Testing the Base Station RAN
for Staging, Deployment and Repair

A Valid8 Whitepaper

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Flexible. Affordable. That's Different.

The Importance of Radio Access Networks

The Radio Access Network represents the part of the modern telecommunication infrastructure that connects individual user equipment (UE), such as mobile phones & IoT devices to the rest of the network. The explosion of IoT technology in the form of technologies for smart devices and self-driving cars has increased the importance of reliable RANs to the overall network. The RAN is generally composed of a base station and antennas designed for a specific level of coverage, along with components for the core network. There is currently a move towards an Open RAN (O-RAN) which is based on off-the-shelf open RAN sub-systems, allowing baseband and radio units from different manufacturers to interoperate together.

For 4G networks the base station is known as Evolved NodeB (eNodeB) and for 5G Next-Generation NodeB (gNodeB).

EnodeB & gNodeB Base Stations

The eNodeB is an evolved technology. The 2G generation used GSM technology and base transceiver stations. NodeB was introduced along with UMTS radio technology in 3G, which required a Radio Network Controller. With the introduction of eNodeB over LTE for 4G, a controller element was no longer necessary, simplifying architecture designs and accelerating response times. With 5G, the next generation of base stations uses NR radio technology in the gNodeB.

Base Stations are a critical component of mobile network architecture. The eNodeB element on the base station is the point of connection between the network and mobile devices (UEs). As independent controllers, base stations on the mobile network must be capable of handling high peak loads, and meet conformance standards on Iu, S1, Xn and NG. Valid8's single solution for base station testing makes it easier than ever to ensure your network is prepared.

Stage → Deploy → Repair

# Testing the RAN with Valid8 Throughout its Life Cycle

Successfully installing a RAN is a complex logistical project, often with steps that need to be performed in remote locations. The ability to perform tests through the process saves time and resources. Valid8's industry-leading capabilities are flexible to support testing at various stages throughout the implementation process.

Staging

As 5G becomes more and more prevalent, and telecommunication companies begin to deploy large numbers of base stations, Valid8 plays a critical role in ensuring the proper configuration and successful operation of the base station before deployment.

Typically, the base stations arrive at the warehouse and need to be unboxed, tested, and prepared for deployment in the field. This may involve kitting of components and connecting to the base station.

Use-Case : Base Station Staging Testing
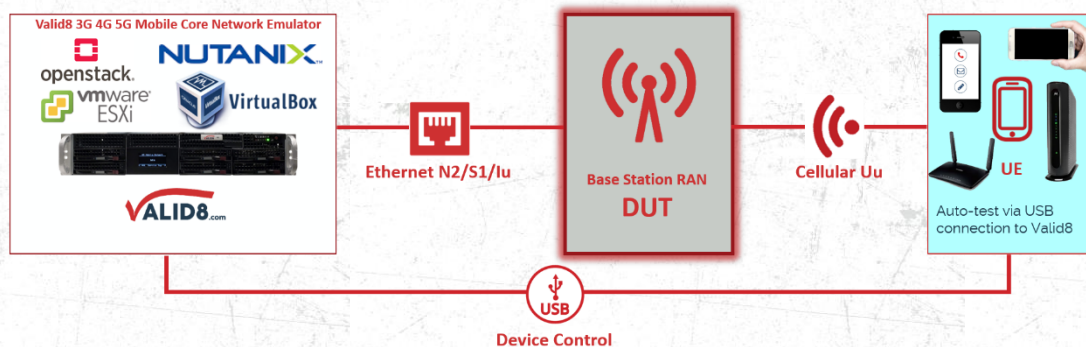
With Valid8 as part of the warehouse test bed, the RAN is unpacked, connected in the racking, and connected to Valid8's Mobile Core Network Emulator using IP addresses that match the core network and deployed as a physical server or virtual machine at the warehouse. Testing at this stage ensures the device has been provisioned correctly (i.e able to accept an IP address, create a profile, handle various bands and bandwidths, PLMN information, etc.).

