Municipal WLAN: Case Examples in Finland

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Abstract

Communication industry in Finland is currently going through a rapid development phase with wireless local area network (WLAN) coverage. Within past two years several WLAN projects have emerged in different parts of the country and, in addition, also completely new business models comparing to traditional ones have been introduced. Municipalities have faced new demand by their citizens for public internet access points. This paper concentrates on current WLAN cases especially from the viewpoint of different cities and municipalities. Framing of the paper has been made for only current WLAN cases in Finland.

1 Introduction to municipal involvement in WLAN development

Due to technological development during past years, communication markets have been introduced new devices with capabilities for WLAN access. However, development of available wireless network coverage has been rather slow since operators have faced financial difficulties to invest for new network capacity. In addition, development of mobile data service market was left behind from other countries since handset bundling was prohibited by regulations until 2006.

In a mission to achieve initial critical mass of user base for larger WLAN networks there have been different types of cooperation models between several groups such as cities, municipalities, companies and universities. This has enabled exploitation of existing network structures and investments by sharing bandwidth of individual groups to others thus gaining large network coverage within alliance members.

Another viewpoint to network development has been that all citizens should have access to internet as a public good. Internet access has been compared to basic infrastructure such as road networks, which should be provided by city or municipal funding. Currently several cities and municipalities have provided WLAN access hotspots in their libraries, schools and city offices.

There has also emerged critique towards cities' investments for WLAN purposes and doubts for the effects on communication operators' revenues if basically same service is also available for free. [32] However, emerged new WLAN access offerings have been compared to book market in context of libraries and book stores.[22] Clearly both are offering same goods for their customers in form of books, but obviously there is demand for both of these offerings.

2 Case examples

This paper presents three leading municipal involved WLAN cases in Finland: SparkNet, PanOULU and Mastonet. In addition, the paper will introduce other smaller and newer network cases which are related to municipal WLAN development. Traditional WLAN business models based on Telco-model [10] [27] (currently available by operators such as TeliaSonera and DNA [11]) have been excluded from this paper along with foreign cases.

2.1 SparkNet

SparkNet [8] [13] [14], originated from city of Turku, is currently largest wireless network in Finland. During past three years it has grown to coverage of 1577 access points and according to its owners it serves over 50 000 registered users.

History and development

SparkNet was founded in April of year 2003 and expanded very quickly to cover campus area of University of Turku, Åbo Akademi University and Turku School of Economics. During the year of 2004, SparkNet was enlarged to offer solutions for companies as well. Four different business solutions were tailored to suite different size of companies' technical demands.

In year 2005, OpenSpark was created to enable individual users to join the community by offering their WLAN access points for shared use. OpenSpark members have also SparkNet access points available thus increasing the amount of total access points in the network. Due to easy scalability and positive network effect, SparkNet and OpenSpark have been proved successful concept with continuous growth of access points. SparkNet has also been able to expand to other cities outside Turku area. Cooperation contracts have been made with cities such as Salo [24], Kaarina, Parainen and Naantali in addition to municipalities such as Lieto, Merimasku and Velkua. Furthermore, SparkNet has been able to capture individual access points from other main cities of Finland along with a few foreign ones as well.

Technical solution

SparkNet is designed to use existing network of e.g. a member company. It divides current networks' bandwidth to company's internal local area network (LAN) and SparkNet network, Figure 1. The separation of these to networks can be done virtually by virtual local area network (VLAN) or by physical separation with different access cables and access points. Company's private

LAN will be protected by its firewall but SparkNet part will remain as a part of common internet behind authentication gateway. This enables SparkNet member to access the network with his personal id and password which are managed by centralized authentication server. This division of bandwidth will enhance security of companies' own LAN's and still enable visitors to use their access points.
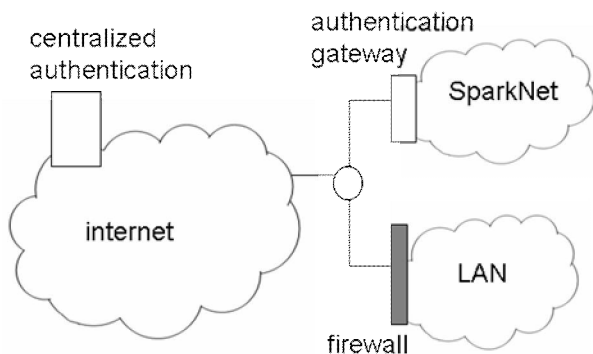

Figure 1 SparkNet's technical solution

Emerged new business opportunities

SparkNet has been able to create value for its customers by offering centralized authentication services. This kind of business model has advantages due to fact that owners of the network have been able to exploit their customer companies' own investments in network infrastructures. This enables SparkNet owners to leverage from large network benefits without having to use large initial investments by themselves.

SparkNet has also created alternative revenue channels by selling time-limited licenses to use their network for visitors who do not belong to SparkNet or OpenSpark community. This business model might provide good opportunities if network is able to capture dominant position comparing to other networks.

2.2 PanOULU

PanOULU-network [6] is originated from city of Oulu and has grown to cover 400 access points. User base has also been enlarged and PanOULU served 4372 unique users during September of 2006.

