

UMTS Base Station Feeding Using Alvarion's WALKair 3000

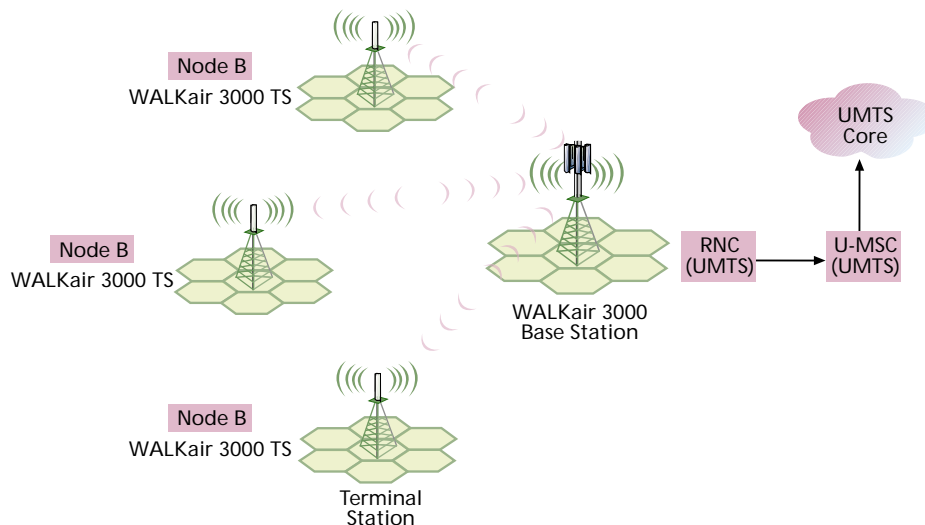
Introduction

As Universal Mobile Telephony Service (UMTS) becomes a viable market reality, the need for more sophisticated and efficient backbone solutions, capable of adequately addressing this next generation of mobile systems, becomes ever more apparent. To cost-effectively address all the needs of their subscribers, UMTS operators require solutions that afford them maximum power and flexibility. UMTS solutions must be optimized for data and be capable of working with all standard communication protocols, including ATM and IP. Further, they must be able to transport the data efficiently and robustly from base stations to the backbone.

Alvarion's WALKair 3000, a state of the art Point-to-Multipoint wireless communications system designed for broadband applications, is the optimal solution for UMTS backhauling requirements. The WALKair 3000 system exhibits extremely high reliability, allows for link protection and diversity and provides the interfaces required by cellular telephony networks. WALKair 3000 allows a simple backhaul structure, with a large coverage area and flexible bandwidth support in conjunction with a simple installation and easy network planning.

Its advantages include:

- Capacity - with the highest cell capacity in the market, WALKair 3000 allows symmetrical data rates of up to 36 Mbps per carrier of 14 MHz and up to 1 Gbps capacity per cell. Such high cell capacity can service many Node-B bases, even in dense areas.
- Multiple Interfaces & Services - WALKair 3000 supports a wide variety of communication protocols, including E1, 10/100BaseT, IP, VoIP, VLAN, and ATM
- Quality of Service (QoS) is provided over both IP and ATM backbones.
- Frequencies - WALKair 3000 supports ETSI-certified frequency bands at 26 GHz and 28 GHz.
- Reliability - WALKair 3000 is a carrier-class system suited for networks with the highest demands.
- Scalability - The WALKair 3000 is a Pay-As-You-Grow system. It is designed to enable a low initial investment, while offering carriers the ability to build-out quickly and easily with additional interfaces, higher bandwidth demand, and greater spectrum allocation.



UMTS Base Station PMP Feeding Application (diagram 1)

UMTS Base Station PMP Feeding Application Architecture

In a UMTS network architecture, each base station Node-B must be connected to a Radio Network Controller (RNC). The RNC basically functions as an aggregator to collect several Node-Bs and their UMTS subscribers' traffic to the UMTS Mobile Switching Center (U-MSC) towards the UMTS core.

