

## GPRS Base Station Feeding Using Alvarion's WALKair Point-to-Multipoint Wireless Solutions

### Introduction

General Packet Radio Services (GPRS) technology enables mobile telephony networks to efficiently provide IP based services such as Internet access, chat, audio and video. GPRS enables a totally new service portfolio for mobile end users, introducing opportunities for mobile network operators to create profitable growth from the increasing mobile usage.

At the BSC, the GPRS data is split off from telephony traffic and is sent over a designated data network. GPRS users can access packet-based services at speeds of 56Kbps to 114Kbps. This leads to a significant increase in required capacity.

To support the added load, mobile operators implementing GPRS usually reduce the coverage radius of base stations, significantly increasing the total

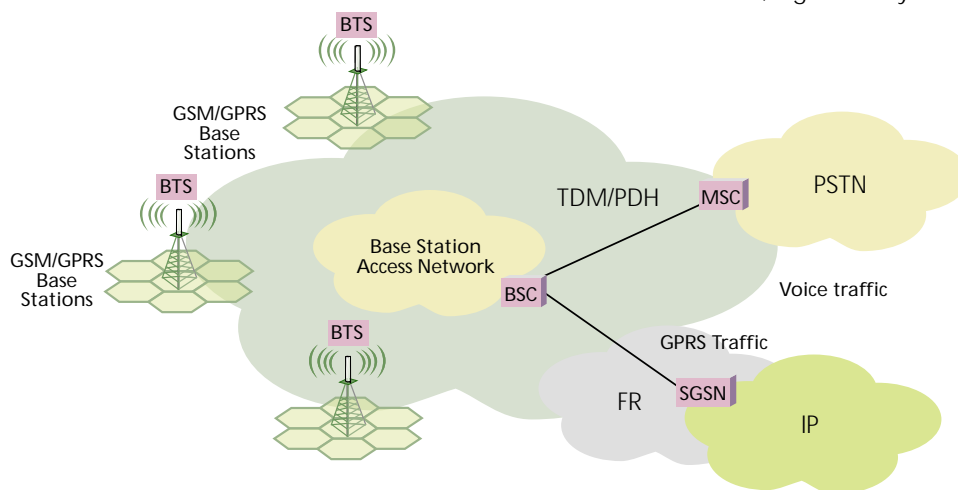


Figure 1 - GPRS Mobile Base Station Structure

GPRS implements packet switching as an overlay of the existing circuit switched mobile network. Thus it is relatively simple to add GPRS to an existing mobile infrastructure. Only a few additional components are required. The use of packet switching makes GPRS highly spectrum efficient: radio resources are shared between data and voice mobile users, and used only when data is actually being exchanged.

Figure 1 illustrates the GPRS mobile telephony base station architecture. In a GSM based GPRS network, telephony and IP traffic is backhauled between the Base Transceiver Station (BTS) and the Base Station Controller (BSC) over the base station access network, using circuit switched infrastructure.

number of base stations by installing micro-cells and pico-cells. This leads to an increased transmission capacity in the parts of the network where transmission lines from various base stations start accumulating into wider streams. The evolution at this stage is to expand the Base Station Access Network with new hub sites at central locations and distribute capacity for base station from these points.

The Base Station Access Networks are most often both owned and operated by mobile networks as a strategic asset. Microwave access dominates in base station access network implementations, as it is often the fastest means for network roll-out and capacity - expansion.

While Point-to-Point links are very common they have their disadvantages, which include difficult installation, licensing complexity, fixed bandwidth allocation and large antenna mast at the BSC site.

