



FlexWave™
Universal Radio Head
Flexible Digital Transport



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That Improves Wireless Coverage, Capacity and Customer Retention

Introduction

Some things never change. Despite the ongoing proliferation for advanced wireless services, service providers must continually address the largest threat to their business—inconsistent voice and data services coverage.

Subscribers demand coverage when and where they need it. Inconsistent coverage compromises service and leads to subscriber churn. Traditional methods for improving coverage consistency—including additional macrocell towers and analog radio heads—cannot effectively provide coverage for dense environments nor accommodate increasing demands for capacity and spectrum use.

It's time for wireless service providers to deliver scalable, distributed antenna solutions to better address the ever changing environment. Scalable digital transport solutions enable service providers to provide superior coverage and significantly reduce maintenance costs.



Digital Transport Extends Coverage, Reduces Expenses

A wide range of advanced wireless services—including smart phones, high-speed Internet and video streaming—are now readily available via implementation of 3G technologies. Unfortunately, 3G implementation often compromises signal consistency. It results in reduced coverage patterns within existing coverage footprints, which can produce coverage holes throughout the network.

Service providers must meet the demand for more bandwidth-intensive services within the limited spectrum available to them. As a result, they will need to promote maximum frequency re-use in their networks.

Macrocell towers are popular options to increase coverage and capacity within specific locations. Unfortunately, they are not feasible in many areas where a lack of coverage affects a large number of subscribers (e.g., municipalities), because they are deemed unflattering on the local landscape. In addition, city centers are too congested; subways and tunnels are too restrictive; and campuses and government buildings have prohibitive zoning regulations. As a result, service providers have had to seek alternative options, including distributed antenna systems (DAS).

Why Choose Digital?

- **Superior dynamic range:** Contrary to analog systems, fiber loss and noise have virtually no effect on RF transport and system noise. Digital RF signals are regenerated with identical performance to create a consistent digital bit stream.
- **Independent bands:** Due to the digitization of the RF signal, multiple frequency bands can be transported, or recreated at full dynamic range, over a single strand of fiber without interfering with one another.
- **Digital simulcast:** Up to eight remote units can be digitally simulcast from a single host unit, without the use of external RF plumbing. Simulcast ratios can be easily reconfigured via easy-to-use element management software.
- **Digital delay settings:** Digital fiber transport allows delay settings to be programmed electronically. It eliminates time-consuming and labor-intensive fiber spooling, which makes deployment and system maintenance easier for service providers.
- **Flexible architecture:** A scalable modular system sealed in an environmentally protected enclosure can be installed with a limited number of bands and expanded easily as the network evolves.
- **Intuitive management:** Simplified management and provisioning minimizes dependent gain and fiber length adjustments in the field.

ADC's Digital Transport

ADC's FlexWave™ digital Universal Radio Head (URH) offers service providers a flexible, small-form-factor solution to extend coverage and capacity in previously hard-to-reach locations. The URH distributes coverage from a centralized radio suite and offers unmatched scalability and compatibility for the growing number of protocols and frequencies in today's demanding wireless networks. Plus, it allows more comprehensive, defined coverage areas, which enables operators to manage the network more efficiently. As a result, the URH minimizes the number of dropped calls and provides more consistent call quality to increase minutes of use (MOU) and reduce customer churn.

The Flexible URH is the Ideal Backbone for 3G and 4G Networks.

With a centralized distributed architecture, service providers can collocate base transceiver stations (BTS) together and feed multiple remote radio transceivers from a common location. From a common BTS location, service providers can combine and distribute their RF spectrum to multiple radiating points. As a result, service providers can reduce capital expenditures and annual operating costs.

The FlexWave URH uses patented RF digitization technology to distribute RF signals. The entire designated RF spectrum is digitized to a digital bit stream and transported via fiber or millimeter wave (MMW) links. Then, the signal is reconstructed—regardless of modulation technology—with full bandwidth at the remote location link. RF signals are replicated at full dynamic range for improved data throughput. Dynamic range is similar to bandwidth—more is better. As a result, the flexible URH is the ideal backbone for 3G and 4G networks with high-data rate broadband services.

