	259
Chinagbn (Jitong)	168
Cernet (China education and research network)	102.5
Cstnet	55
Cmnet (China Mobile)	45
Cietnet	5

In the domestic market, the situation is similar to the China-foreign countries market shown in table 7. Chinanet is the far biggest followed by China Educational Network, Jitong and Cncnet[5]. Chinanet (China Telecom) with its close to monopoly position, can overcharge ISPs interested in renting capacity

from them. This fate for the buyers of IP backbone in China is now improving, as the market is becoming less and less monopoly-like. At the end of 2001 there were over 20 different domestic backbone operators. However, China's state-owned backbone operators still control the market.

ISP

Today in China, there are more than 600 ISPs who rent capacity from the big backbone providers[7]. The ISPs are supervised not to tolerate for example non-governmental propaganda on their servers and some sites are closed to access from China. The government might regulate the content but the pricing is mostly set in competitive spirit. There is a strong dependence among the ISP on the four-five biggest backbone providers but the prices are getting more and more fair.

In conclusion, the semi monopolistic market and the possible conflict of interest with a WISPs backbone provider, increase the bargaining strength of the ISPs and IP backbone operators. It is decreased by the upsurge of new small ISPs and IP backbone operators and by the coming openness due to WTO accession. The final bargaining strength is therefore set to medium.

6.4.2 WLAN equipment (Low bargaining strength)

Note: The WLAN market in China, both indoor and outdoor, is detailed in the "WLAN in China" chapter.

A WISP can have use for both outdoor and indoor WLAN products. The two WLAN markets are open to competition and are dominated by American, European and Taiwanese brands. Some domestic manufacturers are also active or at start-up stage. Israeli manufacturer Breezecom and Avaya largely dominate the outdoor market while competition is more intense in the indoor market where Cisco, Intel, Nokia, 3Com and some domestic brands fight to take market share from leader Avaya. This is most easily done in the start up stage of the market, when growth is fast and it is easier to attract new customers than it is when the market is mature and most buyers already have loyalties to a WLAN manufacturer. Since the industry is mainly using indoor equipment, this market's reduced bargain strength will have the most impact on the WISP industry. The imported brands are still subject to high tariffs and domestic manufactured products are not as good as the imported ones in terms of quality. This leads to, relative to international levels, quite high price levels for indoor and outdoor WLAN AP, bridges and cards. Due to the competition and the entrance of cheaper brands with sufficient stability, prices have been decreasing continuously. Indoor APs are priced from 4000 Yuan (500\$) for a Taiwan/Chinese brand to 8000Yuan (1000\$) for top-end foreign brand. The cheapest cards are sold at 1000 Yuan(125 \$) each.

In conclusion, the competition in the WLAN market is intense and WISPs represent very interesting customers for them. In addition, the WLAN products are not differentiated and there is a competition to gain an early large share of the market. All this indicates the low bargaining strength of the WLAN manufacturers.

6.4.3 Software for network and customer management (Low bargaining strength)

The two active WISPs are outsourcing most of the development and installation to smaller software developers and system integrators. Many of these companies are young, as is the WISP industry, and the quality and functionality of their products are still not thoroughly known. However, there are many Chinese companies, either startups or those who have experience from earlier WLAN development who aspire to provide solutions to WISP. Novawave, Beijing Nodes and Brocomm are among them. As the market is expected to grow, they are interested in joining early and developing close relations with WISPs. They only need to show that their products can deliver what they promise. Buying equipment from abroad is also possible. Small start up Romman, who is providing Public WLAN Access at Tsinghua University bought their system from Hong Kong company Vaka. In conclusion, the bargaining strength is low as they have great interest in forming relations to a WISP for selling their products and they are selling systems that need to prove their capabilities first.

6.4.4 Venues (Low bargaining strength)

To categorize venues as a supplier of a physical space to deploy public WLAN instead of a customer of WISP services is subject to discussion. At the moment the predominant business model considers venues as suppliers of locations to deploy APs and they are rewarded therefore either by a share of the revenue or by the simple fact that the WISP service is beneficial to their customers. However, another model would regard them as buyers of WISP services, in order to offer an additional service to their customers. In this case the venues will share investments and revenues.

Venues in China are starting to realize the possibilities and opportunities that might arise from the association with WISP services. WISPs' efforts in providing information, education and free trial periods have resulted in increasing demand for the service[23]. Many of the venues have been very positive to the services, natural considering they have very little to lose. The main challenge will be to make them share investment costs or to pay the WISP for the service. If the venues were to share more investments and receive more revenue, their bargaining strength would surely grow relative to the WISPs. However, awareness of WISP services continue to be low among the venues and the venues' customers, and usage is sometimes reported sparse.[29]

In conclusion, as long as the practiced business model doesn't oblige venues to pay or share investment costs and revenues, venues are very positive to the service and letting up their location to WISP services is no problem as long as no exclusive contract has been signed with another WISP. Today, the competition for exclusive contracts has not started in China and venues are relatively easy persuaded to cooperate. Their bargaining power is set to low under these circumstances.

6.4.5 Conclusion bargaining strength of suppliers

From the four bargaining strengths of the suppliers (medium, low, low, low) we can see that overall suppliers have low bargaining strength. This is reflected by the fact that many companies are interested in offering their products and

solutions to the up surging WISP industry and venues have little to lose with the current used business models. Two factors add bargaining strength to the suppliers. One is the situation in the ISP/IP backbone market and the other is the importance attached to stable WLAN products and network systems by WISPs. The overall bargaining strength is nevertheless low.

This low bargaining strength is proved by the WISPs' lack of interest to perform backward integration.

6.5 Negotiating power of buyers

Buyers can be categorized into:

- Companies
- Government agencies
- Individuals

6.5.1 Companies (Medium bargaining strength)

High-tech, consulting and financial companies in big cities are regarded as customers with the highest potential during this initial stage of WISP development. There are many reasons. Firstly, these companies have many mobile professionals, the most promising target of WISP services. These companies can profit from WISP services as their employees gain greater efficiency and flexibility and they are therefore likely to pay for these services. At the same time, companies with a large percentage of mobile professionals are key customers for both mobile Internet operators and telecom operators, as they represent a large part of the revenues.¹³

Secondly, companies are easier to target in initial marketing as information exchange and close cooperation occur on a regular basis between the entering WISPs' mother companies and the targeted companies.