The PMP Feeding application is the most cost effective and popular approach employed by Mobile operators for carrying the subscribers' voice and data traffic from the cellular Base Stations (Node-B) to the Base Station Controller (RNC).

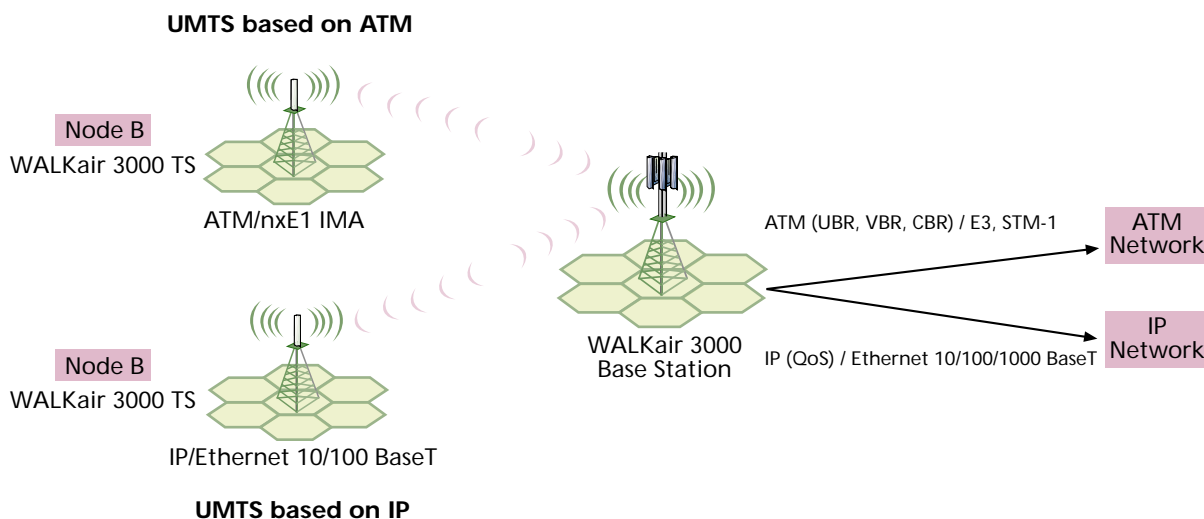
To interface with the UMTS ATM backbone towards the RNC, the WALKair 3000 Base Station uses STM-1 or E3 for the current phase of the UMTS ATM based network. In addition, the system uses 10/100/1000BaseT Ethernet interfaces to support the second phase of UMTS IP based networks. In this respect, the WALKair 3000 system is ideally suited for migration from today's ATM-based UMTS network to future IP-based networks. A WALKair 3000 Terminal Station (TS) is installed at each UMTS Base Station site. To interface with the UMTS Base Station Node-B, the TS supports nxE1 IMA.

Employing WALKair 3000 for UMTS Base Station PMP Feeding

Unparalleled Features Set – Fully Suited For UMTS Feeding Cell Capacity

Optimizing utilization of the available spectrum is a central goal of UMTS transmission networks. A backhaul system that maximizes cell capacity is able to minimize the number of base stations required, and thereby to reduce the mobile operator's capital and operational expenses. The following features enable WALKair 3000 to fully utilize allocated bandwidth and to provide the highest possible system capacity:

- Spectral Efficiency - Maintaining spectral efficiency of 2.5 b/sec/Hz, the WALKair 3000 can deliver a net payload of 36 Mbps per carrier over 14 MHz of bandwidth and up to 1 Gbps capacity per cell. This implies that the system can deliver about 50 Mbps/km² for an available band of 56 MHz in Urban/Dense-Urban areas covered by typical cells (Cell radius of 2-3 km).
- Frequency Reuse - The WALKair 3000 allows up to 8 sectors in a cell, achieving frequency reuse of 1:4 in full cellular deployment.
- Dynamic Bandwidth Allocation - WALKair 3000 allows for full utilization and dynamic split between voice and data networks.
- Minimal overhead - Transmitting IP and/or ATM data over an IP-based air protocol minimizes overhead, improving overall efficiency and capacity.