Applications

Designed to improve capacity and coverage compared to traditional distributed antenna systems (DAS), the cost-effective FlexWave URH is the ideal solution for the most prevalent antenna architecture of today—as well as the microcell and CPRI/OBSAI remote radio head architecture of tomorrow. (Figure 1.) ADC's URH offers unmatched flexibility for virtually any application including:

- **Next Generation DAS:** Manages multiple frequency bands, scalable RF bandwidth and transport rates seamlessly and cost-effectively via all-digital Serial RF (SeRF) transport
- **Remote Radio Head:** Uses industry standards, including CPRI and OBSAI, to reduce BTS expenses and provide distributed coverage
- **Base Station Hotel:** Centralizes radio resources and distributes them to scalable, remote radiating points
- **IP-ready platform:** All-digital platform promotes scalable functionality to ensure seamless integration to IP front/backhaul networks
- **Millimeter Wave (MMW) compatible:** All-digital platform can use MMW as a fiber alternative

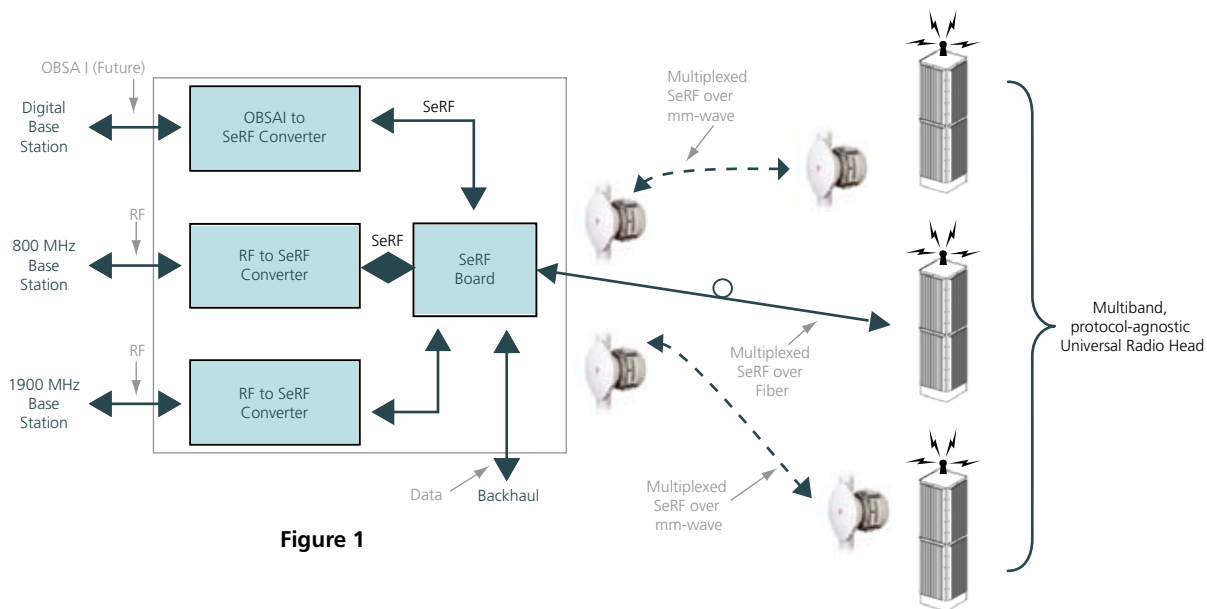


Figure 1

Where Can URH Help?

ADC's URH improves wireless network coverage by extending services from existing cell sites to hard-to-reach areas, including:

- Congested urban centers
- University campuses
- Dense suburban centers
- Corporate business parks
- Healthcare and government facilities
- Subways and tunnels
- Large buildings, stadiums, convention centers, etc.
- Canyons and valleys

Solution Overview

The FlexWave URH comprises a host unit and a remote unit that work in conjunction with one another. The host unit is located at the base station hotel; the environmentally sealed remote enclosure is located at a service provider's designated radiating point (antenna) and supports up to three frequency bands.