By testing at the time of receipt of the base station, any issues are uncovered before assuming any additional costs to transport and deploy the RAN. Base stations with issues can be quickly returned to the supplier for replacement or troubleshooting before the deployment. With the 10s to 100s of base stations being deployed, the time and resource savings are significant.
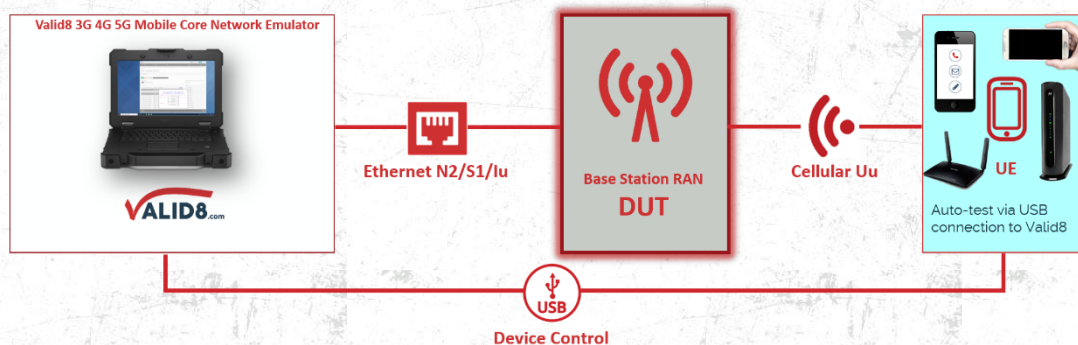
In addition, by using Valid8 emulating the actual core network, configuration of the RAN can be completed at the warehouse vs. configuration on site, better utilizing technical resources.

Deployment

Often the deployment of the RAN occurs in remote or rural areas with limited access to resources or infrastructure. The Valid8 testing platform is an invaluable cost-saving resource as it can be deployed via multiple form factors, including a server-based, laptop or NUC based or cloud-based solution.

Operators perform the same tests a second time at the deployment site to ensure that there was no damage to the RAN during shipping and transportation.

Use-Case : Base Station Deployment Testing

Valid8 3G 4G 5G Mobile Core Network Emulator

Ethernet N2/S1/Iu

Base Station RAN
DUT

Cellular Uu

UE

Auto-test via USB connection to Valid8

USB
Device Control

There is often a delay connecting to the core network during deployment, as the provider needs to turn on the network. Lots time can be wasted time waiting. With Valid8, engineers are able to test the RAN on site, making test calls to have confidence the system will work with the network is activated.

The pandemic closed the test labs for many companies. Valid8's flexible deployment allows for continued testing even with the lab inaccessible.

Flexible. Affordable. **That's Different.**

Repair

When a base station malfunctions or has an issue, it will be shipped back to a warehouse for troubleshooting. With Valid8, diagnosis is simplified. The base station is connected to Valid8's core network to detect issues such as whether a call can be made or if performance of the RAN is acceptable. Repairs are made and Valid8 is able to perform final tests and return the RAN to service.

### Use-Case : Base Station Repair Testing
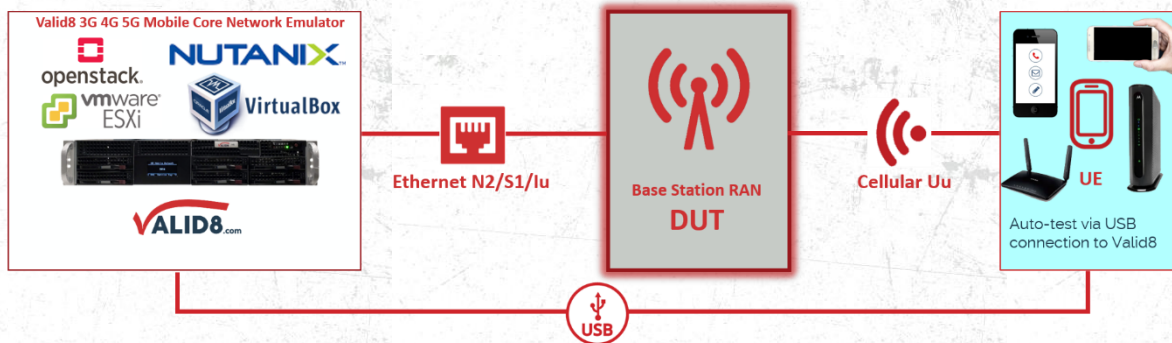
A Single Testing Option Across the Mobile Network

