

C-RAN IN THE CITY

Key Network Elements

C-RAN Network: With the large increase in mobile data traffic, network operators are moving the BBU (BaseBand Units) from macro cell sites to a common central location allowing greater flexibility and cost savings. The connection from the BBU to the RRH (Remote Radio Head) is most commonly via CPRI at rates between 2,457.6 to 10,137.6 Mbps and eCPRI or RoE (IEEE 1914.3) at rates of 1, 10, 25, or 100 Gbps.

Core DWDM (Dense Wavelength Division Multiplexing) ring: Today's networks are interconnected by core DWDM fiber rings, interconnecting major metropolitan areas and populations. These networks consist of multiple 100 Gbps and 10 Gbps links over a single fiber, each on their own wavelengths across the C (1530–1565 nm) and L (1565–1625 nm) bands.

Metro DWDM ring: Consisting of multiple rings per metropolitan area allowing the network bandwidth to be locally isolated. With rapidly growing demand for data, cloud resources are now being localized to within the metro ring, removing the requirement of the traffic transiting the core network. Multiple 10 Gbps, and some 100 Gbps, links each on their own wavelength across the C and L bands.

Macro Cell: A cell in a mobile phone network that provides network coverage using a high power cellular radio base station. The macro cell may be mounted on a tall building or a dedicated radio tower. Typically, the base transceiver station (BTS) radios are located in an equipment room at the base of the tower or on the rooftop. High power radios provide coverage up to 20 km. Connection back to the core network is typically by microwave link or optical fiber.

Small Cell: Low power radios used in the cellular network to provide densification in urban environments. Range may be limited to 0.5 km to 4 km. Typically the integrated radio is mounted on existing street infrastructure such as lamp posts or on the side of a building.

Remote Radio Head (RRH)/eRE/RU: Part of a distributed base station that locates the BBUs at the base of a cell tower, or even remotely at a BBU hotel, and the radios at the top of the tower close to the antennas. The compact RRH is connected to the BBU via a fiber optic cable, typically using CPRI, eCPRI, or RoE (IEEE1914.3) protocols. Use of RRH reduces power loss in long RF cable runs and potentially improves network flexibility, especially to distribute load at peak times. Newer networks using eCPRI protocol the RU will become an eRE and for networks using protocol it will become the RU. These newer eRE and RU contain higher layer processing abilities reducing the bandwidth required across the connection to the eBBU or DU and CU.

BBU Hotel/eREC/CU/DU: is the name given to a single location which houses the baseband units of many distributed RRH. A BBU hotel can be many kilometers from the radio heads, typically using fibers running CPRI protocols between the two. By locating multiple BBU at a common location, radio resources can be allocated dynamically as demand changes. The radios can be mounted closer to the antenna which reduces RF cable losses and may improve PIM performance. OPEX may also be reduced as smaller equipment rooms and less cooling is required at each site. Newer networks using eCPRI the BBU name will become eREC and RoE (IEEE1914.3) it will become a CU connected to multiple DU's each connected to many RU's.

Microwave Radio: A point to point radio link that is often used to connect remote cell sites back to the core network, in place of optical fiber.

DAS (Distributed Antenna Systems): are the most common method selected by operators and building owners to achieve in-building coverage and capacity. DAS are able to accept inputs from a variety of sources making them equipment manufacturer and technology neutral (2G, 3G, 4G).

Passive DAS: Signals from one or more RF sources are distributed throughout a venue using only passive components: coaxial cable, splitters and antennas. Sectorization is achieved by dedicated RF cable feeds to each antenna branch. Typically used for small DAS installations such as SME offices, conference centers and hotels.

Active DAS: Downlink signals from one or more RF sources are conditioned, combined, and converted to light for distribution over fiber cable to radio units located around the venue. Radio units convert the signal back to RF, amplify and re-broadcast them. This allows for greater range within the DAS and is typically used at large sports stadiums, airports and very tall buildings.

Network Interference: The best planned networks are subject to performance degradation from illegal or accidental radio interferers such as unlicensed radio microphones, radios on visiting commercial shipping, leaking cable TV cables or illegal FM transmitters.

Transport layer: A general term for the layer of the OSI Reference Model that provides connection services for high layer applications. Optical Transport Networks (OTN) run up to 400 Gbps, other transport technologies include: Ethernet, CPRI/OBSAI, eCPRI/RoE (IEEE1914.3), SDH/SONET.

Common Public Radio Interface (CPRI): CPRI is an open specification for an interface between Radio Equipment Controllers (REC) often referred to as BBU, and Radio Equipment (RE), often referred to as RRH. The use of a CPRI interface run over a single mode or multi-mode fiber enables the radio equipment to be mounted at the top of a tower very close to the antennas. The BBU and RRH can be up to 2 km apart using single mode fiber or up to 25 km in a C-RAN network, facilitating the use of BBU hotels. The latest specification version 7.0 supports up to 24 Gbps line rates.

eCPRI/RoE (IEEE1914.3): The next generation of CPRI used for 4G-Advance, 4G-TDD and 5G networks, transported over Ethernet frames connecting one or more eRE's/RU's to the eREC/DU called the NGFI-I section. eCPRI and RoE (IEEE1914.3) allow for more processing to be completed in the eRE's/RU's allowing lower bandwidth requirements back to the eREC/DU. This restricts the length (~25km) depending on the type of traffic it is designed to carry. The connection from multiple eREC's/DU's back to the CU will also be over Ethernet, as time critical areas are managed by the eREC's and DU's it allows much longer distances on the NGFI-II section. Subdividing the network into NGFI-I/II allows much greater flexibility and reduction in cost with greater coverage.

