



COMMScope®

How CommScope helps customers realize their wireless coverage potential

# Application Case Studies

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### **CommScope, your trusted partner**

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## Every wireless application has specific challenges. We're ready.

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The faster and more complex the wireless landscape grows, the more CommScope can help. Our insight, experience and vision enable you to achieve more and provide your customers the wireless experience they expect.

### The demand for wireless coverage is growing rapidly

Our society thirsts for excitement, adventure and knowledge. There is an entire world of things to see, do and learn—sports, culture, travel, tourism, history—and more ways to get there. Whether we're already there or on our way, we expect to be able to communicate and share our experiences with others. We depend on wireless coverage to keep us connected anytime and anywhere. Wireless service providers are responding, adding more capable and robust networks from provincial capitals to regional cities and everywhere in between.

### Increasing importance of venue-specific coverage

Of course, wherever we go we're not alone. The bigger the event or venue, the larger the crowds, and everybody needs their bandwidth. The explosion in wireless traffic demands can easily overwhelm the local macro network. Having a dedicated venue-specific coverage solution can relieve the strain on the macro network while enabling the venue to provide greater value to its visitors.

### 4G presents additional challenges

With the spread of 4G, data consumption has become a major challenge for wireless network operators. 4G streaming media, for example, offers users new and more interactive experiences. For operators, however, these data-intensive applications pose difficult challenges when it comes to ensuring wireless coverage at venues.





[Read: Hong Kong-Zhuhai-Macao Bridge Case Study](#)

## Application 1: Expansive Coverage

### Challenges

Exceptionally large coverage area

Blanket coverage over wide geographical range

Strong and reliable signal

User experience at the cell edges

RF interference

Impact from area structures and limited power supply

Installation and maintenance obstacles

Potential future site restrictions

Volatile climate and harsh environment

### Solutions

- **Antennas with different horizontal beamwidths or different gains**  
Allows the operator to adapt to the varied and expansive geographical requirements
- **High-gain antennas**  
Provides the required reach, while decreasing the total number of sites and enhancing coverage efficiency
- **Spectrally efficient RF feeder systems, combiners, and connectivity components**  
Ensures minimum RF path loss
- **Superior product design and engineering**  
Delivers maintenance-free performance that does not decrease over time
- **Relentless testing of antennas and feeder products**  
Guarantees product and performance reliability in any environment
- **Specialized antenna concealment solutions**  
Blends in to the environment, reducing visual impact and increasing potential site locations



## Application 2: High-Density Coverage

### Challenges

- High density of super-users
- Extreme spikes in capacity demands
- Expansive and open indoor coverage area
- Limited spectrum resources
- Services provided by multiple operators
- Site required military-grade network security
- Supplemental outdoor coverage

### Solutions

#### Full use of existing bandwidths

Precise cell coverage minimizes interference, increases capacity

#### High-performance antenna indexing

Achieved zoned quality and density requirements

#### Ultra-wideband antennas with comprehensive coverage

Supports multi-operator service networks

#### High-reliability automated networks

Optimization with zero maintenance

#### Excellent signal-to-noise performance

Increase system capacity and data throughput

#### Fully utilize antenna functionality

Increase spectral efficiency

#### Miniaturization of antennas coverage. Adopt ultra-broad-band antennas coverage, and simplify connection system

High integration with surrounding environments

01

**CommScope helps bridge the divide  
Hong Kong - Zuhai - Macao Bridge  
case study**

## Hong Kong - Zhuhai - Macao Bridge

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With a total length of 55,000 meters, the Hong Kong-Zhuhai-Macao Bridge over the Pearl River estuary is the world's longest sea bridge.

On October 24, 2018, China's President Xi Jinping announced the official commissioning of the bridge as tens of thousands of residents travelled from Guangdong, Hong Kong, and Macau hoping to be among the first to traverse the bridge and share their pictures online.

The event created traffic challenges—not only for the drivers, but for the wireless data they were sending. How did officials ensure the wireless network along the bridge was up to the task? They partnered with CommScope.

As the project's wireless network partner, CommScope predicted the opening-day spike in data traffic along the bridge. Engineers carefully designed the solution to provide maximum capacity and coverage from end-to-end.

As a result, those who got to cross the bridge that day have wonderful stories to share and visual reminders to last a lifetime.

**Share each detail, relive each moment**

This is the power of connection.



# 01. CommScope helps bridge the divide: Hong Kong - Zhuhai - Macao Bridge case study

## Nature's challenge to a state's key project

On September 16, 2018, Zhuhai took a direct hit from super typhoon Mangkhut. The Hong Kong-Zhuhai-Macao Bridge, nevertheless, withstood the storm. Monitoring information from the bridge showed it to be unharmed, and the high-and low-voltage power supply and distribution systems were operating normally. CommScope's antennas—like the bridge—were up to the challenge as well. Then again, this is not the first time CommScope has delivered dependable wireless coverage across a large bridge. Prior successful projects include the Donghai Bridge, where CommScope's antennas were selected to provide reliable coverage.

