



## HOW ALTAI WIFI MACROCELL FACILITATES SMALL CELLS DEPLOYMENT?

# WHITE PAPER

With the surge of mobile data traffic from Internet-based applications, traffic loads on cellular networks has increased tremendously over the past few years. To deal with the high data traffic in urban areas, the cellular operators used to split the existing cellular macrocells into a variety of small cells to increase the network capacity. However, Altai has a better solution in improving the throughput capacity by co-locating the Altai WiFi Macrocells to the existing cellular sites. This can easily turn a 3G network into a 3G+WiFi network.

## 1. The Altai WiFi Macrocell

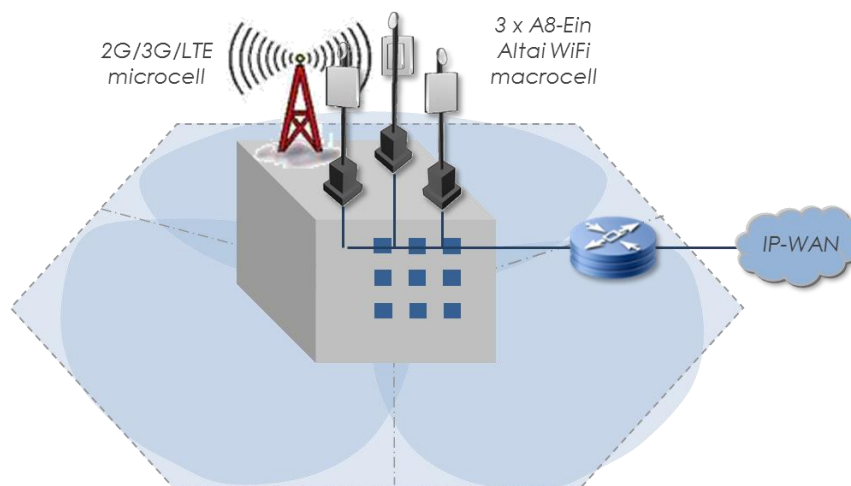
With the surge of mobile data traffic from Internet-based applications, traffic loads on cellular networks has increased tremendously over the past few years. To deal with the high data traffic in urban areas, the cellular operators usually split the existing cellular macrocells into a variety of small cells to increase the network capacity. Small cell encompasses microcells, picocells and femtocells with different environment and coverage range.

Besides the above small cells approach to increasing the network capacity and to also provide 3G/LTE data offload, the Altai WiFi Macrocell approaching simple and easier way to accomplish this task. Since the Altai Macro cell coverage matches closely to the footprints of micro cells as shown in below, the addition of Altai WiFi Macrocells to cellular sites by co-location can easily turn a 3G network into a 3G+WiFi network. The total cost of ownership can be substantially reduced up to 70% due to cost savings and facilities reuse in site acquisition, site rental, backhaul and power supply.

**Figure 1: Footprint Comparison of Altai WiFi Macrocell with 3G Microcell and Altai WiFi Macrocell vs. Standard AP**

Target Area and Range	3G/LTE Small Cell Approach	Altai WiFi Macrocell Approach	Content of Altai WiFi Macrocell	Corresponding Standard AP Solution
Outdoor, 100 to 1000 m	<b>Microcell</b>	<b>A8n WiFi Macrocell</b>	1 A8n to 3 A8-Ein	10 to 30 AP
Indoor, 10 to 100 m	Picocell	A2 Pico WiFi	1 A2	3 to 5 AP
Residential or small offices, 1 to 10 m	Femtocell	C1 CPE/AP	1 CPE	1 AP

**Figure 2: Altai WiFi Macrocell Co-locates with 3G Microcell Site**



### **Classical 3G/LTE Capacity Increase by Cell Splitting**

- To provide extra coverage over the blind spots of dense areas and extend the coverage into an indoor environment
- To increase the network capacity in areas where subscriber density and data usage is high such as urban areas, shopping centers or airports. For instance, in some densely populated areas, the number of subscribers covered by a base station may far exceed the number of channels available in that base station. In this case, the network operator can split the cells into smaller ones to alleviate the capacity problem. With a smaller coverage area, the total number of subscribers served by the base station will be smaller and hence the traffic loading with respect to the smaller size cell is alleviated.
- However, to meet the demand of increasing data traffic in the long term, cell splitting is not enough for future capacity boosts. Offloading 3G data traffic to a WiFi network with small cells is the optimum solution to cater for the increasing demand.

## **2. Advantages of Deploying Altai Macro WiFi over Small Cells**

### **Large Area Coverage Over Microcell Sites**

By using MIMO smart antenna technologies and a patented signal processing algorithm, Altai WiFi Macrocell provides a coverage range as far as 1700m in LOS environment and 800m in NLOS environment. Currently, WiFi coverage in outdoor environments is generally provided using a hotspot approach. Laptop or smartphone users have to be confined within a small spots like coffee shops and telephone booths for internet access. When users are out of the WiFi coverage range, generally around 100-150m for standard AP's, smartphones or laptops with dongles plugged in will automatically switch from WiFi to 3G/LTE network for mobile data usage. Therefore, such 3G/LTE + WiFi hotspot networks does not help too much on alleviating the data traffic of 3G/LTE network, especially for a group of highly mobile users.

