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**Orchestration and Reconfiguration Control Architecture**

## **D6.2: Basic SDR experimentation tools for testbeds**

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Abstract	This deliverable provides an overview of tools used in the ORCA testbed for SDR experimentation. More information can be found on the ORCA portal webpage.

Keywords	SDR, Experimentation, Testbed
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### General control of SDR devices in testbeds:

This deliverable specifies what tools experimenters are expected to use for SDR experimentation on the ORCA facility. Most of these tools are not specific to the usage of SDR, but are more generic testbed tools (e.g., jFed), which can be used to control all kinds of nodes. The effort is spent to make the general control of SDR (such as power cycle, network interface configuration with a host node, and logging into the host node) to be compatible with the jFed<sup>1</sup> commands. By doing so, the configuration of an SDR device becomes very similar to the rest of the devices in the testbed, which makes the usage more convenient for the experimenter. This is the approach we take in all ORCA testbeds. For more details please refer to the ORCA portal <https://www.orca-project.eu/testbeds/>. For ORBIT testbed from RUTGERS, an alternative tool other than jFed is used, however it also implements the SFI interface and therefore has very similar functionalities as jFed.

### SDR specific configuration in testbeds:

For more detailed functionalities of the SDR devices, such as configuring the device to receive or transmit signals, users should use dedicated software and drivers.

In w-iLab.t testbed of IMEC, and ORBIT testbed from RUTGERS, Operating System (OS) images are configured with UHD<sup>2</sup> driver installed for USRP, and Xilinx Vivado tools<sup>3</sup> installed for ZYNQ SDR platform. Users have the privilege to create his own OS image with other desired tools, hence they are not limited to the pre-configured OS image.

In KUL Full-Duplex testbed, LabVIEW Communication Design Suite is installed to either modify the present host interface or build up a new one depending on the experiment scenario. In addition, Xilinx Vivado tools including Xilinx Software Development Kit (SDK) is installed to enable MAC protocol development.

In TUD testbed, the software LabVIEW and LabVIEW Communication Design Suite are available allowing the design on host and FPGA as well as the Xilinx Vivado tools. Further, users are allowed to create their own OS images and are not limited to pre-configured OS images.

Massive MIMO testbed at KUL as different USRP subsystems, runs its own applications frameworks in LabVIEW Communication Design Suite 2.0. Those frameworks include one Base Station Host and multiple Mobile Station Host, to measure different key parameters indicators (KPI) for uplink and downlink.

In the Iris testbed at Trinity College Dublin, all virtual machine images connected to N210s and X310 equipment are preinstalled with the relevant UHD drivers. Depending on the needs of the experimenter, OS images for SDR, network control and management, and evolved packer core, are available via jFed, including IRIS, GNU Radio, srsLTE, the WiSHFUL framework, Open Air Interface, and so forth. See<sup>4</sup> for the most up-to-date list of available equipment and resources. A full set of Iris tutorials are available at<sup>5</sup>. Users have the freedom to install drivers, tools, and libraries based

<sup>1</sup>jFed, <http://jfed.iminds.be/features/>

<sup>2</sup>Universal Hardware Driver (UHD), <https://files.ettus.com/manual/>

<sup>3</sup>Xilinx Vivado, <https://www.xilinx.com/products/design-tools/vivado.html>

<sup>4</sup>Iris Testbed architecture, <https://iris-testbed.connectcentre.ie>

<sup>5</sup>Experiment Tutorial, [https://iris-testbed.connectcentre.ie/experiment\\_tutorial/](https://iris-testbed.connectcentre.ie/experiment_tutorial/)

on their experiment requirements. However, all experimenters must agree to testbed Terms and conditions before use<sup>6</sup>.

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<sup>6</sup> Iris testbed terms and conditions, <https://iris-testbed.connectcentre.ie/terms-of-use/>