COMMSCOPE®

White Paper

The Case for Digital Simulcast

in Microcellular Networks

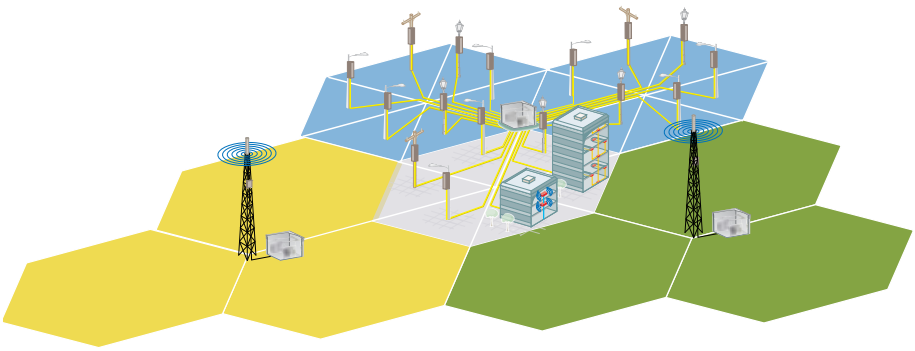
Introduction

The term simulcast is used in a variety of industries, most commonly the broadcast industry, to define the action of simultaneously broadcasting events or programs over multiple media. For a wireless service provider, the term simulcast is used to refer to broadcasting the same sector to multiple antenna points at the same time. Typically, a BTS Sector is a single coverage area defined by spectrum frequency, number of channels (capacity) and coverage area. With simulcast, capacity can be delivered to multiple antenna points rather than just a single antenna point.

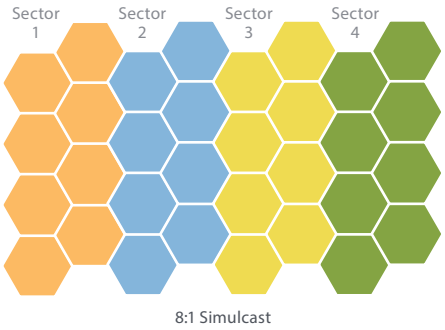
Simulcast is a function that allows you to make changes in your network such as re-sectoring capacity as usage patterns change. This could be time-of-day adjustments (for traffic patterns, sporting events or large gatherings) or in an emergency situation where you needed to add coverage and capacity in an area.

Additionally, there are areas in the mobile network that may have excess capacity but a limited coverage footprint. The coverage footprint may be minimized due to buildings shadowing the RF penetration or RF interferers. In these areas a simulcast configuration could expand the coverage footprint by adding remote antenna points off the radio and maximize your capacity network through the simulcast configuration as demand warrants.

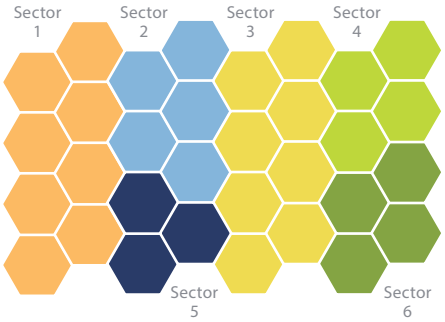
The wired switch network has done this for years. Local exchange carriers oversubscribe their network resources and make adjustments as needed. Simulcast allows wireless operators to distribute radio capacity in a similar fashion and CommScope's digital simulcast functionality greatly reduces the time, effort, and cost of making those changes.



Small Cell Architecture



8:1 Simulcast



Add capacity by splitting sectors and changing the simulcast configuration from 8:1 to 3:1 and 5:1 or 4:1 in high traffic areas

Differences Between Analog and Digital Simulcast

Digital simulcast is a feature in all of CommScope's DAS product lines. The digital aspect is unique compared to analog DAS systems and to remote radio heads (RRH). Digital simulcast adjustments can be made through the GUI versus having to mechanically change the system capacity configuration with RF splitters and combiners. With analog DAS and RRH's, the adjustment is not only mechanical, it also fixed point-to-point and cannot dynamically be adjusted to support recurring fluid traffic patters (such as commuter traffic or for a traffic spike near a stadium) or as swiftly in the event of an emergency.

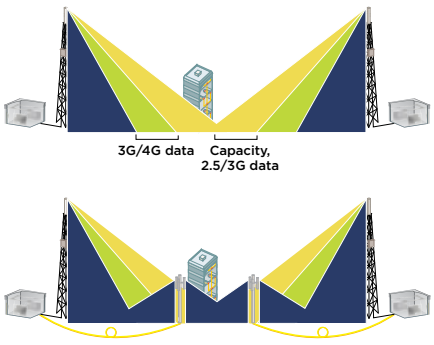
Additionally, analog distribution systems must accommodate for signal loss sustained as it travels over distance. Since analog DAS simulcast is achieved with a physical RF splitter/combiner network (lots of cables and big metal) between the BTS and the analog DAS, there are multiple interfaces. With CommScope's digital DAS, we have a single interface between the BTS and digital DAS complete with a switch matrix in our Host that enables simulcast in the digital domain and not have the big iron physical connections. Making a change to analog DAS requires "rewiring" this physical interface versus digital DAS changes are made through a GUI.