Host Unit

The URH host unit receives RF or baseband signals from the BTS. It digitizes the RF inputs and multiplexes multiple digital RF and baseband inputs for transport via a fiber or MMW link to a remote unit. On the reverse path, the host unit receives the signal from the remote unit and conditions the signal back to the BTS.

The URH host unit's modularity enables technicians to add, remove or replace all major modules—including the digital/analog radio transceivers (DART) cards, system board and fan—without shutting down the entire unit. As a result, subscribers experience minimal service interruption during service or band additions. It supports up to eight BTS interfaces via the DART cards. Plus, it features up to eight pluggable optical transceivers, which enables the URH host unit to simulcast multiple bands to as many as eight remote units.

Remote Unit

The flexible remote unit features a separate modular panel for up to three bands, sectors or tenants. Each panel can be accessed easily for future upgrades or "pay as you grow" capabilities. The sealed IP-67-rated enclosure offers ideal protection from harsh environments. There are no fans or filters that require replacing or maintenance. Plus, fiber, antenna and power connectors are sealed to further protect the investment. The remote unit teams with the host unit to consistently transport digital bit streams via forward and reverse paths.



System Configuration and Network Management

Should any fault occur, the host and remote units use an embedded element management system (EMS) to send an alarm notification to the service provider's network operations center (NOC). Technicians can access the information from any Internet access point for easy, cost-effective and immediate troubleshooting. For on-site troubleshooting, a technician simply plugs a laptop into the craft interface to access all the units connected to it.

The host and remote units offer a wide range of management and configuration controls, including:

- Real-time fault transmission for immediate remote troubleshooting
- Digital timing delays eliminate labor-intensive fiber spooling
- Display of various system levels, (e.g., voltages, RF, power) for convenient, 24/7 management
- History reports with time and date stamps for comprehensive analysis and simplified potential troubleshooting
- Compatible with new software for convenient upgrades

Broadband Digital Performance

Leveraging its breakthrough SeRF technology, ADC designed the FlexWave URH to support 35 MHz of non-continuous bandwidth within a designated frequency band. The URH can multiplex multiple frequency bands via a single fiber strand or wavelength. The SeRF technology also supports variable transport bandwidth for 1.5 to 80 MHz payload over dark fiber or MMW transport. Non-continuous bandwidth provides unprecedented flexibility for broadband digital performance that seamlessly accommodates analog connections.



Conclusion

Bottom line: a flexible, digital URH will save service providers time and money.

ADC's FlexWave URH extends and distributes capacity from base stations to deficient wireless coverage areas, which allows operators to maximize existing resources without the expense or eyesore that accompany high towers. Service providers can achieve short- and long-term CAPEX and OPEX savings, as well as access to new revenue streams, by implementing a flexible URH into their network.

The digital URH also enables service providers to manage their RF networks more efficiently and to provide coverage to holes in macro networks and large enterprises. Additionally, it allows the deployment of innovative technology to upgrade fringe networks.

ADC's URH is ideal for large campus applications because it allows service providers to gain MOUs in high-traffic areas, including municipalities and college campuses. The URH can support multiple air interface protocols and transport rates, and CPRI/OBSAI and DAS architectures.

It all adds up. With ADC's FlexWave URH, the network provides seamless coverage and significantly reduces the percentage of dropped calls for less customer churn and more revenue streams.

By combining multiple frequency bands into a common enclosure on a common carrier network, service providers can minimize site acquisition and zoning challenges and reduce equipment, installation and commissioning costs for significant short-term benefits.

Annual operating costs—including real estate leases, utilities and maintenance—also will be reduced significantly. Plus, the co-location of multiple base

stations will reduce recurring backhaul costs.

ADC's URH offers the only future ready, all-digital platform and scalable wireless solution on the market. It is easy to install and can be added to existing infrastructure for significant cost savings. It can be monitored remotely to minimize maintenance costs, and it can be upgraded quickly, easily and cost-effectively to evolve as the network evolves.

Service providers now have their answer for filling in the blanks in their wireless network.

For more information

To learn more about ADC's FlexWave and other wireless network solutions, please contact us at 952-938-8080 or visit us at www.adc.com/wireless.

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