When indoors – are you really covered?

The Flexible Compact BTS Solution

The incredible success of GSM, brings with it new challenges. As the subscriber base grows, networks are being stretched to support the demand for the heavy increase in traffic both outdoors and indoors. To overcome these challenges and plan for the future, Lucent Technologies has developed a solution to suit the coverage needs of the indoor user. With Lucent's Compact Base Transceiver Station (BTS-2000/2C) as the backbone behind this solution, coupled with Lucent's SQUEEZE, customer satisfaction is guaranteed.



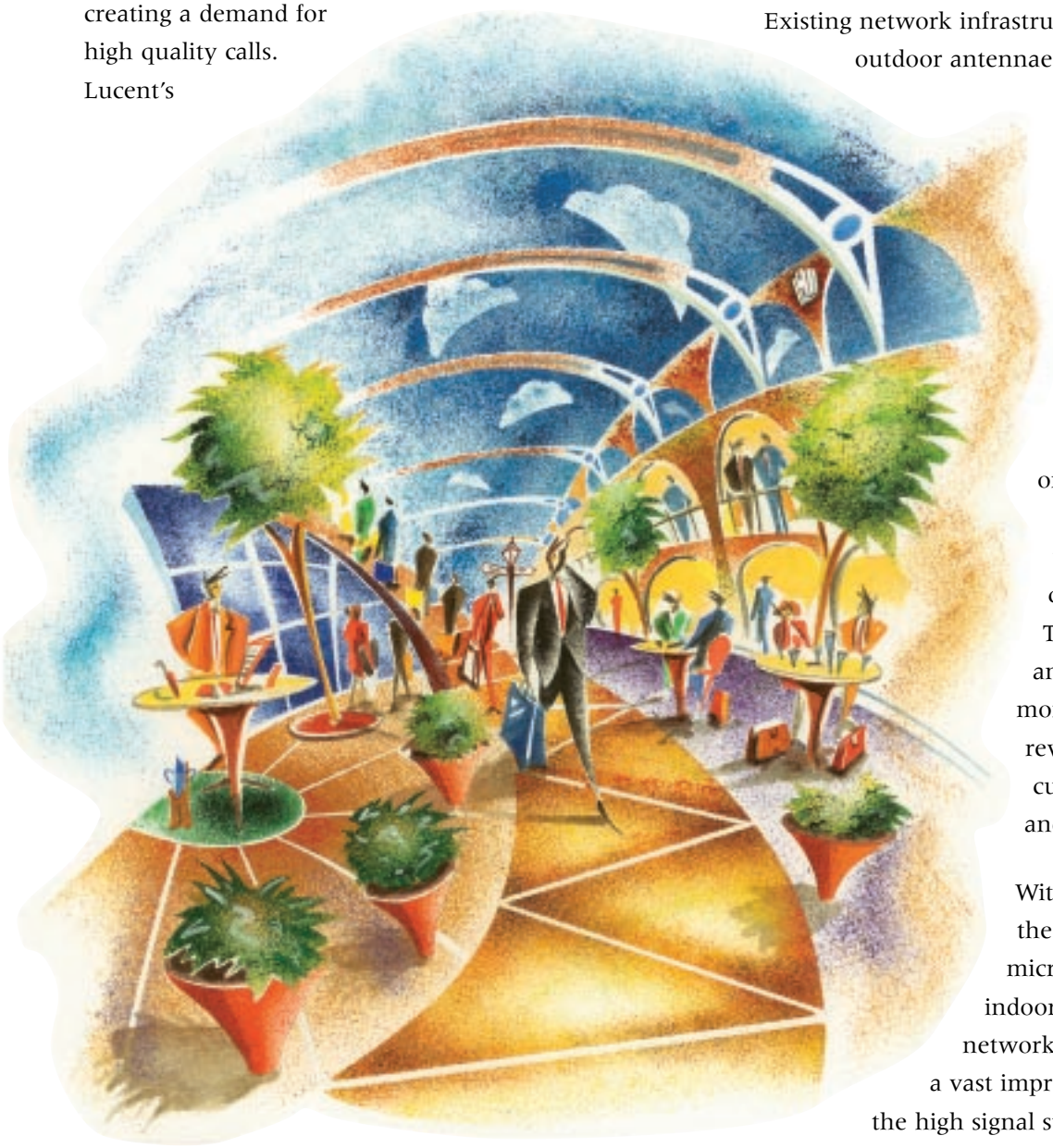
Lucent Technologies understands the importance of flexibility in network design and optimisation to fulfil quality and capacity requirements. We also understand how to combine our experience, tools and products in a manner that will enable the operator to maximise their use of the full frequency spectrum. The following applications are examples of how Lucent's indoor microcellular solution can benefit operators in obtaining even higher capacity within their existing network.