Thirdly, it is an easy way for a WISP to increase the number of customers in large increments. Additionally, some of the companies targeted are still hesitant to accept wireless services, worrying about security and unsure about the benefits. The considered companies' bargaining strengths are therefore strong but due to the low level of competition in the WISP market in China so far, this bargaining strength is decreased, resulting in medium bargaining strength.

Among China Netcom's key accounts, there are few companies that so far actually pay for the service.[23] This is an effect of these companies' strong bargaining strength.

6.5.2 Government agencies (Medium bargaining strength)

Government agencies are less interesting to WISPs than high-tech companies. Firstly, they have fewer mobile professionals and are therefore less likely to appreciate the service. However, some agencies are interested, especially using the combination of WLAN and WISP to equip their offices. By signing up government's agencies, WISPs get many customers at a time. The Chinese government

¹³Boston Consulting Group case experience from Mobile telephony shows that 20% of top accounts represent close to 50% of revenues

is trying to improve the structure of its institutions to meet the new demands posed by modernization and WTO accession. Getting their agencies and officials online is part of that strategy aimed at shaping more effective agencies. The need for wireless is not clear but it is a certainty that new information technology solutions will have to be implemented in the future. There is only a small threat of backward integration from the government agencies. The low level of knowledge about the efficiency gains from WLAN, the small switching costs, and their considerable size increases their final bargaining strength to medium.

6.5.3 Individuals (Low bargaining strength)

Individuals are less interesting to WISPs at this stage. Occasional individuals subscribe to the service, but they are not targeted by WISPs marketing and recruiting efforts. Mostly the service is unknown to the public and there is no real demand. Their bargaining strength is low, as they represent today no major revenue base for WISPs.

6.5.4 Conclusion bargaining strength of buyers

In conclusion, the high-tech, finance and consulting companies are the main target groups for WISPs. They are wanted as customers by the WISPs since they will be a substantial source of revenues in the future. The companies' bargaining strength is only lowered due to the fact that there are very few WISPs so far. The threat of backward integration for real WISP services is very low. Government agencies are also interesting as customers but not individuals as WISPs prefer concentrating their marketing efforts and enlarge customer base in large increments in the beginning. The overall bargaining power of buyers is medium, mostly as a result of the lack of competition between WISPs.

6.6 Threat from substitute products

A note about the five forces of competition model and the category of substitutes, competition/complement from 3G/GPRS:

When the "five forces of competition" model was introduced in the methodology chapter, the difficulty of choosing a market and drawing the boundaries between the market and substitute products was stressed. In this analysis, the market considered is broadband semi mobile Internet provisioning by Public WLAN services. This is often shortened to Public WLAN or WISP business in this thesis. For example WISPs (Wireless Internet Services Providers) could be defined in a much broader sense than just those using 802.11b compatible equipment. The reason why this thesis has focused on the 802.11b technology is because of the spread of the equipment and Internet provisioning using this technology has had. Therefore WISPs using 802.11b technology is placed in the market competitor square and 3G/GPRS as a substitute technology. The reason for this is that a WISP that has invested heavily in 802.11b equipment will have to make substantial reinvestments, in hardware and software installation and system, if it desires to switch technology. A change in technology would create completely new dynamics in the market. There has been much

discussion about whether to consider 3G as a substitute or a complement to Public WLAN. Today, most of the people involved in WLAN business, see that the two technologies can interact to create a better mobile Internet service, with WLAN hotspots in areas with high traffic where its superior 11 Mbps (56 Mbps with 802.11a) transmission rate can boost the 384 kbps normally provides by 3G. Solutions are being developed for seamless roaming between the two technologies and thus possibilities exist to unite it into one service. For example Nokia claims to have such a solution.[30] In such a case it might be less correct to regard 3G and GPRS as substitutes when they actually can be combined to form a global service, working together to promote and facilitate the use of mobile Internet. If all wireless technologies; 802.11b, Bluetooth, 3G, GPRS can be combined into one service the normal substitute would be broadband Internet by cable.

This report does not focus on the issue whether 3G and WLAN will compete or complement. However, the competition or interaction between Semi Mobile Broadband Internet by 802.11b and 3G/GPRS has some interesting features in China that deserves to be included in the report.

Main substitutes or complements to Public WLAN by 802.11b in China are

- 3G
- GPRS
- Bluetooth
- Broadband by wire
- Dial up connections

6.6.1 3G in China

The Chinese authority in charge of mobile telephony, the MII (Ministry of Information Industry) has not chosen what technology to use for the 3G networks. Some of the contestants are W-CDMA, CDMA2000 and TD-SCDMA. The TD-SCDMA technology has been developed in cooperation between German multinational Siemens and Datang, a Chinese company. The fact that one of the developing companies is Chinese makes it one of the favorites, as MII probably prefers that a Chinese company gets part of the license money. Siemens also claims that TD-SCDMA technology can achieve transmission rates as high as 11 Mbps in a limited range, comparable to 802.11b performance. This represents a more real threat to 802.11b technology, since its main complementary advantage to 3G is its high transmission rate.

The success for 802.11b, in complementing 3G, depends on whether the 802.11b cards can be integrated in the devices that will use to access mobile Internet. (Laptops, PDAs, Handsets). Not surprisingly, Siemens doubts that the card will be integrated but believes that both users and manufacturers will prefer one standard, such as the TD-SCDMA, to be used instead of 3G plus WLAN, as it can perform both the short range broadband connectivity of the WLAN and the longer range 3G connectivity.[31] Since the Chinese authorities

have neither chosen the technology neither given out the licenses for 3G, the start of the actual construction of the networks will not be very soon.

