

# ASSERT Wireless Testbed

## WHAT CAN YOU DO WITH THE TESTBED?

- ◆ RSSI change in each milli-second
- ◆ Attenuator control
- ◆ Break links
- ◆ Emulate bad links
- ◆ Change topology
- ◆ Serial access to the UUT
- ◆ Use monitoring devices
  - e.g. spectrum analyzers

## CONTACT INFORMATION

Dr. S. Venkatesan  
venky@utdallas.edu

Dr. Ravi Prakash  
ravip@utdallas.edu

The University of Texas at Dallas

Distributed Systems Lab  
(ECSS 4.213 & 4.214)

The Erik Jonsson School of  
Engineering & Computer  
Science

Mail Station EC32

800 W Campbell Rd

Richardson, TX 75080-3021



Figure 1: 39 of the testbed sites in two 42U racks

## Capabilities

- Native support: 725MHz to 1125MHz
- Each device can be connected to 16 other devices
- Isolated RF environment
- Attenuation up to 127dB on each link

## Supported Devices

- Any device with antenna connectors
  - Devices in native frequency
  - Devices in different frequency but with up/down converter
- Examples: MICA2, Cell Phones, Cordless Phones

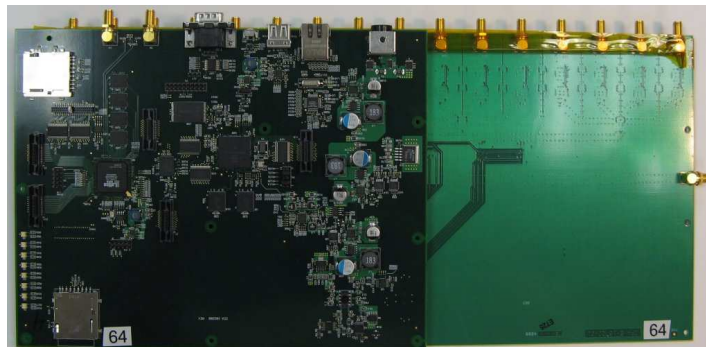


Figure 2: Internal hardware of one site

As wireless networking is becoming more pervasive, there has been a greater desire to develop communication hardware and protocol stacks that have a number of desirable properties like increased throughput, reduced latency, reduced energy consumption, quality of service, security, etc. Consequently, several academic and industrial research groups are actively working towards improving the performance of wireless networks.

We use coaxial cables between the antenna ports of two nodes to emulate an over-the-air link between them. By changing signal attenuation level, using programmable attenuators and amplifiers on the path between nodes, we emulate the formation/disruption of wireless links and node mobility. Using power dividers/combiners we can emulate complex, multi-hop wireless networks. As all communication is over coaxial cables, the network is immune to interference from other wireless networks. It is also possible to inject the desired amount of noise into the links.



## Service Features and Benefits



Figure 3: Close up of the connectors of one site

Field testing wireless equipment in the real world requires extensive time and energy. Changes to the location of the devices require physical movement of the equipment and measurement devices from place to place. This would make repeatability a difficult task. ASSERT emulates the distance between multiple devices by using variable attenuation. This means many identical tests can be performed in the lab instead of in the field.

Moreover, with ASSERT it is possible to conduct experiments in licensed frequencies like the cellular service bands without interfering with the services offered by the owners of these licensed bands. Currently, network equipment vendors are forced to test their hardware in unpopulated areas to minimize interference.

### BENEFITS

- ◆ One-time setup of devices for multiple experiments
- ◆ Repeatability of experiments
- ◆ Remote management and data gathering of devices connected to testbed
- ◆ Capability to add custom monitoring hardware by end user
- ◆ Black box view at the UUT device

### Use Cases

- Verify physical transmission/reception
- Emulate mobility
- Test handoffs of mobile devices
- Measure protocol performance in presence of interfering devices
- Determine application level performance in various controlled RF environments

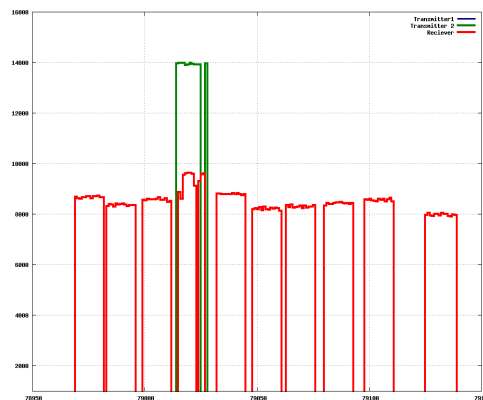


Figure 4: ASSERT provides synchronized information allowing users to precisely correlate transmissions and receptions

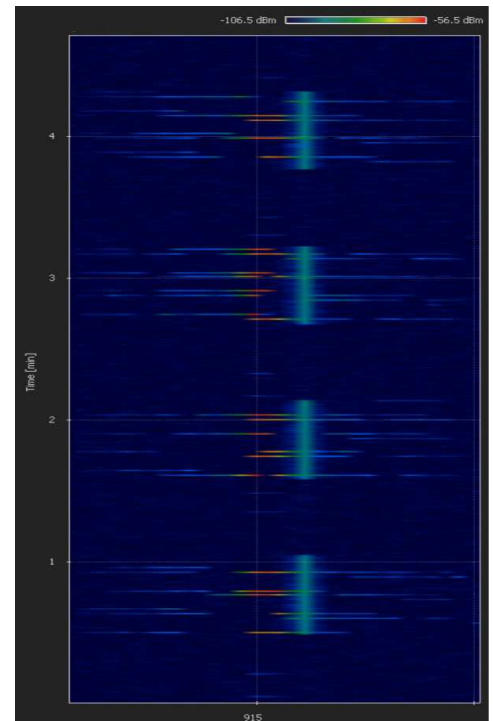


Figure 5: External diagnostic devices can also be connected to the testbed for debugging purposes. Above is a Wi-Spy recording during an experiment.