Simulcast DAS system must be designed such that the transport time to the remote antennas is equal for both analog and digital systems. With analog systems, which deal with changes in the physical world, this is achieved by ensuring that the cable runs to each remote antenna location is of equal length to create equal loss on each path. Each node will require the same amount of cable as the farthest location from the Host. The operator will purchase excess cable and spool it in a storage location. With a digital DAS, the operator can add delay in the digital domain through the GUI (change the delay setting). All calibration is done through the management system so the amplifier and antenna locations can be placed exactly where needed to optimize the wireless access. No excess cabling is required or the storage to support it.

Digital Simulcast

Finally, analog DAS systems are also limited to support RF-output base stations where Prism can perform support RF-output and baseband/CPRI output base stations which are common with 3.5G and 4G radios.

Simulcast Microcellular Networks—Filling the Gaps



Traditional network architectures place base stations (RRH) around an area to provide coverage. When engineers built networks for GSM (covering 80% of the world) they would not have anticipated or accounted for phenomenons unique to next-generation protocols in their network designs. Simply overlaying their existing network infrastructure with next-generation base stations has result in coverage holes as their cells "breathe". Because different protocols and frequencies behave in different ways (consider a GSM network adding CDMA services—GSM does not have the soft hand-off issues or the cell breathing characteristic), it is not technically or economically appropriate to assume the same architecture for 3G and 4G networks as 2G. Next Generation networks such as UMTS /HSPA and LTE have characteristics similar to a CDMA network. Deploying a DAS system with simulcast in these areas, where 3G radios are located with 2G radios, spreads capacity over multiple points lessening the effects of cell breathing.

Financial and Technical Efficiencies of Microcellular Networks

An alternative to deploying large macro site cell towers is to centralize your radio resources at a single location and distribute the signal (providing coverage and capacity) through a network of remote amplifier devices. This is considered micro cellular network architecture. Aside from the RF performance benefits, there are many financial benefits when deploying a micro cellular network architecture.

- Consolidating the radios at a single location provides capex savings as you deploy equipment at one location. Time and money is not spent on zoning, large site acquisition or leasing tower space.
- Microcellular networks minimize the need for roof-top or large tower site acquisition. The Prism Remote fixture is less than two cubic feet and can be mounted on utility poles, in street furniture or even inside of poles and in underground vaults. Besides being significantly smaller than a cell site, it is also significantly easier to install and much less obtrusive to the environment.
- Time-to-service is also greatly reduced having eliminated the need for macro site zoning and construction.
- There are opex savings since the service provider has one facility to maintain and any network changes or updates can be made through a single location. Essentially hundreds of sites can be managed from one place. Truck rolls to each antenna location is not required.

The base station hotel with a digital simulcast DAS architecture is the enabler to provide capacity as needed as opposed to using capacity to provide coverage.

Digital simulcast is a compelling feature for network migration. Service providers are operating networks with 2G, 3G, and soon 4G services. This feature allows the service provider to make network capacity configuration changes as take-rate on services change over time. For example, a microcellular DAS network may be initially set-up with a simulcast configuration of 2:1 supporting GSM and as users migrate to UMTS or LTE, you can change the GSM simulcast to 4:1 or 6:1. Conversely, they could initially offer UMTS or LTE at a 4:1 or 6:1 ratio and change the configuration to 2:1 as more 4G devices and applications are available and users demand those services.

As illustrated, digital simulcast is particularly compelling for multi-operator and/or multi-protocol networks.

Summary

Deploying a microcellular network with digital simulcast improves network efficiency by maximizing use of carrier RF assets, improves operational efficiency, delivers capex and opex savings, and enables swifter roll-out of new services as carrier networks evolve. CommScope is the only vendor on the market that offers digital simulcast functionality for our microcellular DAS solutions.

CommScope (NASDAQ: COMM) helps companies around the world design, build and manage their wired and wireless networks. Our network infrastructure solutions help customers increase bandwidth; maximize existing capacity; improve network performance and availability; increase energy efficiency; and simplify technology migration. You will find our solutions in the largest buildings, venues and outdoor spaces; in data centers and buildings of all shapes, sizes and complexity; at wireless cell sites and in cable headends; and in airports, trains, and tunnels. Vital networks around the world run on CommScope solutions.

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