The start of 3G in Europe has been constantly postponed for several reasons and a wider launch and usage of the service will probably not begin until 2005, which should give an estimated starting time for China around 2007-2008, China being at least around 2 years behind the European schedule. (Sweden, Finland, Germany, France)

There are four factors that point towards a faster development of 3G in China

- China can learn from European mistakes and difficulties encountered as it mostly are the same companies and the same systems in China as in Europe or the US.
- China Mobile and China Unicom have experience in building fast expanding networks in a huge country like China. They have managed to keep the pace of the explosion like development of 2G cellular subscribers in China during the last few years.
- Chinese are generally very positive about high-tech development and demand to have the most advanced technology.
- The intensifying competition in mobile market will force operators to enhance services in order to retain the most attractive customers. One such service would be migrating customers to 3G or 3G-WLAN networks.

How fast the development will be and how affordable the 3G services will be to Chinese people are still to be seen. Thus the industry's decision as to when it will be the best time to introduce the new services will play an important role.

6.6.2 Licenses

As earlier mentioned in the part about 3G, MII has not decided what technology to use for 3G, nor have they decided to whom they will give the licenses. In a speech delivered by MII's minister Wu Jizhuan, he proposed four 3G licenses for China.[32] That China Mobile and China Unicom, the only two existing operators of 2G mobile telephony in China (see table 8), would get one 3G license each, is certain. The two most probable operators to get the remaining two licenses are China Telecom and China Netcom. So far China Netcom has been the hottest contender for a third 3G license. Furthermore, it has been announced that China Netcom is to merge with China Telecom and then to be split into one northern and one southern part. If both of them get a 3G license this would mean one license for each the northern and the southern part of the split, merged company, which makes sense. However, the final results of this restructuring are still not clear.

6.6.3 Winning the strategically important WLAN segment

The WISP services could be seen in a wider strategic perspective. In order to win the important early adopter segment and business customers segment, larger telecom companies fight a battle in both mobile telephony, mobile Internet and

Table 8: The table is an overview of mobile licenses in China. X means a sure license and (x) means a probable license

Operators	2G	3G	CDMA
China Mobile	X	X	
China Unicom	X	X	X
China Telecom		(x)	
China Netcom		(x)	

wired Internet. Chinese mobile telephony is today not very well developed in services and applications. Few users have a voice box and though sending SMS is popular, those are the services, excluding voice, one can use in the Chinese operators networks at the moment. An important customer segment is, the top 20% referred to earlier in this report who accounts for around 50% of the revenues and more than 50% of the profit.[24] In order to retain this group of customers in the future, mobile operators will have to try harder than today to please them. To combine the ordinary speech service with a WISP service could be in the interest of mobile operators. On the other hand, operators that currently don't possess a mobile license but are hoping to get one, could see it as a strategic move in order to lure these customers away from their old 2G operators. This could be accomplished for example with a smart packaging of services including mobile telephony, WISP-service on the same bill. If this would become reality, it would also be in these operators' interest to have handsets and devices, containing WLAN cards, produced.

6.6.4 Conclusion to 3G threat

We will not see 3G services in China until sometime around 2007. Meanwhile the competition in the mobile telephony market will intensify as more licenses are being handed out and customers demand more services. In this perspective 3G operators are more likely to enter the WISP market and help it to grow than just purely compete with it. Public WLAN can provide semi mobile broadband Internet services today. Time is an important factor and once 3G comes around it will be made to complete WLAN and other technologies used. Therefore the threat from 3G is low.

6.6.5 GPRS

The transmission speed of GPRS (115 kbps and lower) is too low to be considered as a competitor to 802.11b. It is an interesting complement though. The idea of using GPRS for less information demanding applications, for example to notify the user of an incoming mail. Then the user can download this heavier mail at a hotspot covered by Public WLAN. In this way GPRS could function in cooperation either solely with WLAN or to cover outside a 3G-WLAN network. Networks combining GPRS and WLAN have an excellent performance and a promising future in China according to some researchers.[33] Today, GPRS (2G) licenses are owned by China Unicom and China Mobile and can be used for example in Beijing inside the third ring road.

6.6.6 Bluetooth

Bluetooth was introduced later than the 802.11b technology and Bluetooth products are just starting to appear (June 2002) in the market. It doesn't have the functionalities of WLAN, and it is limited to around 500 kbps in a 10 m range. The advantage of Bluetooth is its low energy consumption, which makes it interesting to use to provide Mobile Internet in hotspots in devices that needs to be energy saving. So far, there hasn't been any larger scale usage of Bluetooth to provide broadband Internet in China and it is unlikely to happen in the future as Bluetooth lacks in connectivity and WLAN has a two years head start.

6.6.7 Broadband by wire

Though broadband by wire (Ethernet etc.) doesn't have the same functionalities as WLAN, it is a serious competitor to WLAN and Public WLAN services in China. In big cities like Beijing and Shanghai, the widespread use of wired LANs poses a threat as substitution to WLAN. Even though WLAN is superior in flexibility and convenience, venue owners don't recognize these properties and are content with their installed wired networks. Extensive wired LANs can be made to cover most locations in a venue, though this takes extensive installation work. In this way users can create a pseudo semi mobile network, where it is not possible to connect while actually on the move but as soon as they stop, one of the many wired connections is available. Skeptics to new technology prefer known solutions and the much debated security issue for WLAN is an advantage for cable solutions. Because of wired networks' popularity in China, as well as the existence of 6,7 million leased lines in China, the threat from broadband by wire is estimated to be medium.

6.6.8 Dial up connections

A dial up connection is the most common way to connect to the Internet in China today. Of the 34 million Internet users, 21 million connects only by dial up connection and 5,6 million use partly dial up connections[7]. The big problem is of course the low transmission speed of 56 kbps and the lack of stability when using old telephone lines. However, dial up connections are very easy to use and can practically reach wherever the PSTN (Public Switched Telephone Network) goes. Today, many mobile professionals use dial up connections when staying in hotels to check mail and Internet. This makes dial up connections a medium threat to WISP services in spite of its poor transmission rate and unstable connections.