LUCENT HAS IT COVERED

Often when moving indoors, mobile users find that the quality of their phone calls are greatly reduced or sometimes the calls are even dropped. When operating indoors, mobiles suffer considerable variation in the level of both the signal and interference received, owing to a combination of

the screening and reflections produced by the internal structure of the building.

Shopping malls generate large amounts of traffic due to the high subscriber density. For example, busy shoppers and office workers taking a lunch break in a coffee bar may wish to make business calls or tie up with friends, hence creating a demand for high quality calls. Lucent's



Compact BTS is ideal in these situations as it can be discreetly installed due to its small size and elegant design. Either of its integral antenna or a series of small distributed antennae can be used to provide coverage for the whole shopping mall.

The Lucent indoor microcellular solution can also be used for exhibition halls, railway stations and airports, which are other examples of indoor areas that experience high traffic levels. The Compact BTS brings instant relief, ensuring customer satisfaction is optimised, and creating extra revenue.

Existing network infrastructure using outdoor antennae cannot cover subway stations due to the ground acting as a shield to high frequency radio signals. Lucent's Compact BTS can easily be installed in ticketing areas and on platforms to provide unobtrusive high quality coverage. This extra coverage and capacity means more traffic, increased revenue and customer satisfaction and less churn.

With the addition of these versatile microcells in the indoor environment, network quality will show a vast improvement due to the high signal strength, increased capacity and better coverage. Further benefits of introducing Lucent's Compact BTS into a network include better radio signal quality, longer handset battery life for subscribers, and of course alleviating the number of blocked and dropped calls.

The indoor solution in practice

Lucent's planning engineers have recently demonstrated that the Compact BTS is the ideal solution to increase capacity and coverage in indoor areas. Through integrating the Compact BTS with Lucent's tools and planning experience, our engineers rapidly overcame the challenges of relieving an indoor area that experienced very high degrees of blocking. A microcellular network consisting of Compact BTSs was installed in a short period of time with minimal effort.



The outcome of integrating these Compact BTSs into the network was a complete success. The surrounding macrocells still carried the same amount of traffic but blocking levels were reduced from over 5% to less than 1%. Not only had the new Lucent microcells drastically reduced the blocking from the macrocells, they had also served new traffic in the indoor area as the network could now support more users. This meant that the operator was able to realise the full potential of their network and increase the return on investment.

Lucent's Compact BTS – The flexible solution

In the indoor microcellular environment the Compact BTS delivers a wealth of benefits. The key benefit of installing the Compact BTS into a network is flexibility. With two transceivers (TRXs) per Compact BTS, high capacity and improved network quality is available from start-up. Increasing capacity is made easy in cost effective steps by combining Compact BTSs together to make larger cell sites and increased contiguous areas.

Lucent Technologies' Compact BTS is a true micro BTS capable of delivering microcellular solutions for indoor coverage. Its small size enables installation in areas with limited access and also allows it to be installed in a wider range of site locations. This flexibility can improve the choice of location for the Compact BTS from a network planning point of view. With no footprint, real estate and rental costs are kept to a minimum, which brings about a rapid return on investment. To add to this flexibility, Lucent supports a wide range of transmission options including E1, T1 and High-bit-rate Digital Subscriber Line (HDSL).

Naturally, reliability is high on the agenda for every operator. Any network downtime costs more than simply the loss of revenue but also an increased possibility of dissatisfaction and churn amongst subscribers. This is why Lucent, with its innovation engine Bell Labs, has simplified the Compact BTS architecture, minimising the number of components, hence increasing the reliability. This robust design delivers a reliable network, a continuous revenue stream and minimal maintenance costs.

Should the Compact BTS ever need maintenance, the product has been designed so that the whole unit can be swapped out.

This keeps cell downtime to a minimum, reduces site visits and maintenance costs, and ensures an efficient use of manpower. The modular architecture enables quick and simple repair to damaged or faulty parts which ensures that the Compact BTS is rapidly brought back into service or returned to spares holdings.

Lucent's experienced training organisation offers tailored workshops designed specifically to meet an operator's unique requirements. The Compact BTS is fully covered by this service. This is complemented by our comprehensive documentation package that is designed to enable ease of reference and usability.

Microcellular solutions are an obvious way of alleviating environmental impact. Being unobtrusive, elegantly designed, plus optional use of the internal antenna gives the Compact BTS additional security as it blends in with the environment. These features are further enhanced by the Compact BTS's very low power consumption and silent operation.

