Implementing Indoor Solutions for Ubiquitous & Scalable Wireless Networks

Comba's partnership approach in understanding and anticipating customer needs results in a long term and ongoing relationship

Client
- Complex located in China, Beijing with hotel, offices and residential apartments

Requirements
- A complete scalable indoor wireless solution to meet current and future demand of high-end users in the complex

Challenges
- ‘Ping-pong’ effects
- Blind spots in the elevators and basement areas
- Client requirements of minimal negative impact to users during network construction

Solutions Implemented
- Comba's micro-cellular indoor wireless system (3 stages)

Effects
- Significant improvement on indoor wireless system for ubiquitous coverage
- Increased channels for each of the wireless networks (China Mobile and China Unicom) to accommodate up to 100 simultaneous calls each.
- 3G ready network

Background
JingGuang Center, located at Chaoyang District, Beijing, was built in the early 90s. It is 209 meters high and has a total area of approximately 10,000 square meters, with 52 floors above ground and 3 floors in the basement. It is a complex comprising of a 5-star hotel, offices and luxurious apartments. Its 3 basement levels and 1st to 7th floors are public areas with restaurants, bars, banquet venues, business center, fitness center, entertainment venues, carparks and a shopping mall. The 8th through to the 23rd floor are occupied by the JingGuang New World Hotel with 446 luxurious suites. The 25th through to the 38th floors are commercial offices with an area of about 20,000 square meters. The 40th to 52nd floors accommodates 247 luxury apartments.

The Problems
The number of mobile users increased enormously in the 1990s following the development of wireless communication technology. In spite of a macro-basestation built near JingGuang Center, there was severe indoor interference problem due to the blockage of the high-rise buildings nearby and its own architectural structure. It led to weak transmission signal in the central area of the building while both the elevators and basement areas were blind spots.

Increasing Demand of Wireless Communication
There are a large number of high-end users in JingGuang Center with great demand in communications. If those hotel guests and shop owners were unable to receive mobile signals, it would lead to a breach of the good quality and high efficiency image of JingGuang Center. Therefore, JingGuang Center was required to deploy an appropriate system immediately to satisfy the
communication needs of the customers, in order to raise their satisfaction and royalty.

The Requirements

1. Eliminate Blind Spots – There was no signal coverage in key facilities, such as the car parks and elevators.

2. Enhancement of existing signals – Most of the buildings in the JingGuang Center have concrete structures. Typically, such structures pose a serious impediment to basestation transmissions – meaning indoor signals are usually weaker.

3. Increase Number of Channels – The existing base station serving JingGuang Center could not meet the communication demands of the center and the surrounding district. Hence, increasing communication channels was a requisite to resolve the communication traffic congestion during peak hours. However, adding to the challenge was the fact that conditions ruled out the option of building another base station to resolve the problem.

4. Minimize Ping-Pong Effects – The Ping-Pong Effect, (the interrupted sound when using mobiles), occurs when a mobile node fails to complete handoff to the new network and re-associates itself to the previous network or when there were several similar signals in the same area at the same time. Therefore, the proposed solution was required to minimize ‘Ping-Pong’ effects to ensure a clear and prolonged communication transmission.

Cooperating With Mobile Operators and Stakeholders

Implementing the entire solution for JingGuang Center was Beijing China Mobile, who would provide free installation of micro-cellular indoor wireless system. The owner of the property would supply the corresponding installation location, power and connections. As a key wireless solution supplier to China Mobile and China Unicom (who joined the project at a later stage), Comba supplied and installed the indoor wireless system products and equipments.

In regard to choice of supplier and equipment, JingGuang Center had the following considerations:

1. Quality
To guarantee high quality, ubiquitous wireless coverage for users, one of the priorities of JingGuang Center was product quality, translating into transmission quality and minimal failure tolerance of network products and components. Comba’s indoor solution was therefore an ideal match for the requirements. A significant factor was the fact that Comba continually develops new products and solutions according to market demand for ease of upgrades.

2. Technical Support and Post-Sales Services
One of Comba’s strengths was its unrivalled customer support and service structure. As well as regular network periodic testing, Comba provided 24/7 technical support and training for the customer’s technicians.

3. Visual Environment
Product appearance was another major consideration for JingGuang Center. Since some of the antennas have to be installed in the public areas for blind spot coverage, visually pleasing products that blends in seamlessly with its surroundings was an important criteria. Comba’s products are all-climate and have pleasing appearances that are suitable for various environments.

*Comba’s quality products, complete technical support and post-sales services made it the best choice for JingGuang Center*
Installing The Indoor Wireless Solution

First Installation (1998)
The first installation of GSM900 indoor coverage for JingGuang Center commenced in 1998 and completed by the beginning of 1999. The coverage solution included a combination of fiber optics and radio frequency solutions. This landmark installation was one of the first indoor mobile coverage projects in China.