6.6.9 Note about ADSL

ADSL - (Asymmetric Digital Subscriber Line) is a very popular technology used for providing broadband access in China. With a special modem, used on ordinary telephone copper lines, transfer rates between 1-10 Mbps can be achieved downstream and 16 to 640 kbps upstream[34] depending on the geographical distance transmitted. Each location, where the user wants to connect, needs a modem in both ends of the cable and it is therefore hardly regarded as a substitute to WISP services. In addition, ADSL is not a LAN technology but

Table 9: The table shows substitutes and 802.11b main characteristics. Source for transmission rate and typical range, Forrester (2001)

Technology	Transmission rate (max theoretical)	Typical Range	Available	Comment	Threat
3G	384kbps-2M	Cellular network	? (2007)	How much will be built?	Low
GPRS	115 kbps	Cellular network	Under construction	What are the services?	Low
Bluetooth	781 kbps	10m	Now	Few users	Low
Wire by cable (Ethernet)	10-100 Mbps	Cable	Now	Not really mobile	Medium
Dial up	56 kbps	PSTN network	Now	Unstable	Medium
802.11b	11 Mbps	100m	Now	-	-

it can under some circumstances compete with outdoor PTP WLAN, reaching wherever the telephone line is not longer than 8 km. At the maximum distance ADSL provides the narrowest bandwidth (around 1,5 Mbps theoretically).

6.6.10 Conclusion to threat from substitute products and services

As we can see from the summary of substitute products in table 9, the most realistic threat to public WLAN comes from cable LAN technology such as Ethernet and dial up connections. Instead of using WISP services provided by a Public WLAN, people will use Ethernet, or dial up connections in hotels and other venues. Both venues and potential users have so far not fully fallen for the wireless alternative. Ethernet connections are stable, secure and fast and dial up connections practical and accessible almost everywhere there is a telephone. Wireless operators must take this threat seriously and convince customers that the wireless alternative is as safe and stable but also flexible and convenient. Due to the popularity of the wired alternatives the threat from these substitutes is overall medium.

6.7 (6) Regulations

Regulations are sometimes added as a sixth force in the five forces of competition model. In this analysis the regulations are discussed in each part, especially in the barriers to entry section.

6.8 A review of the "five forces of competition" and the results

Figure 5 shows the five forces of competition model with results from the analysis.

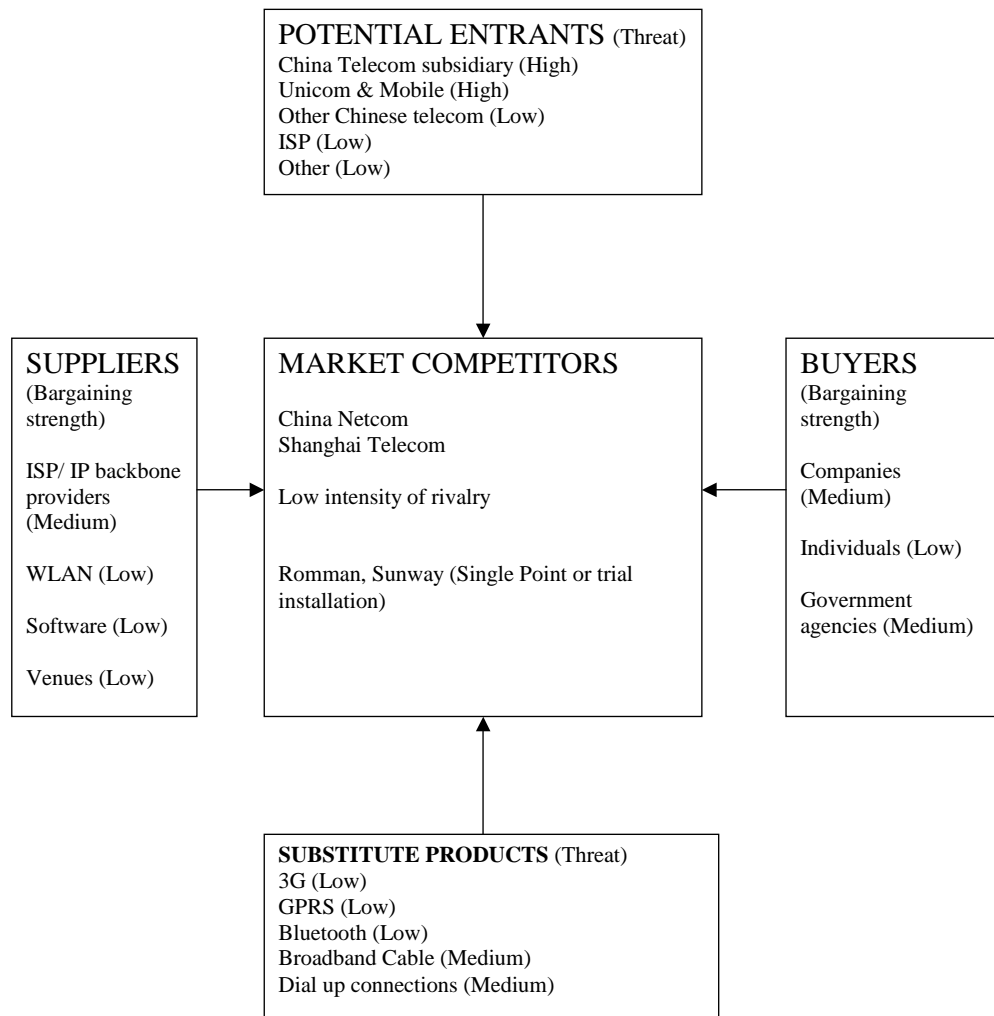


Figure 5: "The five forces of competition" model with analysis about threats and bargaining strength from different actors

6.9 Conclusion to five forces of competition

The WISP market is at a startup stage. There is a high threat from the potential entrants; China Unicom, China Mobile and China Telecom. Jitong and Railway Communication and ISPs are a low threat as potential entrants. Suppliers have low bargaining power, as competition is strong in their markets except in IP

backbone where the suppliers are very concentrated. Nevertheless, the main threats come from bargaining strength of the buyers and the substitute products, namely broadband cable and dial up connections. WISPs need to concentrate their efforts on proving that their product is better than the wired substitutes and on convincing the important customers the benefits of their product, in comparison to substitutes and future potential entrants products.