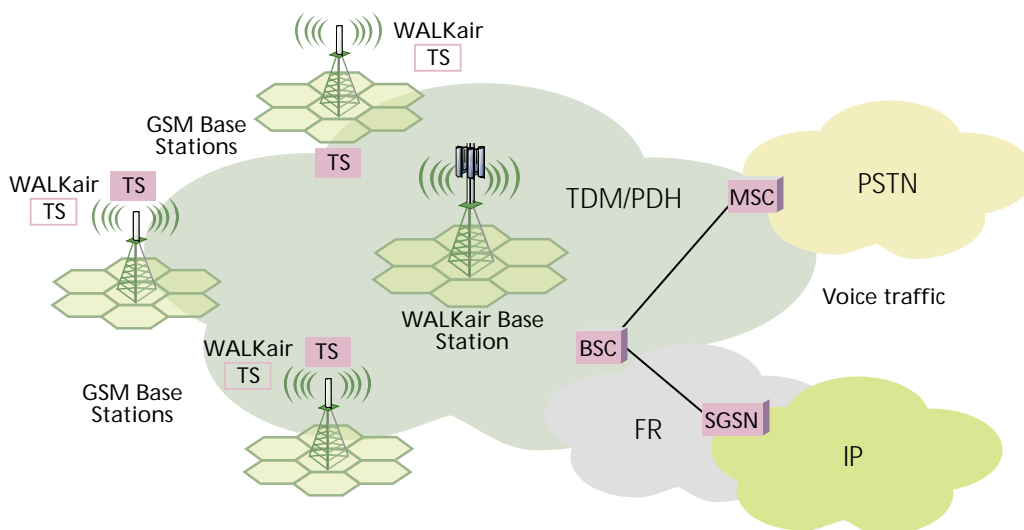
When the number of base stations increases due to GPRS implementation, and the backhaul infrastructure must be upgraded, Point-to-Point links may prove to be too inflexible for quick and cost-effective deployment.

This application note introduces a highly effective alternative for the upgrade of the base station access network to GPRS: Point-to-Multipoint wireless backhaul using Alvarion's WALKair 1000 system. Point-to-Multipoint allows operators to flexibly provide support for the additional base stations and increased capacity required to support GPRS traffic.

Figure 2 illustrates a WALKair 1000 GPRS base station backhaul solution. A WALKair 1000 Terminal Station (TS) is placed at each GPRS base site. A single WALKair 1000 base station is installed at the GPRS BSC, concentrating telephony and packet data traffic from all the associated BTS sites.

Designed for scalability and availability, the WALKair1000 Base Station is comprised of an ETSI chassis with full redundancy of all indoor and outdoor equipment allowing for scalable growth in services, bandwidth and spectrum. WALKair's small footprint is also ideal for dense urban scenarios where often esthetic considerations apply.

Figure 3 illustrates the components of the WALKair 1000 system. The WALKair 1000 system includes a Base Station and multiple Terminal Stations (TS).



**Figure 2 - GPRS Mobile Base Station Feeding with WALKair 1000**

Point-to-Multipoint systems feature simpler installation, one time licensing procedure, dynamic bandwidth and fewer antennas, making them extremely attractive to GPRS operators.

### WALKair 1000 in the Base Station Access Network

WALKair 1000 is a state-of-the-art Point-to-Multipoint wireless access system designed for broadband applications, which can provide an optimal solution for GPRS base station backhaul. WALKair systems operate in the 3.5GHz, 10.5GHz and 26GHz licensed frequency bands, and provide a total capacity of up to 512Mbits/sec.

The WALKair 1000 Terminal Station (TS) is compact and simple to install, with an outdoor footprint of less than 30x30cm. Each TS supports up to two full E1's of net capacity. A WALKair 1000 terminal consists of an indoor unit (IDU) and an outdoor unit (ODU) which comprises a Radio Frequency Unit (RFU) and an integrated antenna.

The IDU and ODU are connected to each other using an intermediate frequency interface and cable.