Wireless Enhancement Project (August 2002)
Since the original major requirement for the center was blind spots elimination, the solution used was based on the criteria of 'big output and less antennas'. However, following the rapid development in mobile technology, coupled with expanding numbers of mobile users, the communication demands of JingGuang Center increased exponentially beyond the capabilities of the existing system. To meet demand and deliver a better service to mobile users, Comba initiated a wireless enhancement project for JingGuang Center in August 2002. Active RF distribution systems were adopted in this project, which replaced all the original narrowband equipment and antennas to improve wireless coverage. Moreover, all installed RF equipment, passive accessories and antennas were 3G-ready to enable ease of capacity expansion and network upgrade in the future. The project was completed in October in the same year.

Capacity Expansion in April 2003
The continuing development of wireless technology and the success of the center meant that mobile phone usage in the JingGuang Center increased enormously beyond original expectations. The original GSM900 indoor system could no longer satisfy users’ demand. Hence, JingGuang Center started another capacity expansion project in April 2003.

Since the equipment installed for the wireless enhancement project in 2002 were 3G ready, only DCS amplifiers and combiners were required to be installed in this project in order to share the antennas with the original GSM900 system – creating significant cost savings. This project just lasted for 2 days that started on 22 April and completed by 24 April.

Comba's Products Utilized
In total, two wireless systems were implemented in the JingGuang Center comprising of 40 amplifiers and 300 antennas.

These included:
- M-4000B GSM Indoor Broadband Booster
- M-4180B-C1/C2 DCS Indoor Broadband Booster components, including:
  - RD-52(3/4)N/NP-F1 Power Divider
  - RC-5NK/NK/NK-**F1 Directional Coupler
  - RB-NKC1 Hybrid Coupler
  - FD-U900D1850B200NNOO Duplexer
  - IXD-360V03NN Multi-Band Indoor Omni Antenna

Results: Enhancing Indoor Coverage Effectively
The seamless indoor wireless system composed of Comba’s products effectively solved the problems of blind spots and channels inadequacy:

1. Blind Spots Elimination – Effectively improved the transmission problems in basements, underground car parks and elevators by eliminating blind spots.
2. Enhanced Transmission Signals – The micro-cellular indoor system enhanced the transmission signals in the concrete-structured JingGuang Center.
3. Increased channels – Network capacity was increased by the micro-cellular indoor system and the problem of traffic congestion during traffic peak hours was resolved.
4. Reduced Ping-Pong Effect – ‘Ping-Pong’ Effect was reduced and the mobile signals kept stable and predominant.

5. Minimize adverse effects from external base station adjustment – The outdoor base station was adjusted frequently for the improvement of transmission signal in the peripheral areas. However these adjustments potentially weakened signals in some areas, although signals in most areas improved. The installation of the microcellular indoor wireless system minimized any adverse effects by maintaining stable coverage inside the center.

Currently, each of the wireless systems deployed by JingGuang Center, Beijing China Mobile and China Unicom networks, accommodates simultaneous communications of about 100 mobile phones. It satisfies the ever-increasing communication demands and helps to increase customer satisfaction and maximize revenues for the operators and center.

Through continuous upgrade and improvement, Comba’s indoor wireless system seamlessly covers all of the JingGuang Center buildings.

"We are very satisfied with Comba’s service since the cooperation started from 1998. Comba has a professional technical support team that understands our operations and deployment. The team provides efficient and prompt services and support. We look forward to continuing our cooperation with Comba."

JingGuang Center Engineering Department spokesperson

Benefits from Implementing Comba’s indoor solutions:

1. Compensates for signal loss by utilizing microcellular indoor system.
2. Two-way uplink/downlink signal amplifier improving call quality.
3. Cover blind spots and extend wireless coverage effectively.
4. Flexible control and monitoring incorporating centralized control systems, remote monitoring and single unit remote control system.
5. Wireline (PSTN) and wireless (GSM transmission and SMS) communications with the network control center (OMC). Built-in wireless modem allows for software updates and downloads.
6. Weather proof design. Solution is waterproof, moisture proof with cooling functionality.

Eight Years of Cooperation

Comba’s quality products, all-round service and professionalism are highly valued by the JingGuang Center. Since 1998, indoor wireless solutions deployed by the center have used equipment deployed by Comba.

As the equipment supplier and solutions provider in the past 8 years, Comba worked closely with JingGuang Center to understand requirements, wants and needs to deploy relevant solutions, updates and comprehensive sales and support services.

For more information, contact your Comba representative, or visit http://www.comba-telecom.com