From the few examples available at the moment, this trend is acknowledged. Focus is on winning top customers with marketing and co operations. The suppliers have little bargaining strength and there is no incentive for backward integration. From a strategic point of view, it is no coincidence that Netcom and the Shanghai branch of China Telecom, the two hottest contenders for the additional two 3G licenses have entered the market in order to, in a later stage, attract top-end customers from the existing mobile operators.

7 Expected market for WISP services

7.1 Laptop sales

The most interesting customers to WISP services are high-tech companies and government agencies. These companies' interest for these services is growing as more and more benefit from the gains in efficiency. The actual utility for companies depends on the usage of laptop computers. Currently in China laptop sales accounts for only 7.15% of total PC sales, much lower than the world average of 20% (35% in the US, 50% in Japan)[35]. IDC estimates that laptop's share of total computer sales will increase to 9% in 2002. Following the global trend, even with conservative estimates, laptop sales will likely reach 50% of desktop sales in the next few years. In all, close to 600 000 laptops are forecasted to be sold in China in 2002.[36] Meanwhile, laptop sales in the US are estimated to reach 30 million in 2002.[37] Thus the Chinese laptop sales represents 2% of the US sales and the market resembles the situation in the WLAN market where the Chinese sales reached 1,5% of the total WLAN sales in the world.

7.2 PDA sales

More and more top-end PDAs models are equipped with WLAN cards and the sales of combined handset and PDA rose to 108,000 units in 2001 from 86,000 in 2000. At the same time 2,8 million low-end model units were sold.[38] 90% of the PDAs sales went to personal or household use and only 10% for business use. This may be a result of that many PDAs are still not made for business use, but it could also prove that very few Chinese businesses understand the functionality and flexibility that PDAs can bring. This raises concern to the question of whether the Chinese will grasp the new functionalities that come with the new wireless data networks and WISP services. Worldwide PDA sales reached 13,1 million in 2001.[39]

7.3 Analysis of the Chinese consumer market

China is a huge country in terms of population (1,3 billion) and area (9,3 million square km or equivalent to the US). Even though China, since the new economic policy launched by Deng Xiaoping in 1978, has quadrupled its GDP, it is still

Table 10: The table shows average monthly expenditures for Chinese Internet users. Source. CNNIC's Semiannual Survey Report on the Development of China's Internet (January 2002). This is an online survey that received 75,383 responses, among which 64,627 were valid.

Monthly expenditure (Yuan)	-50	51-100	101-200	201-300	301-400	401-500	500-
Percentage	40,9%	31,4%	20,0%	4,8%	1,3%	0,7%	0,9%

a poor country with a GDP per capita around US\$ 3,600 (Year 2000 estimate, US GDP per capita is US\$ 36 000).[40] 10% of Chinese are living below poverty line and 50% earn their living as farmers[40]. The big question is how affordable are these services for Chinese Internet users? And are they likely to appreciate these new services?

Three reasons why the consumer market for WISP services in China could develop:

- Chinese people who live in big cities spend a lot of time out of their house. Housing is cramped in many bigger cities like Beijing and Shanghai. Very few have a car. Instead people use public transportation. This resembles the situation in Japan where new message services and mobile Internet have proven to be an initial success.
- Internet cafes are very popular in China, perhaps as a result of the reason stated in the previous paragraph. Internet cafes are springing up all the time with such intensity that Chinas government, who want to regulate the business, closed down 200 smaller unauthorized Internet cafés in Shanghai in May 2002.[41] Still there are plenty of Internet cafés, with new giant chains opening up all the time. These cafés are mostly used for playing games and the people who go there usually don't have a computer at home. However, to use computer in public spaces does seem to suit the Chinese due to the conditions of life in big cities.
- The lead-time to have a fix broadband cable installed is too long in China and that could influence people to switch to a quick WISP subscription instead of waiting for the fix line, much like mobile phones take customer from fixed telephony when the provisioning time for the latter gets too long.

Table 10 shows that 7,7% of the 34 million users, or 2,6 million Chinese, spend 200 Yuan or more on Internet services per month. 200 Yuan or US\$ 24 is a little less than the US\$30 monthly fee that several North American WISPs, as T-mobile and Wayport, charge monthly. 27,7% of Internet users spend more than 100 Yuan a month.

In the survey showed in table 11, CNNIC asked Internet users who pays for the Internet access. The survey indicates that three out of four Internet users pay for the expenses themselves. It is possible that the 7,7% who spend more than 200 Yuan on Internet access per month mostly belong to the 10,7% that

Table 11: The figure shows who pays for the individual's Internet access in China. Source: CNNIC Semiannual Survey Report on the development of China's Internet (January 2002).

Professional charges	10,7%
Users' own expense	73,7%
Both	15,6%

get their expenditures paid by a company, as 200 Yuan represents a considerable amount for individuals in China.

Of the total 34 million Internet users (December 2001), 30% live in Beijing, Shanghai and Guangdong areas,[7] where the average income is the highest and people spend a lot of times out of their house. As a benchmark, the yearly average income in China 2000 was 6280 Yuan in urban areas and 2253 Yuan in rural areas[43].

7.4 Cellular ARPUs

Another parameter for communication services' affordability could be cellular operators' revenues. China Mobile reported a 125 Yuan (US\$ 15) ARPU (Average Revenue Per User) for their 75 million subscribers for the period from January 1 to March 20. This is a slight drop from 127 Yuan (US\$ 15,3) during the period September 21 - December 31 2001 and follows a trend with decreasing ARPUs in mobile telephony. This is a result of basic services becoming more and more popular and affordable for lower income groups[42]. Mobile's rival China Unicom has always had lower ARPU at around US\$ 10.[42]

7.5 Assumptions

Assuming that the Internet users are prepared to spend the same amount as they currently spend on Internet Access, on the new WISP services, few could today afford them. Even if Chinese WISPs could reduce the price of their services to 200 Yuan or US\$ 24,4 per month, a little less than the US\$ 30 a month that T-mobile and Wayport, charged in the US (In May 2002), only 7,7% of current Chinese Internet users are paying more than this amount for their Internet access. Also assuming that the people who spend the most on Internet access have their Internet access paid by their companies there is a little market for WISP services outside of mobile professionals at the moment. If it is possible to reduce prices to 100 Yuan (US\$ 12,2) there would be 27,7 % of Internet users (around 10 million) who are used to paying that much. Probably, a large majority of them would normally have their fees paid more or less by their company, as the percentage who get their Internet wholly or partly paid by a company is 26,3%.