## None as unique as the Hong Kong-Zhuhai-Macao Bridge.

The Hong Kong-Zhuhai-Macao Bridge is one of China's signature infrastructure projects—the longest, most complex bridge in the world. It spans three regions: Zhuhai, Hong Kong and Macau. For both the nation and the Guangdong-Hong Kong-Macao Greater Bay Area, it is significant.



For those in charge of the bridge's construction, wireless coverage along its span was important. Its seaside location is attacked by typhoons every year and corrosion from the salty mist is a common concern. In addition, the bridge is constantly exposed to the sun and its powerful ultra-violet radiation. So the antenna materials required ultra-high weather resistance. The bridge itself is approximately 55 kilometers long. It includes stretches of underwater tunnel as well as the above-sea bridge that is subjected to constant flexure and undulation. All of this imposed additional strict requirements on the performance of the antennas.

As a source of national pride, the Hong Kong-Zhuhai-Macao Bridge is strictly secured and managed. Real-time testing of any equipment located on the bridge, such as the antennas, is impossible. In addition, wireless coverage across its length involves three operators: China Mobile, China Telecom and China Unicom. This required a multi-operator, multi-band coverage solution. Finally, aesthetics were important; the antennas needed to present an orderly and consistent appearance. All of these required very high-quality antennas.



The project's administrative team was strict in all respects; installation and construction were no exception. The needs of the three operators had to be satisfied and the specific installation and construction requirements regarding placement of the wireless equipment had to be fulfilled. For example, the antennas could only be installed onto the gantries of the bridge as designated by the bridge administration. Relocating installed devices or adding equipment during deployment of the wireless system was not permitted. Once the wireless coverage solution had been commissioned, further access to the bridge would be closed off by the security operations of Hong Kong, Zhuhai and Macau. Armed police would be responsible for the security on the bridge. As a result, normal maintenance on the antennas would be impossible. The entire wireless system had to be of the highest quality and reliability and be virtually maintenance-free.

## Comprehensive communication solution satisfies personalized demands

### Complex application scenario

Generally speaking, the Hong Kong-Zhuhai-Macau Bridge is not completely level. It flexes and undulates, based on the waves and the underwater conditions. As noted, the bridge administration required that the antennas be installed onto designated gantries, with many adjacent gantries located up to three kilometers apart. Despite these difficulties, CommScope achieved perfect coverage. Their multiband narrow-beam high-gain antenna (RVV-33B-R3) delivered seamless high-speed coverage over the long distances.

### System shared among multiple operators

To fulfill service requirements, the operators required that more than two systems be installed at the same time. There had to be as few antennas installed as possible and they had to look beautiful wherever possible and meet the gantry's wind resistance requirement. CommScope's 700M-2700M, multiband/multiport, narrow-beam high-gain antennas addressed the issues perfectly. They met the bridge administration's strict requirements regarding the consistency of size, dimensions, appearance and color, while addressing the operators' needs for 2G, 3G and 4G network support.



# 01. CommScope helps bridge the divide: Hong Kong - Zhuhai - Macao Bridge case study

## Strict reliability requirements

Based on the strict mandates from the bridge administration, as well as the effects of constant vehicle traffic, the equipment needed to be maintenance-free and require minimal service over an extended period of time. This requirement was compounded by the harsh environment that required the antennas be resistant to typhoons and the corrosive effects of salt mist. CommScope's antennas exceed all requirements. They are equal to or above national standards—with some being designed and tested at environmental levels higher than those required by the IEC standards. As a result, they are fully guaranteed for reliability over their lifespan. With more than 40 years of field experience in antenna design and performance, CommScope has proven that their antennas can meet the reliability and longevity requirements of the Hong Kong-Zhuhai-Macau Bridge.

## Mitigating system interference

Part of the Hong Kong-Zhuhai-Macau Bridge is on the border of Zhuhai and Macau, areas where this is significant co-channel interference among operators. CommScope's narrow-beam antennas enhance coverage in these locations, ensuring that the signal propagation and reception range are limited to the bridge. This successfully reduces any co-channel interference from Macau.

## Integrating wireless and cable coverage

Besides providing high-performance wireless coverage for the bridge's three mobile operators, CommScope also provided a 25-kilometer leaky cable, which not only satisfies the needs of the public communication network but also ensures daily maintenance and allocation of the bridge as a whole.