Anritsu Solutions For Every Network Element



Network Master™ Pro
MT1000A

All in one optical cable and data transmission field test instrument for installation and maintenance engineers. The MT1000A supports transport testing from 1.5 Mbps to 100 Gbps, on Ethernet, OTN, SDH/SONET, PDH/DSn, Fiber Channel, CPRI/OBSAI, eCPRI/RoE (IEEE1914.3) and timing PTP/1PPS. CPRI RF spectrum analysis and optional OTDR and fiber visual inspection probes are available.



Network Master™ Pro
MT1040A

Handheld all-in-one portable tester with multi-rates from 10 Mbps to 400 Gbps over various network interfaces including Ethernet, OTN, SDH/SONET, Fiber Channel, CPRI/eCPRI, etc. The MT1040A supports stackable structures of 2x400GbE, 2x200GbE, and 4x100GbE with four simultaneous remote users, and has a built-in real-time visual 200G/400G FEC analysis feature. The MT1040A is a powerful tester for interoperability, installation, troubleshooting and field deployment.



Network Master™
MT9090A

A modular palm sized platform for field technicians that can be optioned as an Optical Time Domain Reflectometer (OTDR), CWDM Optical Channel Analyzer (OCA) or 10/100M/1000 GigE Analyzer.



ACCESS Master™
MT9085

This optical fiber analyzer is designed for installing and maintaining access, metro, or core networks. The MT9085 is a complete fiber test tool including: OTDR, light source, power meter, VFL, and video inspection probe (VIP). The MT9085 features multiple wavelengths and options for all your CRAN testing needs to meet any network testing requirement access or metro, FTTX, LAN, or MFH.



Field Master™ Pro
MS2090A

The Field Master Pro delivers the highest performance in a field portable spectrum analyzer with frequency options to 54 GHz for LTE and 5G FR1 and FR2 installation and maintenance. A full suite of RF performance and modulation quality measurements are provided. The Real Time spectrum analyzer option is ideal for interference hunting including for signal in signal. Additional options support cable and antenna measurements, interference triangulation and coverage mapping.



Site Master Combo Cable & Antenna
Analyzer with SPA and VNA Option

Anritsu Site Master combines all the essential instruments for an RF field technician into a single, battery powered, portable instrument with proven rugged design and reliability. Test antenna cable feeds and transmitter characteristics including cellular demods plus a true VNA for amplifier, filter and downconverter measurements. An RTSA option provides enhanced insights when interference hunting.



Site Master™ Handheld Cable
& Antenna Analyzer S331L

The S331L offers the highest value in a rugged, handheld cable and antenna analyzer for contractors, installers, and wireless service providers, who need an instrument to reduce site maintenance expenses. Optimized for RF line sweep measurements to 4 GHz, the S331L delivers an entire workday of battery and time, the most ever offered in a handheld cable and antenna analyzer.



Site Master™ Ultra-portable
Cable & Antenna Analyzer S331P

The S331P is an ultra-portable version of the industry-leading Site Master Series of Cable and Antenna Analyzers. It is the smallest, lightest, fastest, and most cost effective instrument in the Site Master family. No battery is required, since the USB port of Windows 7, 8, and 10 tablet devices, laptops or desktop PCs power it. The two frequency ranges (150 kHz to 4 GHz and 150 kHz to 6 GHz), makes it the only small, headless Site Master product capable of measurements down to 150 kHz for low frequency radio communications applications and up to 6 GHz for higher frequency applications like LTE-U in the 5 GHz unlicensed spectrum.



PIM Master™
MW82119B

PIM Master is a battery-operated, high power Passive Intermodulation (PIM) tester covering global cellular standards. PIM is a form of interference generated by components such as connectors, cable assemblies, filters, and antennas. When subjected to the downlink signals at a cell site, these normally linear components can generate spurious signals in the uplink path. PIM Master is a specialized test instrument able to measure system linearity and identify PIM locations both inside the cable system and beyond the antenna. An RF line sweep option is available to reduce the number of testers a field technician requires for each site visit.



Field Master™
MS2080A

The Field Master is optimized for LTE and 5G FR1 installation and maintenance measurements in a field portable spectrum analyzer. Fast sweep times coupled with a range of features to protect it from the routine knocks in the field make this the perfect cell technicians analyzer. A full suite of RF performance and modulation quality measurements are provided. The Real Time spectrum analyzer option is ideal for interference hunting including for signal in signal. Additional options support cable and antenna measurements, interference triangulation and coverage mapping.



Remote Spectrum Monitor
MS2710xA

Remote Spectrum Monitors are designed for distribution around a large geographic area to monitor all RF transmissions to 6 GHz. Weatherproof IP67 models for outdoor installation and in building models with up to 24 RF ports for cell site monitoring are available. Centrally located Vision software monitors all transmissions, quickly identifying the sources of interference that degrade network performance. POA and TDOA algorithms quickly pinpoint interference for rapid identification and resolution.