7.6 Conclusion

The main customers in the immediate future will be mobile professionals in companies and governmental agencies. The interest for WISP services will increase as laptop sales approaches international level in a couple of years. In a

long-term scenario, WISP services have a great potential of being a success in attracting normal consumers, as Chinese tend to spend a lot of time out of their house.

8 Final conclusion to WISP market

The WISP market is at an early stage. Even though the market is still small, important parameters such as Internet usage, indoor WLAN and laptop sales are increasing fast. The competition in the WLAN market and among system integrators facilitate for WISPs while the most important inhibitor is price on WLAN products.

It is critical for Chinese WISPs to gain profit from the "early adopters" segment while waiting for the broader market to develop. The early adopters will also have a strategic value, as they will become core to the battle for mobile telephony subscribers. Chinese telecom companies, active or aspiring to be active in mobile telephony market, are expected to dominate the WISP market partly because of the strategic value in the battle for mobile telephony-Internet partly because of the state-owned Telco's size, experience and relations. The initial focus for the WISP should be to convince potential customers of the superiority of Public WLAN services over wired substitutes and retain the important customers. A foreign player can contribute with his knowledge about business models but will still need a Chinese company's who has experience in China's services market and relations. Looking at business models and billing, we can see that both players already have embraced the prepaid cards, also very popular in mobile phones in China, where the user is charged for the time he actually spends connected. Further, Shanghai telecom has an interesting way of retaining customers when they offer to install APs at the customer's home and an interesting business model when charging extra for public APs used in addition to the AP at home.

9 Suggestions for further research

For this thesis an assumption about the connection between high-end mobile subscribers and early adopters of WISP services has been made. This connection needs to be investigated further. Perhaps there are also connections between early adopters in other areas and users of WISP either as a Internet service or use of Public WLAN in other business models, in-store information etc. This could be useful information for Public WLAN industry.

Further research on how shared point access systems and open community networks could work in China with Universities, organizations and community networks would also be interesting.

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10.1

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10.2 A selection of useful websites

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<http://www.51wireless.com> (TianyiTong service homepage)

<http://www.sh-wireless.com> (Shanghai Telecom wireless services)

<http://www.stats.gov.cn> (Statistics about China)

<http://www.bluetoothinchina.com> (About Bluetooth in China)

<http://www.mobileoffice.com.cn> (China Netcom's mobile office service)

<http://www.cnc.net.cn> (China Netcom)

<http://www.80211.com.cn> (Beijing Nodes 802.11 homepage)

<http://www.wto.org> (World trade organization)

<http://www.cnnic.net.cn> (China Internet Network Information Center)

10.3 Short presentation of some of the interviewees for this thesis

Zhu Yi - Business developer at Beijing Nodes. An experienced (set up in 1996) Beijing based system integrator and WLAN enabler with 26 employees. They are now also producing and proposing WISP solutions for hotspots.

Zhao Qing - Engineer at MII's (Ministry of Information Industry) department for new technologies and new services. MII is the ministry responsible for mobile telephony and Internet regulations in China.

Fredrik Hähnel - IT and Telecom consultant at the Swedish trade council in Shanghai. The Swedish trade council provides export information and consulting services.

Peter Rosta - commercial counselor at the embassy of Sweden in China.

Litchi and Jun He - Shanghai Brocomm Technology Chinese set up in March 2001 as a subsidiary of American company Above Cable. Provides WLAN solutions and will help in installation of Shanghai Tian yi tong service.

Jin Lei - Manager of the ISP Sunway parallel computer company. Sunway serves 130 companies with Internet in 12 different buildings and ran a

Public WLAN trial at three downtown hotels in Beijing.

Zhou Ting - manager of Nova Wave, a new startup that provides hotspot WISP solutions to Shanghai Telecom's Tian Yi Tong service.

Selina Zhou - Marketing specialist at China Netcom's mobile communication unit and "Mobile office". Mobile office was the earliest Chinese WISP, launched in October 2001.

Wang Haitao - Product Manager at Tsinghua Tongfang, a high tech company active in many domains. Produced Lucent cards in 2000 then switched to a Taiwanese manufacturer. Launched their new cards in December 2001.

Wang Min - Senior Manager at Symbol China. Symbol came to China in 1995 and specializes in barcode scanners and products for the vertical market where they are 2nd in the world.

Sun Yu - Manager at Romman Ltd, a new startup that handles a Public WLAN system in the prestigious Tsinghua University library.

