



Hybrid Distributed Antenna System for Campus Wide In-Building Cellular Coverage

Background

University campus is a miniature of a small city with hundreds of academic and administration buildings, medical center, athletic stadium, power plant, shuttle bus line, IT Data center and residence halls. In most universities, students normally stay in various residence halls and apartments during the semester. As in the city life, smartphones become the students' companion at the university. It is critical to have the students' smartphones connected 24/7. Even though wireless service providers put their effort to enhance the campus wireless service quality, due to the building construction materials such as metal structure, low e-rated window, etc., universities encounter the issues on the cellular coverage and capacity over the entire campus. This often results in the students' complaints about not being able to make phone calls and connected to Internet due to poor cellular coverage and interference from the building walls and infrastructure.

Current solutions and their limitations

Two solutions are currently widely adopted as described in the table below and carry their own limitation as follows:

Existing Solution	Limitations
Cellular Tower in Campus	High total cost of ownership to build the antenna site. Negative aesthetic impact on Campus area when large antennas are installed. Coverage may not be even throughout the campus.
Neutral Host DAS owned by 3 rd Party Hosting Company	Loss of the property and technology control. Limited flexibility with existing wireless service provider's antenna sites (i.e. All or nothing approach)

Intelibs Solution – Hybrid Distributed Antenna Systems (DAS)

Intelibs' Hybrid DAS offers ideal wireless solution for the Campus environment with the flexibility and scalability in terms of selection of antenna transmission powers, and indoor and outdoor antennas installations. It also derives connection of the RF source from the central head end room or the remote building rooftop RF source. The system is designed to even work in hard-to-reach areas such as underground utility tunnel.

Intelibs DAS Solution Highlights

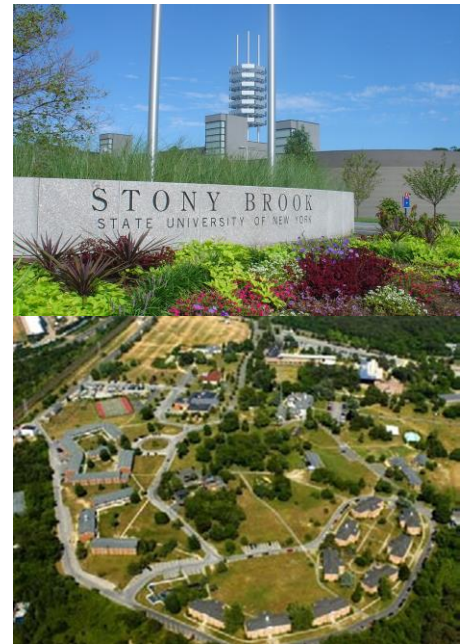
- Multi-Carrier/Multi-Band Support
- Small Form factor Equipment
- Lower power consumption to use standard 120V power outlet
- Fiber to Antenna Architecture to make minimal coax cabling
- Tough-Built equipment design

Innovative Business Model - Academia-Industry Collaboration:

The collaboration model turns the focus of the campus wireless network project from conventional site lease to the academia-industry collaboration, and from financial ROI to the service oriented ROI. As a collaborative partner, both wireless carriers and universities have common objective offering the best networking service to the university user group. Wireless carriers committed the capital investment to upgrade the university IT infrastructure to make their wireless service users to be connected with the outside world anytime anywhere.

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Stony Brook University Campus DAS Network



Stony Brook University (SBU) is the largest public university in Long Island, NY. Located at Stony Brook, NY, SBU is situated 50 miles from NYC, with about 1900 academic staffs and 24,500 students (vs. 13,700 Town Residence) in 1039 Acres of space accommodating more than 200 academic buildings.