Altai WiFi Macrocell approach using A8n series Super WiFi base station can be deployed in microcells to solve the discrete coverage problem. A8n, which matches the foot print of most 3G/LTE deployments in dense urban environment, can be co-located with the existing 3G/LTE cell sites to provide a seamless WiFi coverage over the microcells. Within the hotzone, mobile and nomadic users can access the Internet anywhere, not just the particular spots, via WiFi without switching back and forth between WiFi and 3G/LTE network.

**Figure 3: Example of WiFi Hotzone Provision for China Mobile 3G in Kunshan, Suzhou, China by using A8**



### **Substantial Reduction in the Number of APs Deployed in a Picocell Environment**

With the feature of highly density population in a picocell environment, mobile data traffic is normally congested in a 3G/LTE network. Therefore, it is better to deploy a WiFi network to offload the 3G/LTE data into a picocell environment such as building complexes or shopping malls. Traditionally, a large number of APs shall be installed inside the complicated areas for NLOS environment to provide the required RF coverage. The design of Altai WiFi macrocell is to extend the coverage from outdoor to indoor by using C1 or U1 CPE, which can increase the power of signal coverage to indoor NLOS areas WITHOUT the requirement of laying Ethernet cables. If, however, an Ethernet line is available, Altai WiFi AP A2 can be used and it can be installed in NLOS environment where capacity requirements are the greatest. On average, fewer numbers of A2 are required to provide picocell coverage compared to other traditional APs. Therefore, this will create great savings for operators to offload 3G/LTE data using the minimum number of APs.

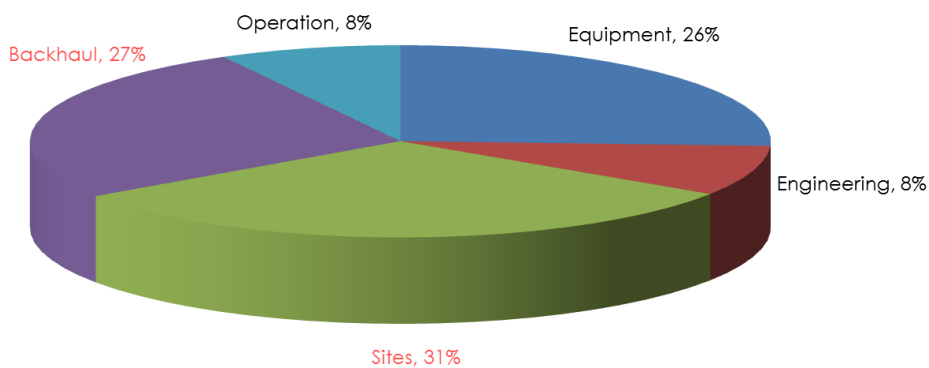
### **Effective Savings on Site Acquisition, Radio Planning and Installation**

Standard AP performance degrades substantially when co-locating with cellular sites and may not be workable in high in-band interference environments. However, with the use of high performance filters and a low spurious emissions design, Altai WiFi Macrocell provides better radio interference mitigation which allows co-location with cellular antennas as close as 50cm while maintaining good performance at high in-band interference environments without interruption to existing cellular infrastructures. This interference control and spurious emissions management allows operator to co-locate the WiFi macro cell with their existing cellular site. The operator can greatly reduce the cost of site acquisition and installation (CAPEX saving), reuse site facilities such as site rental, power supply and backhaul (OPEX saving), as well as plug-and-play roll-out 3G/LTE + WiFi network service (fast deployment).

**Reduction in TCO**

From our previous white paper on cost elements of city-wide WiFi network analysis, we can see from the following diagram that the Site cost and Backhaul cost are the two largest cost elements amongst the five cost elements in a typical large scale WiFi network using standard AP's. Therefore, the importance of deploying WiFi using cellular site co-locating is exactly to reduce or better eliminate these two cost elements. A totally up to 58% of the project cost can be saved just by reducing these two elements. Together with other cost element reductions, a total 70% saving in TCO could be possible!

**Figure 4: Cost Elements Distribution in Typical Large Scale WiFi Deployment**



**Summary**

The following summarizes the key features of the Altai WiFi Macrocell solution and highlights the advantages of deploying Altai WiFi Macrocell in small cells for operators to offload their 3G/LTE data with a WiFi network.

Altai WiFi Macrocell Features	Distinct Advantages over Standard AP	Key Benefits to Operators for 3G/LTE Data Offload in Small Cells
<ul style="list-style-type: none"> <li>• Smart antenna technology</li> <li>• Multi-radio architecture</li> <li>• Patented digital signal processing algorithm</li> <li>• Robust in-band filtering and low spurious emission design</li> </ul>	<ul style="list-style-type: none"> <li>• Enhanced RF coverage for NLOS in small cells</li> <li>• Better interference mitigation and maintain system robustness under the complicated environments of small cells</li> <li>• Maintain high throughput and capacity in small cells that have high interference</li> </ul>	<ul style="list-style-type: none"> <li>• Minimal number of AP's required</li> <li>• Minimal total cost of site acquisition, radio planning and installation by co-locating AP's with existing cellular infrastructure</li> <li>• Rapid service roll-out for 3G/LTE + WiFi network by site facilities reuse</li> </ul>

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Dec 14, 2012

Revised on Jul 19, 2013