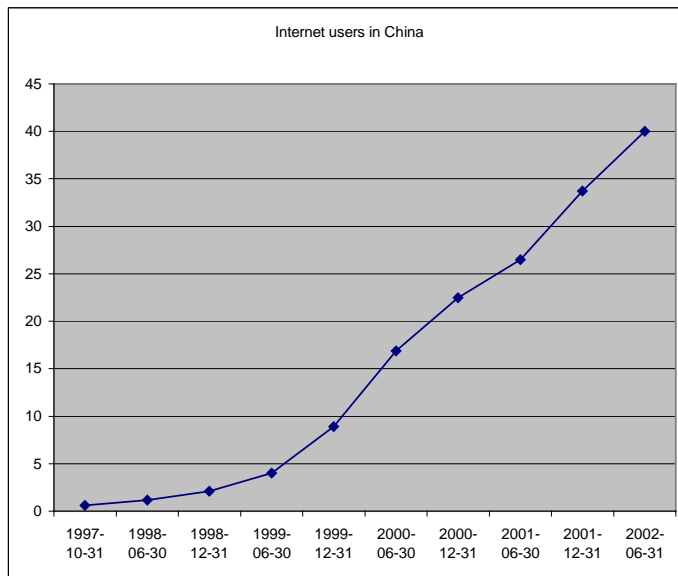
11 Appendix

A Pricing for Shanghai Telecom's service Tian Yi Tong

Fee items					Unit	Fee	
Installation fee					per account each time	10	
Account registration fee					per account each time	100	
End equipment fee			Modem		1	590	
			Wlan Card	PCMCIA	1	600	
				USB	1	800	
Tian Yi Tong	Installation, change, testing fees	New Installation 1 AP	Company		each time	300	
			Individual		each time	300	
		Installation change 1 AP	Company		each time	100	
			Individual		each time	100	
		Adding 1 AP	Company		each time	100	
			Individual		each time	100	
		Location Move 1 AP	Home (inside)		each time	100	
			Home(outside)		each time	300	
	Network usage fee	Limited monthly usage	home use (60 hrs inclusive, 0.1Yuan/Min afterwards)	512K	per account per month (1 AP)	100	
			home use (60 hrs inclusive, 0.15Yuan/Min afterwards)	1M	per account per month	140	
			public areas (60 hrs inclusive, 0.15Yuan/Min afterwards)		per account per month	100	
		Unlimited monthly usage	Home use	512 K	per account per month (1 AP)	150	
				512 K	per account per month (1 AP)	1600	
			company use	1M	per account per month (1 AP)	2600	
			public areas		per account per month	150	
			Public area pre-paid			per Min	0,2
		Adding AP	home user		20 Yuan additional per new AP per month		
			company user		100 Yuan additional per new AP per month		

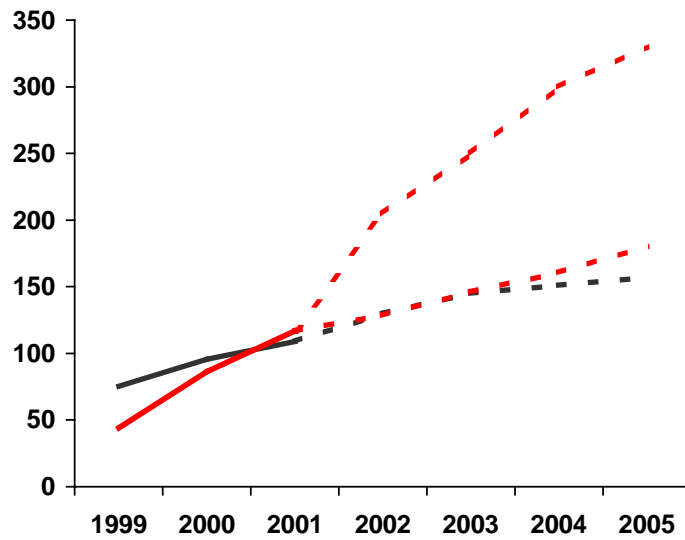
Pricing for Shanghai Telecom's service Tian Yi Tong in RMB (Yuan), Source: Shanghai Telecom

B Number of Internet users in China (Million)



Number of Internet users in China (Million), Source: CNNIC

C Forecasts of mobile subscriptions in China (Million)



Red: Forecasts of mobile subscriptions in China (Millions), high and low estimate. Black: Mobile subscriptions in the US. Source: Boston Consulting Group

D Acronyms and Abbreviations

802.11 - is a wireless LANs transmission standard and provides 1 or 2 Mbps in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).

802.11a - is an extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5GHz band. 802.11a uses an orthogonal frequency division multiplexing encoding scheme rather than FHSS or DSSS.

802.11b (also referred to as 802.11 High Rate or Wi-Fi) – an extension to 802.11 that applies to wireless LANs and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only DSSS. 802.11b was a 1999 ratification to the original 802.11 standard, allowing wireless functionality comparable to Ethernet.

802.11g - applies to wireless LANs and provides 20+ Mbps in the 2.4 GHz band.

AP - (Short for Access Point) a hardware device or a computer's software that acts as a communication hub for users of a wireless device to connect to a wired LAN.

Backbone - The main networks connections composing the Internet.

Bluetooth - Bluetooth refers to a short-range radio technology aimed at simplifying communications among net devices and between devices and the Internet using the unlicensed 2.5 GHz band. It aims to simplify data synchronization between Net devices and other computers. As it is the same operating frequency as 802.11b some concerns have been raised for interference problems. Products with Bluetooth technology must be qualified and pass interoperability testing by the Bluetooth Special Interest Group prior to release. The Bluetooth 1.0 specification consists of two documents: the Foundation Core, which provides design specifications, and the Foundation Profile, which provides interoperability guidelines. Bluetooth's founding members include Ericsson, IBM, Intel, Nokia and Toshiba.

CNNIC - (China Internet Network Information Center) Chinese government Agency that informs and reports about the Internet activity in China.

DSSS - (Direct Sequence Spread Spectrum) is one of two types of spread spectrum radio, the other being frequency-hopping spread spectrum. DSSS is a transmission technology used in WLAN transmissions where a data signal at the sending station is combined with a higher data rate bit sequence,

or chipping code, that divides the user data according to a spreading ratio. The chipping code is a redundant bit pattern for each bit that is transmitted, which increases the signal's resistance to interference. If one or more bits in the pattern are damaged during transmission, the original data can be recovered due to the redundancy of the transmission.

Ethernet - A local-area network (LAN) architecture developed by Xerox Corporation in cooperation with DEC and Intel in 1976. Ethernet uses a bus or star topology and supports data transfer rates of 10 Mbps. The Ethernet specification served as the basis for the IEEE 802.3 standard, which specifies the physical and lower software layers. Ethernet uses the CSMA/CD access method to handle simultaneous demands. It is one of the most widely implemented LAN standards.

FHSS - (Frequency Hopping Spread Spectrum) is one of two types of spread spectrum radio, the other being direct-sequence spread spectrum. FHSS is a transmission technology used in WLAN transmissions where the data signal is modulated with a narrowband carrier signal that "hops" in a random but predictable sequence from frequency to frequency as a function of time over a wide band of frequencies. The signal energy is spread in time domain rather than chopping each bit into small pieces in the frequency domain. This technique reduces interference because a signal from a narrowband system will only affect the spread spectrum signal if both are transmitting at the same frequency at the same time. If synchronized properly, a single logical channel is maintained.

