Section D. Leaflet

Title:

WISHFUL Full Duplex: a Hardware and Software framework for Full Duplex Radio Control experiments

Organization:

KU Leuven, Networked System group, part of the TELEMIC division

Goal of the extension:

We have introduced a new testbed with in-band full duplex capabilities. The KU Leuven testbed presents substantially different hardware than what is already available in WISHFUL and allows experimenters to design and test full duplex MAC protocols on the software defined radios in the testbed by using the WiSHFUL UPI structure fully implemented.

Main challenges of the extension:

The design of a full duplex MAC protocol to work efficiently and offer a good degree of flexibility to experimenters has not been straightforward and has required many rounds of design, implementations and improvements. Another major difficulty has been in integrating the KUL SDR FD testbed in WiSHFUL by providing a UPI compliant layer to control the testbed with the standard UPI structure.

Description of the Extension:

The setup is composed by 6 USRP SDRs with In-Band Full Duplexers, one host PC for each USRP and a Server which controls the overall testbed as presented in Figure 2. The users can log-in in the server and control the experiments by modifying the controller and agents.
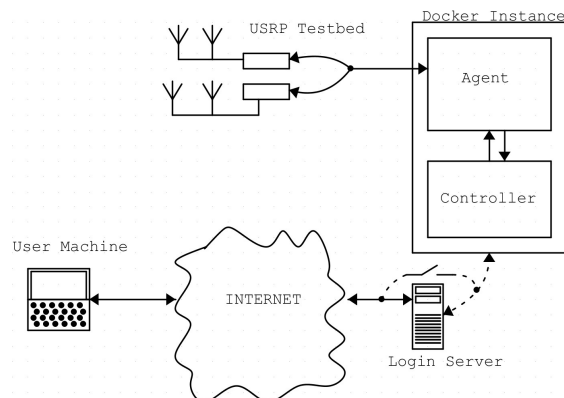

Figure 2: Full Duplex testbed architecture

Main results:

The provided testbed is completely UPI compliant and can be used to perform FD MAC testing. It can be accessed for outside using the Fed4Fire tools and allows experimenters to either use the provided MAC protocol to perform tests varying input signals and control parameters or to design their own MAC protocol and interface it with our agent via the UPIs.

A LABVIEW window will show the control parameters and measurement values in real-time as the experiments are conducted, as shown in **Error! Reference source not found.**, while the UPIs are used to control the experiment and retrieve the results.
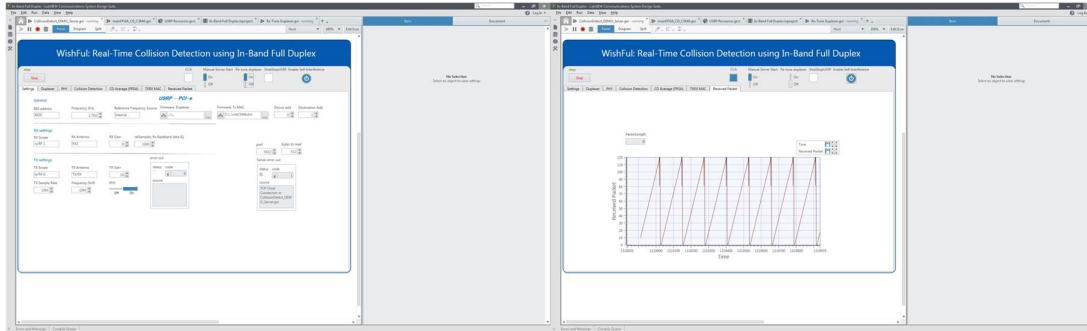
Figure 3: LABVIEW screens showing real-time experiment performance with controllable parameters (above) and output values (below)

Conclusions:

We are pleased with the final testbed implementation, it is flexible, robust against tampering and provides powerful software/hardware for FD MAC and PHY testing. The integration into WiSHFUL allows any external experimenter to test their MAC protocol as long as they design it compliant to the general and newly provided UPIs.

Feedback:

Thanks to the software tools and hardware provided to us by WiSHFUL, we were able to open up our own Full Duplex testbed to the world and integrate it into a hierarchal control framework finally allowing the study of full duplex with real-life application requirements.