

Altai Outdoor Wi-Fi Network for Urban Application



With the wide availability of WiFi client terminals and the demand for mobility from the general public, enterprises and the governments, the growth of large scale WiFi network is ever-increasing. The trend is: from hotspots to hot zones and ultimately to city-wide WiFi. Building up for hotspots and hot zones is relatively easy in respect to network coverage, throughput capacity and network management. However, to build a large scale WiFi network covering all urban areas is completely another story.

1. The Problem

Those WISPs who had installed traditional mesh AP network had experienced the following problems that could not be completely overcome:

- **High site rental and backhaul costs** – out of the five major cost elements of an urban WiFi network, namely equipment, engineering, site rental, backhaul and operation costs, the site rental and backhaul costs occupy the two largest portions. Site rental costs are unavoidable as APs are needed to be installed at higher locations, usually at rooftop of low-raised buildings.
- **Lengthy deployment time** – the time required to install an urban network is highly depending on the number of sites required to install. For a typical mesh AP of coverage radius from 90 to 150 m, a few APs are required for almost every street. Just to cover urban areas of a small city, a quantity of tens of thousand of APs may be required and deployment may take over years.

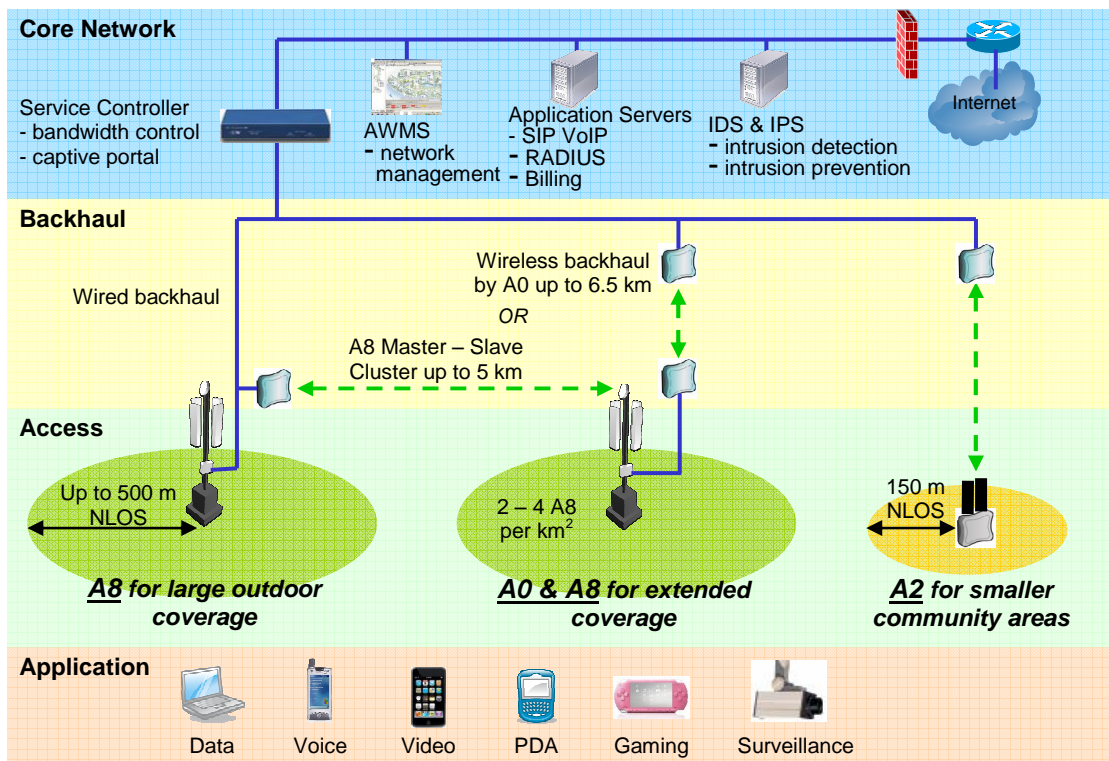
- **High signal interference environment** – different types of signal interference sources exist in urban areas, such as GSM, CDMA, WiFi or PCS etc. The result may not be just lowering the throughput, but it may also jam the channels.