Footprint - Coverage area for the services of a WISP. The physical space where one can connect to the network using a WISP.

GHz - Giga Herz. Billion of periods per second.

GPRS - (General Packet Radio Service) a standard for wireless communications which runs at speeds up to 115 kilobits per second, compared with current GSM (Global System for Mobile Communications) systems' 9.6 kilobits. GPRS, which supports a wide range of bandwidths, is an efficient use of limited bandwidth and is particularly suited for sending and receiving small bursts of data, such as e-mail and Web browsing, as well as large volumes of data.

GRIC - is a WISP broker. Customers to companies that have signed a contract with GRIC, can use, all GRIC partners' networks to connect to the Internet and their corporate networks. They have this multinational services both for dialup connections and Wi-Fi broadband access.

Hotspot - A location where one can connect using WLAN card and laptop computer. Typically an Airport, hotel, restaurant, café etc.

IEEE - (Institute of Electrical and Electronics Engineers) pronounced I-triple-E. Founded in 1884 as the AIEE, the IEEE was formed in 1963 when AIEE merged with IRE. IEEE is an organization composed of engineers, scientists, and students. The IEEE is best known for developing standards for the computer and electronics industry. In particular, the IEEE 802 standards for local-area networks are widely followed.

ISP - (Internet Service Provider) a company that provides access to the Internet.

Kbps - Kilobits per second, a measure of transmission speed. Thousands of data bits per second.

LAN - (Local Area Network) A computer network that spans a relatively small area. Most LANs are confined to a single building or group of buildings. However, one LAN can be connected to other LANs over any distance via telephone lines and radio waves. A system of LANs connected in this way is called a wide-area network (WAN).

LAWN - (Local Area Wireless Network) see WLAN

Mbps - Megabit per second, a measure of transmission speed. Million of data bits per second.

MII - (Ministry of Information Industry) Chinese Ministry responsible for Internet and telecom regulations.

PDA - (Personal Digital Assistant) a handheld device that can combines computing, telephone/fax, and networking features. A typical PDA can function as a cellular phone, fax sender and a personal organizer. Unlike portable computers, most PDAs began as pen-based, using a stylus rather than a keyboard for input. This means that they also incorporated handwriting recognition features. Some PDAs can also react to voice input by using voice recognition technologies. PDAs of today are available in either a stylus or keyboard version.

Public WLAN - Installing WLAN in Public Area either for business reasons making subscription or free of charge, increasing customer satisfaction.

SOE - (State Owned Enterprise)

SOHO - (Small Office Home Office) When mentioned in context with WLAN products often referring to less advanced/expensive WLAN products used for home or small offices.

Venue - Hotspot location. A location where one can use the WISP's services.

VPN - Short for virtual private network, a network that is constructed by using public wire or wireless connections to connect nodes. For example, there are a number of systems that enable you to create networks using the Internet as the medium for transporting data. These systems use encryption and other security mechanisms to ensure that only authorized users can access the network and that the data cannot be intercepted.

WAN - (Wide Area Network) A computer network that spans a relatively large geographical area. Typically, a WAN consists of two or more local-area networks (LANs).

WECA - (Wireless Ethernet Compatibility Alliance) an organization made up of leading wireless equipment and software providers with the mission of guaranteeing interoperability of Wi-Fi products and to promote Wi-Fi as the global wireless LAN standard across all markets.

Wi-Fi - (Wireless Fidelity) and is another name for IEEE 802.11b. It is a trade term promulgated by the Wireless Ethernet Compatibility Alliance (WECA). "Wi-Fi" is used in place of 802.11b in the same way that "Ethernet" is used in place of IEEE 802.3. Products certified as Wi-Fi by WECA are interoperable with each other even if they are from different manufacturers. A user with a Wi-Fi product can use any brand of access point with any other brand of client hardware that is built to the Wi-Fi standard.

WISP - (Wireless Internet Service Provider) A company that supplies a Wireless Internet Access. Almost all WISPs today use WLAN IEEE 802.11b compatible products. In the future other transmission technologies are possible, for example Bluetooth.

WLAN - (Wireless Local Area Network) Wireless Network assuring communication between computer terminals and / or peripheral equipment.

WLL - (Wireless Local Loop) Systems that use wireless as last mile solution to connect fixed communication devices in homes offices etc.

E WTO overview

In the year 2000, China finally put an end to its almost 15 year long conquest to join WTO (and its predecessor GATT) and signed an agreement with the European Union. China had, only one year earlier, in spite of international turbulence at that time, signed an agreement with the USA. With the two most powerful of its members accepting China's entrance, WTO could grow to the gigantic trade organization it is, comprising 97% of total world trade. One of the most important issues concerning China's entrance into the WTO is that it opens up China's long protected services market. The WTO agreement is a combination of the old GATT (The General Agreement on Tariffs and Trade) and the new GATS (General Agreement on Trade in Services).

Before, the Telecom services as well as other services including banking, insurance, tourism etc. were closed to foreign business. Now these are to be opened to investments and joint venture much like the manufacturing industry and in some cases even wholly own foreign companies will be allowed. For the telecom services market the regulations agreed upon are as follows:

- In the area of paging and value-added services, which includes e-mail, voice mail, online information and database retrieval, facsimile, and on-line information service, China will permit 30 % foreign ownership upon accession, 49 % after one year, and 50 after two years after accession to the WTO
- Regarding mobile services, which includes voice and data, analogue/digital cellular, and PCS services, China has permitted 25 % foreign ownership on accession, and China will permit 35 % foreign ownership after one year, 49 % three years after accession.
- China will permit 25 % foreign ownership of its domestic and international service, which includes voice, packet-switched, circuit-switched and facsimile services, after three years of accession, 35 % after five years and 49 % six years after accession

It should be understood that these conditions apply for all of WTO members as a result of the WTO Most Favoured Nation¹⁴ policy. Even though some businesses have been granted permission to perform telecom services on the Chinese mainland, for example AT&T's installations in the Pudong area this will mean totally new conditions for most foreign businesses.

¹⁴According to this policy all nations member of WTO must be treated in the same way and be given the same tariffs as the most favoured one (i.e. the one with lowest tariff)