Campus DAS network offers:

- Over 50 Buildings, Complete 3G/4G Network Coverage Enhancement
- Over 10 Time improvement in the 3G and 4G wireless service quality coverage
- Over 10 Time Increase of 4G Data Download Speed from below 5 Mbps to over 75 Mbps download speed

Case Study: Campus Wireless Network at Stony Brook University

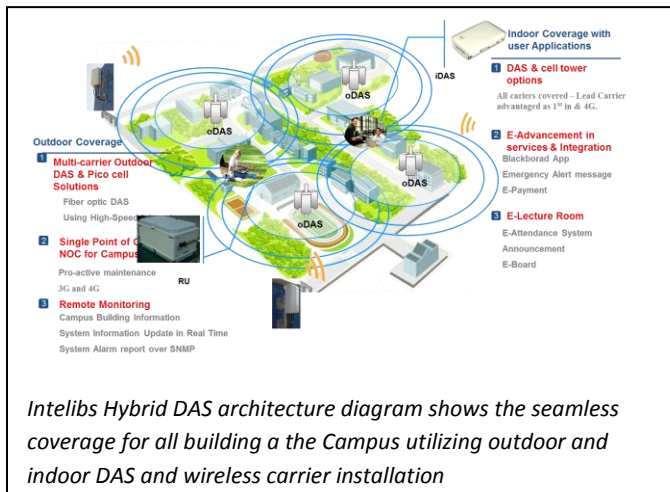
As one of the rapidly growing universities, Stony Brook University (SBU) encountered wireless service challenge as new emerging services such as Tweet, Instagram and Facebook demand large data transactions. The University is where the early adopters test the new mobile devices and applications with the high demand of the data service quality. Students already use their own mobile device rather than the landline phone in their dormitory rooms. These trends push the SBU to seek the high capacity and best coverage of the wireless service anywhere anytime. In addition, the growing public safety concern requires the wireless service quality enhancement.

SBU was seeking a flexible but scalable wireless solution that can provide excellent wireless coverage and capacity for all major carriers with the following requirements:

- Targeting the entire campus environment including their stadiums and other sporting facilities,
- Delivering a campus-wide wireless communications network for students, faculty and visitors,
- Not impacting the existing cellular antenna sites' service, and
- Design for the future expansion as the University continues growing.

Hybrid DAS Deployment

Stony Brook University evaluated all the available solutions and decided to adopt Intelibs Hybrid DAS solution that works with existing cellular antenna sites on the campus.



Site survey and RF Test: In the predesign work, site survey was conducted including structural analysis, electrical engineering, HVAC analysis with additional heat generation at the head end and remote antenna sites where the DAS equipment is located. Over 1000 acres of campus with more than 50 target buildings, a series of building RF penetration test with the contiguous wave (CW) signal had been conducted in order to estimate the RF signal penetration loss. The test attributes the high accuracy of the DAS network by profiling the RF signal strength requirement to complete the wireless coverage and capacity as our RF engineers design the DAS network using software tool.

Design and Deployment: Intelibs designed the mixture of outdoor and indoor DAS network. Outdoor DAS targets outside and inside the building area, while the indoor DAS covers

particular indoor area where the outdoor DAS radio signal cannot penetrate due to the building material (e.g. E-rated windows) or location (e.g. underground utility tunnel, ground level).

Phased DAS Deployment: The project has been implemented in two phases. The first phase started from the academic mall and residential area. The second phase expanded to the special-purpose venues such as athletic stadium, utility tunnel and dental medicine building. As part of the collaboration between wireless carrier and University, university owned fiber optic network is provided between the remote antenna sites and the head end room where the wireless carrier's base stations are located. Wireless service provider also contributed the capital expenditure to build the fiber link where it was not available. The project was also designed to include other carriers in the future as the University accelerates the IT infrastructure toward mobility transformation.

Stony Brook University now offers the superior 4G Wireless network throughout the Campus. In addition, the SBU maintenance staffs are now able to be connected to the internet through the 4G smartphone as the DAS network covers the underground utility tunnel. The collaboration between Wireless carrier and SBU derived the smart investment not only to build Wireless DAS network but also to upgrade the electric utility and IT network infrastructure that is currently used for the university IT operation (e.g. University WiFi network expansion).

About Intelibs

Intelibs delivers market leading, best-of breed 3G and 4G wireless in-building and outdoor coverage and capacity solutions that overcome barriers such as call drop, slow email access or internet access stall, ensuring seamless coverage from the deepest recesses of buildings and extending living, learning and working zones. For more information, please visit www.intelibs.com or email to info@intelibs.com.