IRIS Software Defined Radio Testbed

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Functional Layers

FED4FIRE
FEDERATION FOR FIRE PLUS

Experiments
LTE
Wi-Fi

Virtualised Experiments

NFV Layer
Slices
URLLC
eMBB
mMTC
Compute, Storage, Management
KVM
SDN Network
HyDRA
Access Network

Virtualisation Layer
openstack
HyDRA
COPA

Functional Elements

jFed
Public Internet
Aggregate Manager

LXC
LXD
docker
OpenFlow
IRIS Hardware Resources
Fed4FIRE+ Federated

- 24 x N210 USRPs with SBX120 - Carrier frequency from 400 MHz to 4.4 GHz (Ceiling mounted)
- 5 x X310 USRPs with SBX120 and CBX120 Carrier frequency 40 MHz to 6GHz (Ceiling mounted)
- Dell Networking S4048T-ON high performance SDN/OpenFlow 1.3 Switch (New)
- OpenStack Cloud Platform with 100+ Virtual Machines
- Support srsLTE, GNU Radio, OAI, Handsets (with Sims), etc.
- Future Internet Experimentation (NFV, SDN, SDR, ICN, etc.,)

Experimentation Units

- Enable Software Defined Radio experimentation
- Virtual Machine + USRP (N210 or X310)
  - 4 cores and 4GB RAM
  - USRP + SBX120
  - Up to 10 MHz of Bandwidth per end-point
Iris - The Reconfigurable Radio Testbed

Architecture

Iris - the reconfigurable radio testbed at Trinity College Dublin provides virtualized radio hardware to support the experimental investigation of the interplay between radio capabilities and networks. Our facility pairs underlying flexible radio and computations resources with various hypervisors in the form of software radio frameworks to realize various research and testing configurations. We employ the following hardware elements as underlying radio resources:

- 18 x ceiling mounted USRP N210s equipped with SBX daughterboards reaching frequencies between 400-4400 MHz Rx/Tx (40 MHz);
- 2 x USRP N210 Beam elements with SBX daughterboards reaching frequencies between 400-4400 MHz Rx/Tx (40 MHz);
- Each physical resource is also equipped with 4 Cores and 4GB RAM

These platforms are connected to a private computational cloud, allowing users to deploy an array of computational environments. To expose the functionality of this equipment for a variety of applications, we employ a variety of radio hypervisors, each with different capabilities and organized into the two categories of open standards compliant and blue sky oriented systems. The category of open standards compliant hypervisors includes frameworks based on open implementations of proven waveforms, such as the OpenBTS or Amarisoft frameworks. Blue sky oriented hypervisors, on the other hand, freely enable prototyping of wireless systems, as exemplified by GNURadio. Software Defined Radio (SDR) hypervisors available at the Iris Testbed include:

- GNU Radio SDR,
- Iris SDR,
- and the SRS LTE 3GPP library.

In addition to these frameworks, we also offer support for...
### Basic Iris Testbed Experiment Tutorial

In this section, we provide a basic tutorial on how to run a simple experiment on the IRIS testbed. To run this tutorial, you will need jFed installed, of at least version 5.8. To install jFed, proceed to [http://jfed.iminds.be/](http://jfed.iminds.be/)

### Experiment Description

In this experiment, you will reserve two virtual machines, one for transmission and another for reception. Two stages for this tutorial will be considered, one where a simple sinusoidal wave is transmitted and observed over the air, and another where an OFDM signal is transmitted using GNURadio software.

### Sinusoid Transmission

To reserve two virtual machines, open jFed and go to the RSpec editor. In the RSpec editor, include the RSpec found below and then press run. This RSpec will request two nodes, 'tx_node' and 'rx_node'.

```xml
<?xml version='1.0'?>
<rspec xmlns="http://www.geni.net/resources/rspec/3" type="request" generated_by="jFed RSpec Editor" generated="2016-11-10T15

<nodemanager client_id="tx_node" exclusive="true" component_manager_id="urn:publicid:IDN+iris-testbed.connectcentre.ie+authority+am" <sliver_type name="usrp-vm"> <disc_image name="urn:publicid:IDN+iris-testbed.connectcentre.ie+image+plain" />
</sliver_type>
<location xmlns="http://jfed.iminds.be/rspec/ext/jfed" x="410.0" y="185.0"/>
</node>

<nodemanager client_id="rx_node" exclusive="true" component_manager_id="urn:publicid:IDN+iris-testbed.connectcentre.ie+authority+am" <sliver_type name="usrp-vm"> <disc_image name="urn:publicid:IDN+iris-testbed.connectcentre.ie+image+plain" />
</sliver_type>
<location xmlns="http://jfed.iminds.be/rspec/ext/jfed" x="110.0" y="185.0.000000000000003"/>
</node>
<jfed-command:experimentBarrierSegment orderNumber="0" tag="Barrier segment 0"/>
</rspec>
```

After pressing run, select the project you belong to, the slice name you want to create and the duration of the reservation. Since this is only an example reservation, a 3-hour reservation should suffice. Then wait while the virtual machine is created and configured. This contains...
VxFs!

Browse available vxfs: software packages that are used by applications, ready to be deployed to target resources!

- **hydra_client_2tx_2rx**
  
  by dcollin5, Trinity College Dublin

- **hydra_rx1**
  
  by dcollin5, Trinity College Dublin

- **hydra_rx2**
  
  by dcollin5, Trinity College Dublin
Questions???