2. The Altai Solution

With special care to the urban WiFi application market, Altai can fully comply with and exceed all the expectations mentioned above. A typical installation scenario and the corresponding network components are described below:

- **Primary coverage** – **Altai A8 WiFi Cellular Base Station** will be used for primary 802.11 b/g coverage. We can group up to 4 A8s together to form a cluster, with each slave or master providing a 20 Mbps usable throughput (thus a cluster can provide totally 80 Mbps throughput). A8 can provide a coverage radius of 350 to 500 m NLOS across the urban areas where the buildings are relatively low-raised. For congested high-raised building areas, the coverage is highly dependable on the building and street structure. A 250 m NLOS coverage radius along a street (i.e. 500 m span) can be used as a rule-of-thumb.

Network Diagram for Urban WiFi Network



- **Secondary coverage** – **Altai A2 WiFi Pico Access Point** provides a low cost alternative for filling coverage holes such as shadow areas behind tall buildings. It provides an average of up to 150 m NLOS radius 802.11b/g access coverage. A2 is very useful for small community areas such as parks, community halls, libraries and sport fields.
- **Backhaul and termination point** – **Altai A0 WiFi Bridge**, to be installed near wire termination point, provides flexible wireless backhaul connection to A8 built-in 5 GHz 802.11a radio, when fibre connection is not available at that site.

- **Network and client management** – *Altai WiFi Management System (AWMS)* will be used for full configuration, fault, security, performance, wireless link and client management with multiple languages, GUI and GPS network map support.
- **Service control** – Service Controller will be installed at backend to provide captive portal access control as well as user bandwidth control. Bandwidth control can be configured per SSID, base station or user. A8 can provide 16 levels SSID with independent priority and security setting for each SSID.
- **Application servers** – different application servers will be installed at backend. If VoIP service is required, SIP server will be used. RADIUS server can be used for user authentication.
- **Network security** – Altai WiFi system provides all necessary security features including WPA and WPA2-PSK, 802.1x (PEAP, TLS, TTLS) authentication, MAC address filtering, WEP, TKIP and AES encryption, SSID disable, intra-VAP traffic blocking, captive portal for guest access and physical security. Additional Service Controller can be used for per user, base station or SSID bandwidth control, captive portal and login password authentication. Optional Intrusion Detection and Prevention System can be used for further prevention of cracking and other malicious threats.

3. The Altai Advantage

- **500 m NLOS large outdoor coverage** – by using *multiple radios and multiple smart antennas technology*, extra antenna array gain, diversity gain and special gain from signal processing technique can be attained. A 3X increase in distance or 7X increase in area coverage can be achieved. Yet, the transmit power is relative low (default 21 dBm) to match with the low powered CPE such as PDA and SIP phone in the uplink for good voice quality in VoIP application.
- **Minimum installation sites (1/6 of mesh AP)** – by using *cellular backhaul architecture* similar to those of GSM or CDMA base stations, dedicated backhaul of 20 Mbps can be assigned to each A8, ensuring highest bandwidth possible for each user. A cluster bandwidth of as high as 80 Mbps can be provided.
- **65% saving in CAPEX and OPEX** – with much lower quantity of base station per area, Altai WiFi networking products can save your costs not only in hardware, but also in site buildup, installation, maintenance and operation, resulting in saving in total cost of ownership of as high as 65%! Fast deployment is another form of time cost saving as well.
- **Fast deployment in days** – each of the 4 sector antennas can be installed at different positions horizontally or vertically, and each of which can be adjusted in orientation and down-tilted angle allowing different target distances and cell shapes.
- **Superior noise mitigation** – by using patented *Adaptive Interference Control* and special signal sampling technique, A8 can operate in a signal environment with much interference and can co-exist with near-band radio equipment such as GSM and CDMA.
- **Special tube antenna for lamppost** – a special model with tube antenna as shown in Fig. 4 and 5 below is available. The colour and the cylindrical diameter can be tailor-made to suit different lamppost size.

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