The WALKair 1000 Base Station is a modular hub, which aggregates traffic from as many as 16 Terminal Stations. It presents E1, V5.2 or Ethernet interfaces to the network. The entire base station can provide a total network capacity of 64 E1 in 14 MHz of spectrum,



**Figure 3 - WALKair 1000 Base Station and Terminal Station**

which can be divided among the Terminal Stations as required, using flexible bandwidth allocation. The WALKair 1000 base station features one or more Scalable Basic Unit (BS-BU). Each of these units uses a 1.75MHz carrier and is connected to an intermediate frequency multiplexer (IF-MUX), which combines traffic to a single outdoor unit, consisting of an RFU and an antenna. One IF-MUX and ODU combination is installed per sector.

### **Advantages of WALKair 1000 as a GPRS Base Station Feeding.**

With WALKair, mobile operators introducing GPRS into their network incur the following benefits:

- High capacity: Up to 2xE1 per mobile base station, up to 256xE1 per BTS.
- Bandwidth flexibility - Concentration, aggregation and grooming of Nx E1 from several base sites to the Base Station Controller (BSC).
- Highly cost effective solution.
- Interface flexibility: E1, Fractional E1 and Ethernet.
- Location flexibility: Base sites can be placed anywhere in coverage area
- Frequencies flexibility - WALKair1000 supports ETSI certified frequency bands at 3.5, 10.5 and 26GHz.
- Power Flexibility - Base station operates on - 48 VDC power source. TS operates at - 48VDC or 220VAC.

- Reliability - WALKair1000 is a carrier class system suited for networks with the highest availability demands.
- Scalability - The WALKair1000 requires a low initial investment with quick and simple addition of interfaces and throughput.
- Reduced antenna mast loading at BSC site
- Small footprint - Outdoor units are 30x30cm. Indoor units are mountable in outdoor cabinets and shelters.

### **WALKair 1000 Capacity Considerations**

Optimizing the use of available spectrum is one of the main goals of a GSM/GPRS backhaul network. A system that maximizes cell capacity minimizes the number of hub sites required, and thus reduce the operator's capital and operational expenses. WALKair 1000 is highly efficient at utilizing available bandwidth, and thus offers the highest system capacity due to the following factors:

- High Spectral Efficiency - With a spectral efficiency of 2.5b/sec/Hz the WALKair1000 is capable of delivering a net payload of 4/8 Mbps over carriers of 1.75/3.5 MHz respectively. Capacity calculations show that for an available band of 28 MHz and a macro call size of 2Km in Urban/Dense-Urban area, the system can deliver at least 10 Mbits/km<sup>2</sup>.
- Frequency Reuse - The WALKair1000 allows a maximum of 8 sectors in a cell achieving a frequency reuse of 1:4 in full cellular deployment.

### **Additional Revenue Opportunities**

Mobile operators implementing a WALKair 1000 backhaul network can also benefit from additional revenues by utilizing spare capacity for other Fixed Wireless Access applications. Connecting business customers via Ethernet, Frame Relay, Leased Line or ISDN applications to data or voice networks could be one example of such utilization. Furthermore access backhaul capacity can be sold to other mobile operators to support their backhaul requirements.

### **Summary**

Increasing subscriber numbers and share of data traffic creates a significant growth in the transmission capacity.

Radio based transmission is used for the last mile access to a greater extent. Incorporating Point-to-Multipoint technology in the Base Station Access Network allows for cost effective and bandwidth efficient backhauling of mobile traffic to the core network. Mobile operators installing GPRS upgrades to their GSM networks should consider the benefits of using Alvarion's WALKair 1000 Point-to-Multipoint radio systems to support the increased transmission requirements. WALKair 1000 can

reduce cost, increase speed of deployment and allow flexibility unavailable with alternative backhaul solutions. With WALKair 1000, implementing GPRS can be easier and more profitable.

Today the WALKair products are implemented in several mobile networks around the world as backhauling solutions. With some networks extending to hundreds of BTS connected, mobile operators leverage on the advantages of efficient and secured PMP Access System.