History and development

Development of PanOULU-network began in October of 2003. Initial cooperation contract was signed by City of Oulu, University of Oulu, Oulu University of Applied Sciences and Oulu Telecom. After combining their individual networks to share access to other members, PanOULU-network has been developed to offer also companies or individuals a possibility to participate in network growth by ordering PanOULU subscription. This is very similar business model comparing to SparkNet in Turku area. Initially, PanOULU-network required its user to have user id and password. However, authentication was decided to remove in June of 2005 to

decrease needed amount of network management and, in addition, to offer easy access for visitors from outside Oulu area. Removing of authentication of users has raised questions about network's security and possibilities for potential harmful use of network.

Along with development of PanOULU network citizens of Oulu have learned to be more familiar with wireless data usage and its opportunities. To promote new potential uses of PanOULU network, city of Oulu even announced a competition for its citizens to create new mobile services which would utilize PanOULU's capabilities. [25]

Technology

PanOULU consists of four different visitor networks which are KampusWLAN, OuluNET, OukaWLAN and RotuaariWLAN, Figure 2. In addition, with PanOULU subscription companies can offer their guests access to PanOULU network during their visit in company premises.
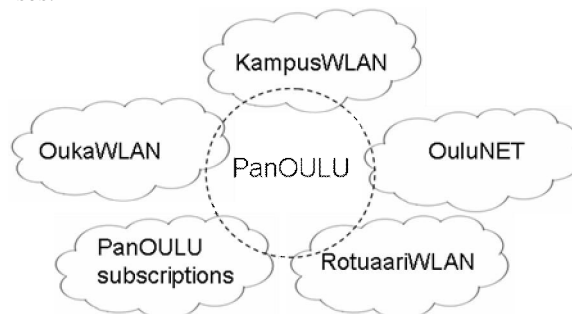

Figure 2 PanOULU visitor networks

Currently, there are three different WLAN standards available: 802.11b, 802.11a and 802.11g. All PanOULU access points are able to use 802.11b-standard and most of access points in indoor premises support 802.11a-standard. 802.11g is supported only by new models of access points.

2.3 Mastonet

Development of Mastonet [4] started in 2005. Mastonet is operated by city of Lahti and is supposed to serve its citizens and visitors of Lahti area. Currently network has grown to cover 85 access points which serve on average 400 different users per day. According to Mastonet providers, the network coverage is currently 80 % of whole Lahti citizens. City of Lahti has also realized possibilities for temporary increase of network capacity demand and for example during large sport event, Lahti Ski Games 2006, Mastonet's resources were temporary enlarged three times to serve city visitors and thus promote city as technology leader. [31]

Mastonet uses mainly 802.11b-standards with its access points, but also Mastonet's newest access points support 802.11g-stardard. City of Lahti has decided that public internet access should be provided for citizens for free

and thus there is no authentication required when accessing Mastonet. However, user support and security are not provided with as high level comparing to telecom operator offerings.

2.4 Other municipal involved WLAN cases

Following good experiences by leading network providers examples such as cities of Turku, Oulu and Lahti, other cities and municipalities have also began to develop their own WLAN offerings. Cities have realized that offering public WLAN access points they can create value for visitors and enhance business innovations. In addition, offered access points enhance cities credibility as leaders of technology and development. Several cities have began to offer public access points at least to city libraries, city offices, schools and other main public areas. In addition, there have emerged new potential places to install access points such as city busses in Helsinki area [29].

Even though initially some cities such as Helsinki were suspicious [19] about city involvement the public pressure has changed their opinions. City of Helsinki has now been developing their WLAN offering and it will cover 60-70 access points in the end of 2006 [20] [30]. Other cities were WLAN access points are being offered are for example Pori [1], Lappeenranta [7], Varkaus [3], Kemiö [5] and Tampere [2]. Some have even taken their offerings one step higher as for example municipality of Kinnula has even provide first year college students own laptop computers to use their public WLAN [17].

However, not all cities support this kind of development [17] [26]. For example city of Espoo does not consider their job to be involved in building WLAN infrastructure [16]. City representatives believe in market driven development at least in this phase, but few minor projects have been still being developed by other parties [28]. Same approach has been with city of Tampere were they are also reluctant to use scarce tax funds for developing WLAN coverage. In Tampere there are WLAN access points in city libraries but currently there are no plans to expand their coverage to public city areas. Even though these large follower cities do not currently play key roles in WLAN development, their actions will definitely be significant to future development of Finnish WLAN coverage and dominant players

2.5 Summary of case examples

Three leading network developers have few important differences which might have been significant for their development speed, Table 1. Currently, it seems that authentication and member-only access has created motivation for potential users to join SparkNet/OpenSpark, thus authentication playing a key role in their enlargement success.

Table 1 Summary of three leading networks

Network name	SparkNet	PanOULU	Mastonet
origin city	Turku	Oulu	Lahti
operating since	4 / 2003	10 / 2003	7 / 2005
access points	1577	400	85
authentication	centralized	none	none
free public access	no	yes	yes
community model	yes	yes	no

3 Future issues concerning WLAN development in Finland

This section of the paper concentrates on issues which will be relevant for future development of Finnish WLAN networks after year 2006. Development examples by three leading actors have revealed some valuable information for follower cities to consider. Clearly, SparkNet in Turku has shown fastest enlargement of their network's access point coverage which should be considered as a good growth model for others to follow.