WALKair 3000 supports ATM/IP UMTS networks (diagram 2)

Future migration from ATM to IP Based

UMTS networks

Since the WALKair 3000 supports both ATM and IP protocols, it is flexible in its support of both ATM and IP-based UMTS networks.

Moreover, the WALKair 3000 offers a simple and cost effective migration from ATM to future IP-based UMTS networks. Diagram 2 illustrates both options.

As shown by diagram 2, both networks can operate simultaneously over the WALKair 3000 system, thus allowing a smooth and uncomplicated migration from an ATM-based to an IP-based UMTS system while maintaining the end-to-end QoS for both environments.

Network-sharing for UMTS

Collocation is an option for future UMTS networks. To support network sharing, the transmission network must have the intelligence to internally separate traffic from different networks over shared physical links. WALKair 3000 offers two different types of traffic separation methods:

1. Over an ATM network - The WALKair 3000 maps each partner network to different PVCs over the ATM network.
2. Over an IP network - The WALKair 3000 maps each partner network to a separate VLAN.

In each case, both networks maintain full privacy and security, together with guaranteed bandwidth-on-demand maintaining the required end-to-end QoS. Collocation can be implemented either at the Node-B site, allowing two or more networks to share a Terminal Station, or at the Base Station site.

BWA Applications

The multi-service approach of the WALKair 3000 offers mobile operators a wide variety of options for utilizing the system to expand their revenue base without significantly increasing expenses. In dense business areas, operators can draw on the residual capacity of WALKair 3000 terminal stations, located on tall office buildings, in order to offer additional enhanced services such as:

- Voice and Data in emerging and lucrative market segments, such as Small-Medium-Enterprises (SME), Corporate Branch offices (MTU/MDU) and Large Corporations
- E1/FE1 and IP services in conjunction with end-to-end QoS to business customers

- Excess transmission capacity for other cellular operators

Scalability

With data traffic increasing exponentially, carriers require a network infrastructure that is capable of sustaining continuous growth while retaining flexibility and modularity. WALKair 3000 offers state-of-the-art scalability with the following features:

Terminal Station

- Additional capacity - performed remotely by the Network Management System, the WALKair 3000 eliminates the need to modify the Terminal Station.
- Additional interfaces - the WALKair 3000 Terminal Station can accommodate a variety of interface cards, added through the simple insertion of an expansion board and connectors.

Base Station

The WALKair 3000 Base Station consists of an ETSI chassis with full redundancy of all indoor and outdoor equipment allowing scalable growth in services, bandwidth and spectrum.

Additional Basic Unit cards can be added to the Base Station chassis simply and quickly, while ongoing traffic flows uninterrupted. Due to WALKair's Multi-carrier outdoor units, the addition requires no supplemental antennas in an operating sector. Further, the units can be configured ahead of time from the Network Management System.

Reliability

The WALKair3000 conforms to the highest reliability standards:

1. Redundancy - Full redundancy of the indoor and outdoor units of the WALKair 3000 - including power supplies, fans, basic unit cards, network interface cards, IF MUX, Antennas and RFU - guarantees the highest availability.
2. Automatic Dual Modulation - By automatically and manually switching modulation per TS, the WALKair 3000 guarantees enhanced coverage and availability. It offers a robust air link between Terminal Stations and Base Stations all year long and in all weather conditions.