### **Wireless communication and cable data transmission are indispensable**

While providing an antenna solution for the Hong Kong-Zhuhai-Macao Bridge, CommScope was a truly inclusive partner, taking into consideration the various needs of the bridge management, as well as the operators and communication service providers. The result was a win-win for all parties. In fact, tests show all A's for CommScope's comprehensive communication solution. For the Zhuhai Port of the Hong Kong-Zhuhai-Macao Bridge, the comprehensive wireless and cabling system reinforce the qualities for which CommScope is known: high usability, high security, and high reliability solutions that guarantee the highly effective and safe transmission of data and uninterrupted operations at the port.

CommScope won clients' trust with its robust technology, high-quality products, abundant practical experience and professional service. CommScope offers the Hong Kong-Zhuhai-Macao Bridge a 24-hour communication coverage solution. On the day it was commissioned, people were able to happily communicate with others and quickly upload their photos; part of the credit should be given to CommScope.

## CommScope: helping customers realize more potential in their networks every day

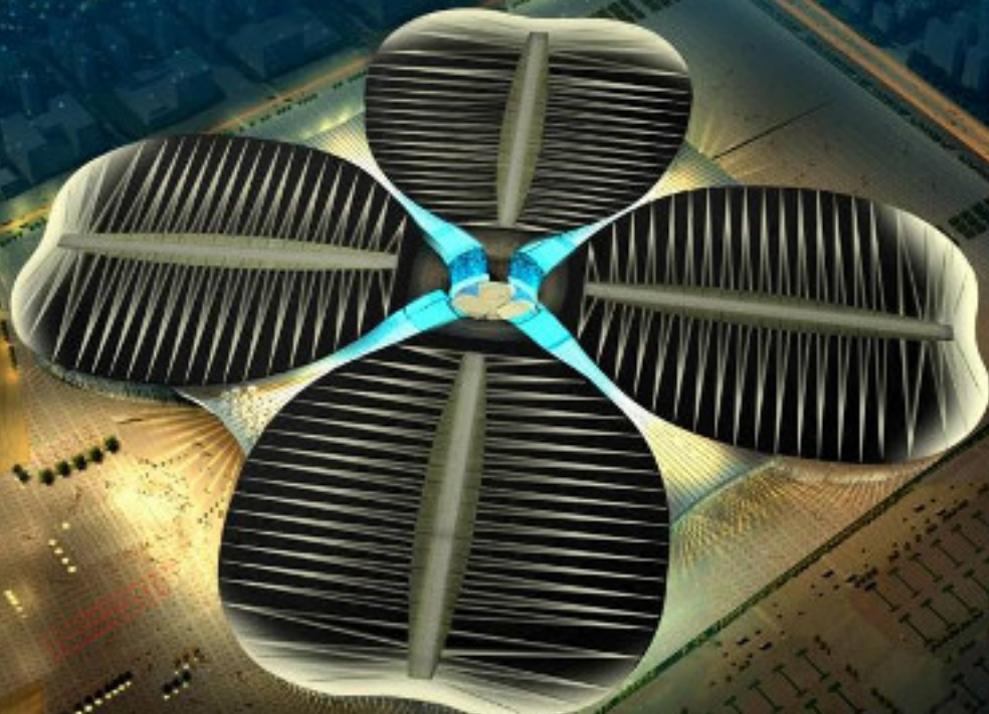
The Hong Kong-Zhuhai-Macao Bridge presented an unprecedented challenge, not only for those involved in its design and construction but also for the communication solutions partner. What is worth a thumbs-up is that the comprehensive communication solution offered by CommScope satisfies the needs of the bridge for wireless communication and highly effective data transmission, which not only enables business as usual in a harsh natural environment but simultaneously satisfies the needs of multiple service providers. It is a perfect match for a uniquely designed and built bridge. Since its deployment, CommScope's high-quality, full-coverage communication solution has been well received by the client and its collaborators. The company's ability to successfully adapt and address unique applications has taken another step forward. Regardless of how harsh the application environment is or what the requirements from users may be, CommScope responds: with timely solutions that are cost-efficient, practical—informed by the customer's unique challenges and technical considerations. CommScope works with and supports operators and clients while, at the same time, providing one-stop services, including all components of the radio-frequency passive transmission system. They not only guarantee the overall quality of the end product, they provide the comprehensive services—such as selection, purchase, installation and testing—that help customers realize more potential in their network every day.

**Brochure:**  
[Multiband Combining Solutions](#)

**Blog:**  
[The RF Path  
Complex, Quite Simply](#)

**Product:**  
[Antenna RVV-33B-R3](#)

**Product:**  
[HELIAX® SureFlex® D-CLASS™  
Cable Assemblies](#)



02

**Invisible antennas deliver tangible results for “China International Import Expo”**

### National Exhibition and Convention Center, Shanghai

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The huge building resembling a four-leaf clover, located to the west of Shanghai Hongqiao Central Business District, is meant to be an eye catcher. It is the National Exhibition and Convention Center (Shanghai).