3.1 Development model for building WLAN networks

After analyze of Finnish case examples has been done, clearly most of the different networks share common pattern in their development phases, Figure 3. To achieve critical mass of user base to achieve benefits from positive networking effect, they must first build initial user base. This is most easily done by cooperation between universities and polytechnics since they have already large potential user bases installed. In addition, students are good target group to test new wireless devices. Another separate area where initial development is most easily done is city libraries and offices since cities and municipalities want to offer services for their citizen and do not require profits from the users. Cooperation with these kinds of separated networks could be called "early phase" of network development.
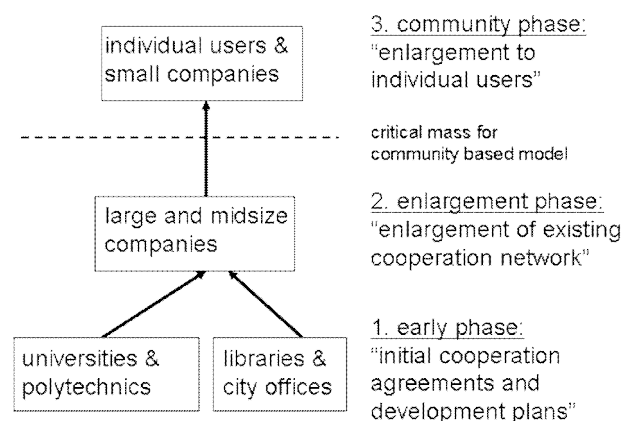

Figure 3 Development model for WLAN networks

After cooperation between first phase networks has been successfully done and tested, network can enlarge its

offerings to corporate customers. Corporations have also potential user groups already available, but they are not most likely to be willing to join as founding members. Thus second phase is very suitable for them to join the network.

Successful combination of first phase cooperation networks to second phase company networks can enable network to achieve critical mass of user base and access points to begin community based network model e.g. OpenSpark. By sharing individually owned access points to other community members access point owner increases his own value by getting access to other access points as well. Clearly this increase also total value of network with increasing amount of access points for its members.

3.2 Regulatory challenges concerning public WLAN access offerings

Since new business models have emerged after WLAN networks development began in 2003, current regulators have faced difficulties while trying to adapt old rules to new market situation. Main issues concerning these new network models are telecom operators' customers right to share their connection to outsiders in cases like OpenSpark community. Some operators have seen this as a threat to their business while others have allowed it and seen sharing of connections as value adding service for their customers. Increasing amount of wireless data usage will thus aid new WLAN service development by enlarging its user base. However, question has been raised about responsibility issues in case of network violations from shared access points.

Offering of free access points without authentication

Another main issue has been the challenge of defining term "telecommunication operator", since defined operators have legal responsibilities on reporting to Ficora about their spectrum usage and service quality. The challenge is who Ficora defines as operator depending on are they offering WLAN access to undefined users or defined user group. Ficora has published a memo [9] concerning this issue which should help definitions in future cases. From the viewpoint of municipalities, it is not desired to be described as telecommunication operator since that would create additional costs and unavoidable responsibilities [15].

3.3 Development after year 2006

Development in public WLAN coverage during year 2006 has clearly build promising foundation for enlargement in near future. Cooperation models and community based access points have been proved successful way to exploit incumbent network infrastructure and individual investments for common benefit. This has enabled WLAN technology to better achieve required critical mass of users to enhance service development. However, currently most of WLAN projects have been concentrated on rather small areas. In the future after those developing WLAN projects have matured with their coverage areas, market will probably see more cooperation between different separate networks which would combine their resources for larger network coverage for individual users. In addition, development of terminal equipment will play crucial role in development and customers' adoption to new services.

There are also possible new entrants to WLAN provider markets which might be able to capture their share of Finnish markets. Fon, originated from Spain, is currently building similar shared access network comparing to SparkNet solution [18]. Currently Fon operates already in various countries worldwide with thousands of access points. Also large foreign WLAN developer The Cloud has been exploring their possibilities towards operations in Finnish markets [21]. The Cloud considers themselves as largest WLAN operator in Europe thus giving them potential capabilities to enlarge their network to cover Finland. In addition, Digita and Siemens are opening new competing network for 450 MHz spectrum area during April in 2007 [23]. This new network could capture large share of potential customers especially in rural areas were distances are longer than in urban areas.

4 Conclusion

This paper presented public WLAN situation in Finland in October of 2006 from a viewpoint of city and municipal involvement. There have been clear sights of various development efforts in different areas of Finland and after few years network coverage will most likely be developed to rather different from current situation. However, there might raise new regulatory issues such as absence of authentication which might be denied by regulation if problems will emerge. This issue will clearly become more important when networks get more users in the future. Furthermore, it is currently not clear what effects will publicly offered WLAN access points have towards operators' revenues.

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