Valid8's RAN testing technology delivers a comprehensive testing solution for all the various base station technologies within a single platform. Through Valid8, operators perform performance (iPerf), load testing of NodeB and eNodeB, including peak load conditions using real UE's, error conditions using Virtual UE's, or a combination of both, as well as pre-conformance subset testing on Iu, S1, Xn and NG.

The Valid8 RAN testing solution includes the following features and configuration options:

- Mobile Core Network Emulator
- Real UEs controlled by USB
- UE Emulator
- IMS Core
- Test Suite – Iu, S1, Xn, NG
- Security Suite
- Multi-band including CBRS band
- IoT

Beyond testing of the base station connection to the core network, Valid8 emulates UE's and delivers a complete test that includes UE's connecting to the base station and then to the core network.
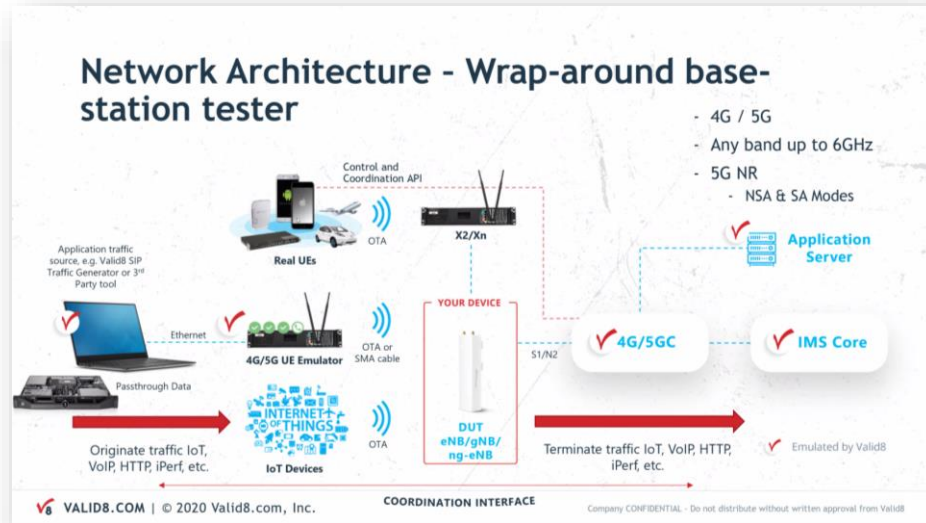
Network reliability is more critical than ever. With new IoT-enabled devices coming online daily and a push for 5G technology, the RAN becomes critical. Operators need flexible capabilities to test base stations and must have the confidence that their infrastructure is able to handle the increasing load, with a specific focus on the initial point of contact between the base station and the UE's.

About Valid8:

Valid8 helps the world's networks operate by providing the best methods to simulate & test any network equipment and communication protocol. With 17 years of proven results, Valid8 believes that testing tools should start with a flexible and affordable base with the ability to customize solutions to needs. Clients should only pay for what they need. Valid8 is dedicated to customer success with a comprehensive support program providing direct access to engineers to assist with training, integration, and problem-solving. Over 90% of customer feedback points to Valid8's flexibility and service as the reason they have chosen to partner with the company. Valid8 has succeeded in giving clients a refreshing change from the testing status quo.