This results in a very cost effective solution for indoor microcellular applications. While installation, maintenance and real estate costs are minimised, the Compact BTS also ensures that maximum revenue can be attained at the site.

Revenue generation is not only facilitated by high reliability and network availability but also by its portability and the high quality coverage offered to subscribers.

This impressive catalogue of benefits combined with the SQUEEZE portfolio, enables operators to successfully achieve maximum revenue from indoor solutions.

The ultimate solution for your GSM network

Using Lucent's Compact BTS to implement an indoor microcellular network results in outstanding coverage improvement and quality enhancement – a must for rapidly expanding networks. SQUEEZE'ing the most from a network using hierarchical cell structures for indoor coverage offers the greatest increase in capacity currently available to operators. This is furthered by the extensive capacity gains made possible by tighter frequency re-use.



Lucent Technologies is a world leader in the deployment of cellular communications and has gained vast experience in the technical, operational and financial aspects of network design and deployment. Through our proven knowledge of radio frequency planning, network implementation and network operation, Lucent offers operators an end-to-end solution to conquer their cellular challenges.

SQUEEZE'ING

THE MOST FROM YOUR NETWORK

To enhance our offering, Lucent has introduced Spectrum Quality EnhancEment ZonE, SQUEEZE. Microcells are just one of the many features the SQUEEZE portfolio offers to increase network capacity and improve quality. The other SQUEEZE features can be combined with Lucent's Compact BTS microcells for enhanced improvement.

The V.I.P solution is here

Variable Interference Planning (VIP) can increase network capacity by up to 100%. Using frequency hopping to increase capacity without degrading quality, Lucent's VIP_{two} enables an operator's existing spectrum to be used more efficiently with tighter re-use patterns and more frequency channels assigned to each cell.

This, combined with microcellular planning allows for huge increases in capacity to satisfy existing demand and prepare for future network growth. Lucent's Compact BTS supports this effectively and efficiently.

Bridging the spectrum gap

Microcellular networks do not have to be in just one frequency band, they can also be dual band. GSM 900 cells can be used for the macrocellular layer and GSM 1800 cells for the microcellular layer or both frequencies can be used for each layer.

Maximum use can be made of available spectrum to increase capacity and support both GSM 900 and 1800 subscribers. This in turn creates greater revenue by allowing higher subscriber numbers and roaming with any chosen operator. Lucent's Compact BTS is available for both GSM 900 and 1800, and can be configured to support the microcellular layers of a dual band network.

Let Lucent manage your network

Realising the full potential of microcellular networks relies heavily on the ability of the network to optimise the traffic load in the different layers. Lucent's hierarchical network solutions have been developed alongside radio link control algorithms. These algorithms have been designed to facilitate the distribution of mobiles between different cell layers based on mobility. For example, pedestrians will have their calls carried on the microcellular layer, whilst fast moving mobile calls will be carried on the macrocellular layer.

The use of these algorithms enables an optimum distribution to be achieved whilst minimising the number of unnecessary handovers between layers. The benefits are a high quality network where dropped and blocked calls are significantly reduced keeping existing customers satisfied and creating extra revenue.

Make planning a WiSE decision

Lucent has developed two state-of-the-art microcellular planning tools designed to simplify the network planning process of hierarchical networks. Lucent's Wireless Systems Engineering (WiSE) and Simulation Tool for the Evaluation of Algorithms in Mobile networks (STEAM) will verify microcell locations for optimum performance. These tools simplify the design process that would normally involve detailed and often time consuming studies.

Introducing microcells into a network using Lucent's Compact BTS, supported by Lucent's SQUEEZE, enables an operator to realise huge increases in capacity across the network.

Lucent Technologies has been a leader in telecommunications for more than a hundred years. From microchips to entire GSM systems, our hardware and software solutions are used all around the world. Bell Labs, Lucent's innovation engine, is at the forefront of telecommunications research and development, constantly refining current technologies and investigating new possibilities. Lucent also offers comprehensive and astute business consultation on issues such as marketing, sales and customer care. To learn more about how we might be able to help your business, or if you have any questions, we urge you to contact us.

Lucent Technologies
GSM Global Headquarters
Optimus
Windmill Hill Business Park
Swindon
Wiltshire, SN5 6PP, UK

Customer Response Centre:
Tel: +44 7000 Lucent (582368)
Fax: +44 118 932 8148
Email: gsminfo@mktpoint.com

This document is for planning purposes only and is not intended to modify or supplement any specifications or warranties or tariffs relating to these products. The technical specifications contained herein are approximate and subject to change without notice.

Lucent Technologies
Bell Labs Innovations



Brochure Number WPIMICRO 05/99
© Copyright 1999 Lucent Technologies