

ADC Cell Site Capacity Solutions:

Enhancing Access & Backhaul Capabilities in Wireless Networks



Historically, wireless networks were designed by collocating base stations with cell towers around specific and concentrated geographical areas to provide coverage. When engineers built these networks, they could not have anticipated or accounted for today's bandwidth requirements and customer expectations. In their efforts to roll-out new services through next generation technologies, many operators chose to overlay their existing networks with next-generation base stations. This strategy has resulted in coverage gaps. Additionally, mobile usage patterns and how we use our wireless devices continues to change. The rapid proliferation

of wireless devices and the subsequent increase in voice and data traffic has put a strain on today's networks. Because of this, mobile users experience slower data throughput or network unavailability—decreasing customer satisfaction.

Due to the nature of the next-generation wireless technologies and the data applications they enable, high frequency 3G and 4G networks are more sensitive to service degradation as radio waves travel long distances and face natural and artificial barriers. For service providers launching 3G and 4G at frequencies below 1 GHz, RF propagation is not the challenge. Rather, maintaining up and downlink balance will be key to deliver data and video services. There is a correlation between the uplink distance and data rates. The farther the user is from the cell site, the greater likelihood of service degradation. Achieving greater data rates will require placing antennas closer to the user and a method to contend with the volume of data being transmitted between the cell site and the mobile device. A high capacity network architecture that supports the front and backhaul demands will be required. The challenges will escalate as new technologies lead to increased sales of new devices and spur exponential growth in applications that will utilize the additional bandwidth speed and throughput.

Data usage most commonly occurs inside buildings, where next-generation technology service suffers most. Signals are attenuated by the structure itself and often service is unavailable without a supplementary wireless solution. Traditional mobile network architectures with large, high-powered towers are less effective in providing pin-point coverage, and adding more cell sites is a lengthy, costly and difficult process.

APPLICATION NOTE



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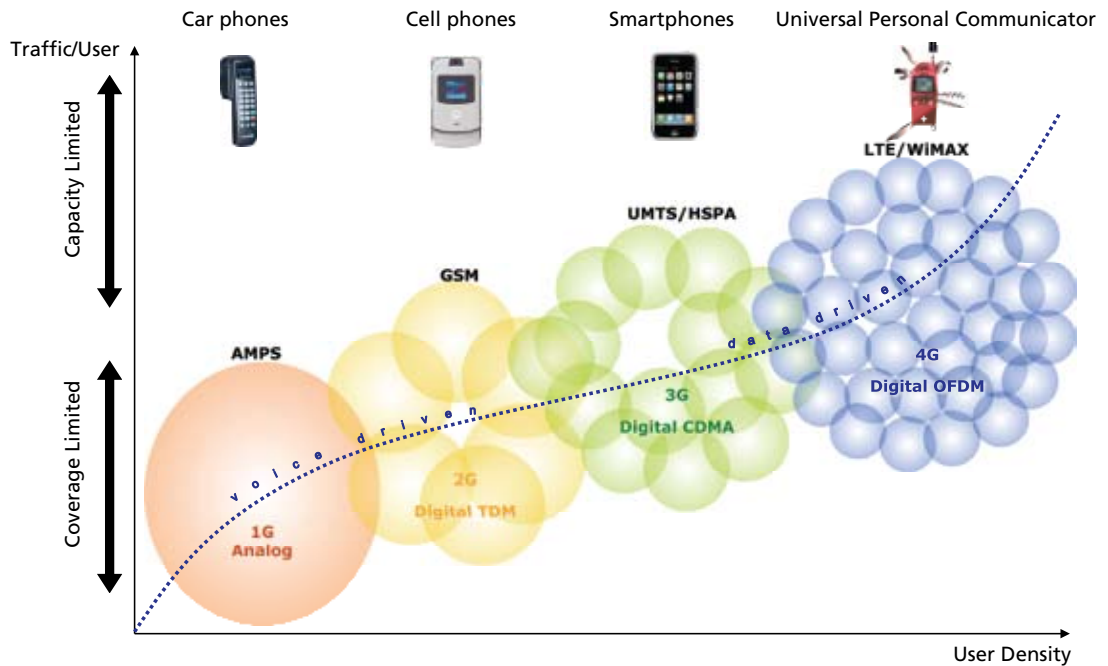


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This diagram illustrates the mobile network evolution of devices, cell size, usage and challenges as new technologies and applications emerge.

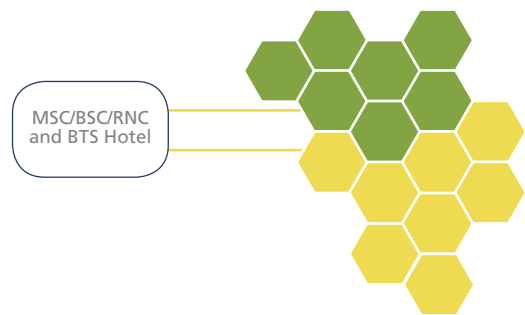
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Unless the backhaul capacity between the cell site and mobile switching center (MSC) is augmented prior to launching these services, capacity issues will continue to plague the mobile operator (and their users). The increase, particularly in data traffic, has been so great that traditional methods of incrementally augmenting backhaul capacity, adding additional DS1 for example, are either insufficient and require continuous upgrades as traffic increases or are not possible in some locations.