Positive Business Case Model For PMP Feeding

Application

Cellular operators who leverage PMP equipment for feeding applications are pursuing a solid business case model that can significantly increase their revenue generation:

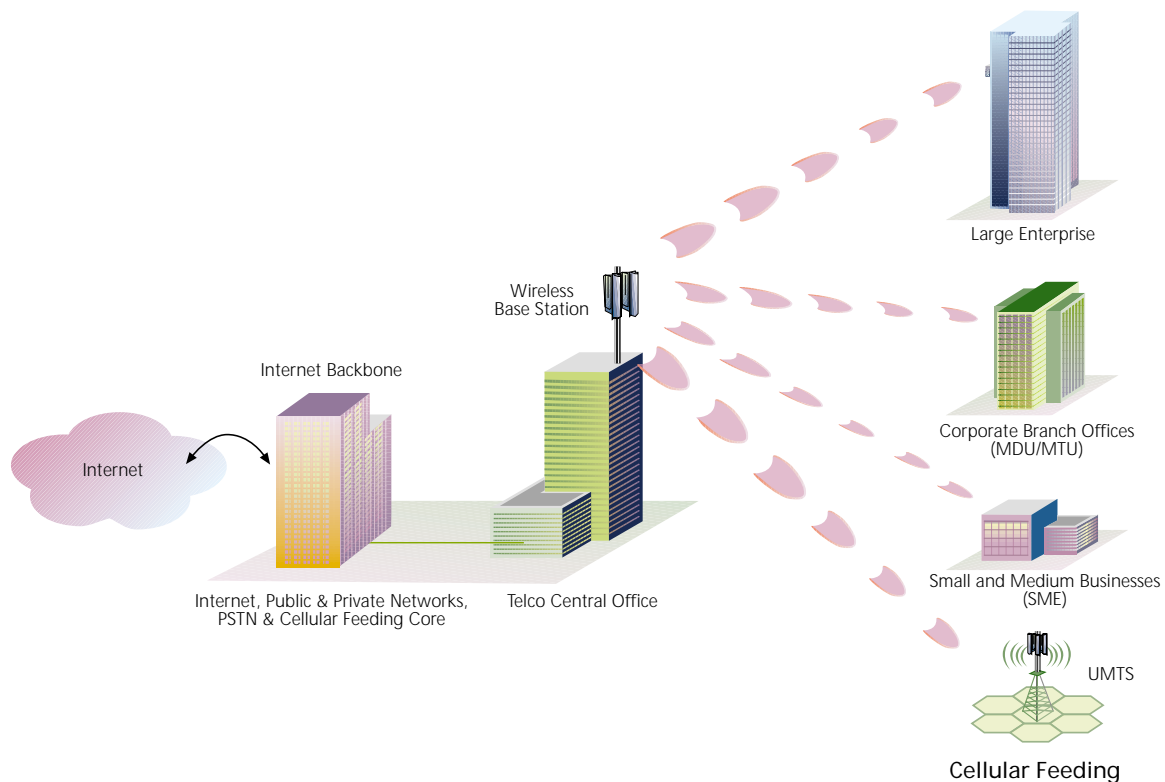
- Cellular operators are typically strong, established carriers with a firm financial standing, extensive infrastructure investments, and a large and established multi-segment customer base.
- Cellular operators have developed the business and operation support systems (BSS/OSS) to ensure circuit provisioning, billing, network management and maintenance as well as sales and marketing.
- Cellular operators nearly all have experience in building wireless networks and running voice and data services.
- When compared to traditional base station feeding options, point-to-multipoint solutions present significant advantages over other backhaul technologies in terms of cost, deployment speed, scalability and flexibility. With point-to-multipoint,

cellular operators can replace leased lines with high monthly charges. Point-to-Multipoint wireless base station feeding solutions provide functions equivalent to wire-line and point-to-point microwave links. They have lower equipment cost, are quicker to deploy and require less space for equipment and antennas. Point-to-multipoint solutions scale easily to support subscriber growth, and enable the high bandwidth required to support data services, as their popularity grows. *

- Cellular operators deploying point-to-multipoint systems for base station backhaul can utilize the same infrastructure with relative ease and leverage their existing customer base to provide Broadband Wireless Access services to business and residential users. Cellular Operators can thus capitalize on additional revenue sources by providing new services and applications using the same infrastructure and with minimal additional cost. **