This is the site of the China International Import Expo, an annual trade event that attracts more than 3,000 enterprises from more than 130 countries each year, not to mention a global audience eager to keep updated on the event. Given the massive flow of people—and the huge amount of data generated—ensuring smooth wireless access and communication is a stiff challenge for the show’s operator. Like many ultra large venues, ensuring adequate wireless capacity begins by minimizing RF interference. In a venue the size of the National Exhibition and Convention Center, the solution required high-quality antennas with superior interference rejection and the ability to satisfy the huge data capacity requirements.

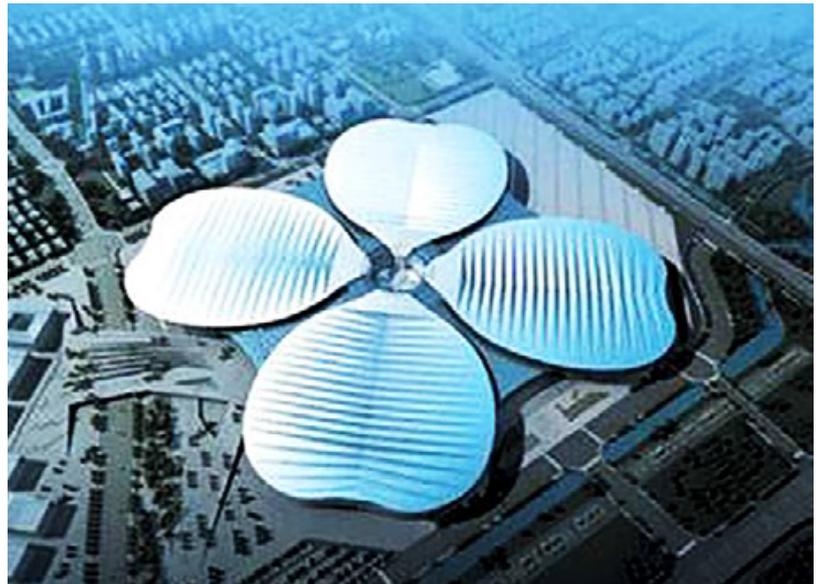
How to ensure seamless coverage of such an expansive space for so many visitors?

### Strict customer requirements:

Provide manufacturing and performance specifications supporting product quality

Demonstrate CommScope’s success with similar prior projects

Document CommScope’s technical expertise and service levels



## 02. Invisible antennas deliver tangible results for “China International Import Expo”

To develop the best solution, CommScope focused on maximizing the two key metrics of a wireless system:

### Coverage and capacity

Under normal circumstances, antenna performance in a large venue is based largely on RF characteristics such as third-order intermodulation, beam forming, and frequency range. To ensure success at the first China International Import Expo, and provide attendees the best possible wireless experience, the RF solution needed to deliver extraordinary RF performance.



### Solution

As a specialized supplier of wireless communication solutions, CommScope offers antenna solutions specially designed for large venues. Among these is an advanced solution that provides enough full band coverage to satisfy the various custom multiband requirements of different operators. In addition, it offers different beam forming functions, radiation patterns and gain levels to satisfy the venue’s challenging design and traffic requirements.

In an ultra-large venue, interference among signals of the same frequency is also a critical challenge as it seriously undermines the user experience. CommScope’s recommended Andrew® beam-forming antenna solution eliminated this issue. Its narrow-beam and outstanding horizontal/vertical sidelobe suppression effectively mitigate interference levels. In addition, excellent third-order intermodulation performance effectively guarantees ultra-high capacity and rate.

## 02. Invisible antennas deliver tangible results for “China International Import Expo”

### Benefits of CommScope’s antenna system

Even with the design proposal, how strong do the antennas need to be for the installation design of such a huge venue?

The National Exhibition and Convention Center (Shanghai) is much bigger than other venues. Therefore, the design and installation requirements are more difficult.

According to CommScope experts, its antennas are smaller and lighter and can be easily installed. In addition, they are easier to conceal in order to preserve the beauty of the venue. CommScope’s antennas, for example, may be installed horizontally or vertically; the orientation can be easily adjusted to optimize planning, design and coverage.

During construction and installation, CommScope provides one-stop services including field research, solution proposal, testing and comparison, installation training and supervision, and network optimization.

After the upgrade, the CommScope solution performed as expected. Specific improvements included a 75 percent increase in coverage capacity and a 45 percent increase in access rate—all while supporting the combined communication and data demands of more than half a million attendees and exhibitors at the China International Import Expo.



**Product: CMAX-3030S-43-V53 Antennas**

CommScope pushes the boundaries of communications technology with game-changing ideas and ground-breaking discoveries that spark profound human achievement. We collaborate with our customers and partners to design, create and build the world's most advanced networks. It is our passion and commitment to identify the next opportunity and realize a better tomorrow. Discover more at [commscope.com](https://commscope.com)

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EB-113465-EN