Traditional RAN Architecture
(Three Sector Cell Sites)



Small Cell RAN Architecture with BTS Hotel and DAS
(Each Hexagon is a Cell Site)

This diagram illustrates a traditional radio access network (RAN) architecture which requires incremental updates as capacity and technology enhancements occur over time. These updates will require truck rolls for site-specific service and OPEX increases for additional leased backhaul capabilities.

As operators move to small cell architectures, DAS not only improves access and network efficiency (by redirecting under-utilized capacity to high traffic areas), it significantly saves backhaul cost over time. By collocating radio resources and using CWDM technology, the operators OPEX is greatly reduced by minimizing fiber count and real estate.



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ADC offers complete solutions to address front and backhaul coverage and capacity challenges.

Fronthaul (Wireless Access) Solutions

Improving wireless access and managing service migration with microcellular network solutions

ADC offers the industry's leading distributed antenna systems (DAS) solution which enables the wireless service provider to access service areas macro site cell towers cannot reach or are technically or financially prohibitive. DAS systems take the RF from a macro site or a base station hotel and distribute the signal through several antennas. This architecture maximizes network efficiency and improves signal propagation by placing antennas closer to the mobile user. Radio resources can be placed in a single location, minimizing real estate and simplifying management and maintenance of the network assets. ADC's FlexWave™ Prism RF distribution system is a multi-protocol, multi-band solution that eliminates the need for multiple base stations to be placed at each cell site or antenna location. Base station capacity can be distributed to multiple antenna points through a unique feature, digital simulcast. Digital simulcast enables efficient radio utilization over multiple antenna points by selecting how capacity is distributed to the DAS through the element management system (EMS). Housing the radios in a centralized suite also offers trunking efficiencies for backhaul.

The benefits of microcellular networks include:

- CAPEX savings: less site development expenditures,
- OPEX savings: consolidating base station radios at a single location (base station hotel), saves time and money. Resources can be serviced and maintained at one location. Literally hundreds of sites can be managed from one place,
- Simplified site acquisition: microcellular networks minimize the need for roof-top or large tower sites. The Prism Remote fixture is a compact, environmentally hardened unit that can be mounted on or even inside of utility poles, traffic sign posts or in underground vaults,
- Speedier time-to-service: with solutions that are easy to zone, install, and configure, and
- Future-proofed networks: as ADC's Prism solution supports all protocols and is base station vendor agnostic.

Backhaul Solutions:

Improving capacity with cost-effective backhaul solutions

With as much as twenty-five percent of OPEX dedicated to backhaul expenses, operators need to navigate solutions that are fiscally responsible while offering greater bandwidth for the network traffic booms of 3G and 4G.

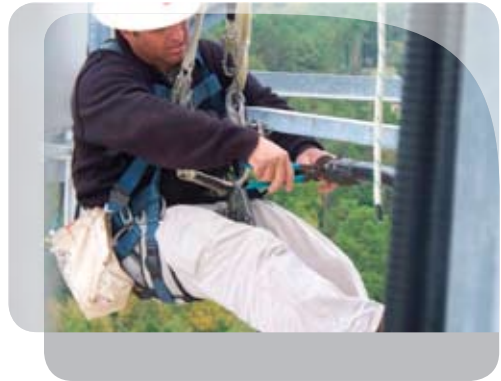
ADC offers a variety of fiber-to-the-cell-site solutions to address the bandwidth, flexibility, and long-term cost effectiveness required by this network infrastructure. By deploying an optical network between the MSC and the cell site, ADC solutions ensure current and future backhaul capacity needs are met. Since many cell sites are collocated or very near competitor's cell sites, the exponential capacity increase of an end-to-end fiber solution offers service providers an additional revenue stream. Local exchange carriers (LECs), in particular, are building excess fiber capacity to the cell site and then selling that capacity to competitive wireless operators at the same cell site.

The benefits of improving backhaul capabilities include the ability to:

- Accommodate capacity growth cost-effectively with pay-as-you-grow backhaul capacity solutions,
- Maximize existing network resources by extending signals,
- Eliminate the cost and need for power at your demarc with hybrid cables,
- Strengthen the security of your network with lock box solutions, and
- Minimize cost by using SONET alternative solutions.

The value of working with ADC to upgrade service within your network includes:

- Cut one PO: working with a single vendor to manage your wired and wireless access, backhaul, and professional services
 - » ability to offer multiple technical solutions
 - » ability to provide turnkey solutions with project based or time-and-expense based professional services
 - » ability to support a full scale of applications: ranging from individual projects to end-to-end network planning,
- Lowest cost of sale: deal directly with the OEM and skilled service resources
- Quality and experience: ADC is a leader in network architecture and product development for both DAS and fiber solutions.



3G and 4G technologies continue to place greater demands on access and backhaul. Contact ADC today to learn more about solutions that can help you build a network that is flexible, economical, built to scale and simplified as applications and demands become more complex.



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