* For more information, please view our Cellular Feeding White Paper

** For more information, please view our Business Case for BWA White Paper



Converged BWA and Cellular Backhauling Application

Road Map Evolution: Launching UMTS Over the Airwaves

UMTS deployment status:

- First Phase: UMTS trials and initial deployments in Europe have commenced in 2002.
- Second Phase: Commercial deployments will be installed during 2003. Comprehensive deployment is forecasted for the end of 2003 and is expected to intensify during 2004. The technical requirements for a BWA PMP system necessary for driving the UMTS Base Station feeding application are as follows:
 1. The UMTS Base Station feeding application by a BWA PMP system will use mainly the 28 GHz RF band in Europe and in some cases, the 26 GHz as well.
 2. For the trials and initial deployments until mid 2002: Up to 2xE1 IMA ports at the TS will be used for Node-B feeding connectivity. However, the actual required bandwidth will be in the range of 20% to 50% from the maximum available capacity.
 3. For the actual commercial deployments from the end of 2003 and during 2004: 4xE1 IMA ports at the TS will be used for Node-B feeding connectivity. In a steady state phase of the deployment the actual typical capacity figures will be about 50% of the total available capacity.
 4. For both of the aforementioned phases, an ATM type of connectivity between the BWA Base Station towards the ATM Backbone and the RNC is required.
 5. Readability and high availability capabilities are required from the system

The following WALKair 3000 road map schedule is synchronized with the UMTS deployment schedule as described above. Furthermore, the road map features content is fully adjusted to the UMTS actual deployment schedule in order to meet the UMTS technical requirements on each of the deployment phases and to smooth the process of efficiently installing the UMTS Base Station PMP feeding infrastructure.

1. WALKair 3000 currently supports the first phase of the UMTS feeding application with the following features:
 - 26 & 28 GHz ETSI RF band - In Europe, the UMTS PMP feeding application is provided primarily over the 28 GHz frequency

- Base Station Shelf with nxE1 card - Clear E1 channels are mapped from the CPE E1 ports towards the UMTS Backbone via the NIU (Network Interface Card) type of nxE1 at the BS shelf. These clear E1 channels carry the ATM traffic in IMA format.

The IMA functionality is supported by a dedicated card in the ATM access switch that is located on the front of the WALKair 3000 BS. As a result, Alvarion supports a transparent solution for UMTS Node-B PMP feeding towards the RNC. This solution complies with the UMTS trials and the UMTS initial deployments that transpired in 2002.

2. WALKair 3000 will support the second phase of the UMTS feeding application in July of 2003 when the following features will be supported:
 - nxE1 IMA functionality - The ATM traffic in IMA format will be mapped from the CPE E1 ports towards the UMTS Backbone via the NIU (Network Interface Card) type of ATM (E3 or STM-1) at the BS shelf. The nxE1 IMA traffic coming from Node-B will be mapped from the TS over ATM interface type at the BS towards the RNC.
 - DBA (Dynamic Bandwidth allocation) for efficient air bandwidth control for the ATM IMA traffic type.

This comprehensive solution will eliminate the need of an ATM access switch for IMA functionality that is located on the front of the WALKair 3000 BS. As a result, in mid 2003, Alvarion will support a comprehensive and a cost effective solution for the UMTS Node-B PMP feeding application. This solution will fully correspond with the UMTS commercial deployments that are expected to go forward currently and until 2004.

Conclusion

The WALKair 3000 point-to-multipoint system is an ideal solution for UMTS backhaul applications. WALKair 3000 maximizes spectral usage and link capacity, and serves as a perfect hybrid between the ATM and IP worlds with their associated QoS mechanisms. When compared to point-to-point solutions, the WALKair 3000 is substantially more cost-effective, offers better coverage area, and provides seamless support for network-sharing environments.

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