[www.alvarion.com](http://www.alvarion.com)

**International Corporate Headquarters**  
Alvarion Ltd.  
Tel: +972 3 645 6262  
Fax: +972 3 645 6222  
Email: [corporate-sales@alvarion.com](mailto:corporate-sales@alvarion.com)

**North America Headquarters**  
Alvarion Inc.  
5858 Edison Place  
Carlsbad, CA 92008  
Tel: +1 760 517 3100  
Fax: +1 760 517 3200  
Email: [n.america-sales@alvarion.com](mailto:n.america-sales@alvarion.com)

**Latin America & Caribbean**  
7491 W. Oakland Park Blvd.  
Suite 304  
Lauderhill, FL 33319 USA  
Tel: +1 954 746 7420  
Fax: +1 954 746 9332  
Email: [lasales@alvarion.com](mailto:lasales@alvarion.com)

**Asia Pacific**  
Room 2602,26/F  
Laws Commercial Plaza  
788 Cheung Sha Wan Road  
Kowloon Hong Kong  
Tel: +852 2786 9996  
Fax: +852 2310 0062  
Email: [far.east-sales@alvarion.com](mailto:far.east-sales@alvarion.com)

**Brazil**  
Ar. Brigadeiro Faria Lima, 1685  
1st floor -room 1C  
Sao Paulo 01452-001 Brazil  
Tel: +55 11 3815 6225  
Fax: +55 11 3813 0467  
Email: [brazil-sales@alvarion.com](mailto:brazil-sales@alvarion.com)

**China**  
Rm.803, Tower 1,  
Bright China Chang An Building, No.7  
Jianguomen Nei Avenue  
Beijing 100005 China  
Tel: +86 10 6510 2800  
Fax: +86 10 6510 2803  
Email: [china-sales@alvarion.com](mailto:china-sales@alvarion.com)

**Czech Republic**  
Detsky Dum  
Na Prikope 15  
110 00 Praha 1 Czech Republic  
Tel: +420 222 191 233  
Fax: +420 222 191 200  
Email: [czech-sales@alvarion.com](mailto:czech-sales@alvarion.com)

**France**  
Le Saint James, 3 Chemin de la Dime  
95700, Roissy en France  
Tel: +33 1 34 38 54 30  
Fax: +33 1 34 38 54 39  
Email: [france-sales@alvarion.com](mailto:france-sales@alvarion.com)

**Germany**  
Landsberger Str. 302  
80687 Munich, Germany  
Tel: +49 89 90405 923  
Fax: +49 89 90405 922  
Email: [germany-sales@alvarion.com](mailto:germany-sales@alvarion.com)

**Japan**  
Bureau Toranomon #1004  
2-7-16 Toranomon, Minato-ku,  
Tokyo 105-0001, Japan  
Phone : + 81-3-3506-7616  
Fax: + 81-3-3506-7616  
Email: [alvarion-japan@alvarion.com](mailto:alvarion-japan@alvarion.com)

**U.K. & Ireland**  
15 Liberty House  
New Greenham Park, Newbury  
Berkshire, RG19 6HW England  
Tel: +44 845 450 1414  
Fax: +44 845 450 1455  
Email: [uk-sales@alvarion.com](mailto:uk-sales@alvarion.com)

**Romania**  
1 Natiunile Unite Blv., Bld. 1081  
2nd floor,  
Bukarest 705052, Romania  
Tel: +40 1 335 7631  
Fax: +40 1 335 7634  
Email: [romania-sales@alvarion.com](mailto:romania-sales@alvarion.com)

**Russia**  
16, Bld. 47, 3th Mutishinskaya,  
11th floor, office 1101  
129626 Moscow, Russia  
Tel: +7 (095) 737-88-06  
Fax: +7 (095) 287-98-99  
Email: [info@alvarion.ru](mailto:info@alvarion.ru)

**Uruguay**  
Bolonia 1976  
Montevideo, Uruguay 11500  
Tel: +598 2 606 2651  
Fax: +598 2 606 2652  
Email: [lasales@alvarion.com](mailto:lasales@alvarion.com)