Experiment 7.7:
Online gathering of Spectrum Sensing Delay and Energy Consumption Measurements in the CREW Benchmarking Framework

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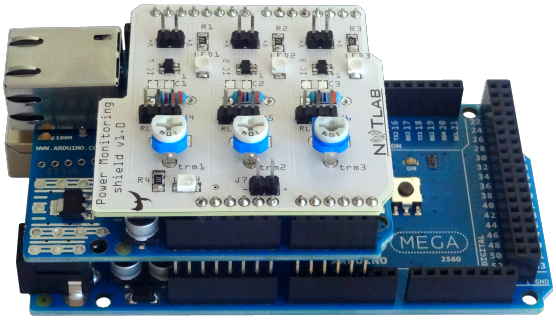
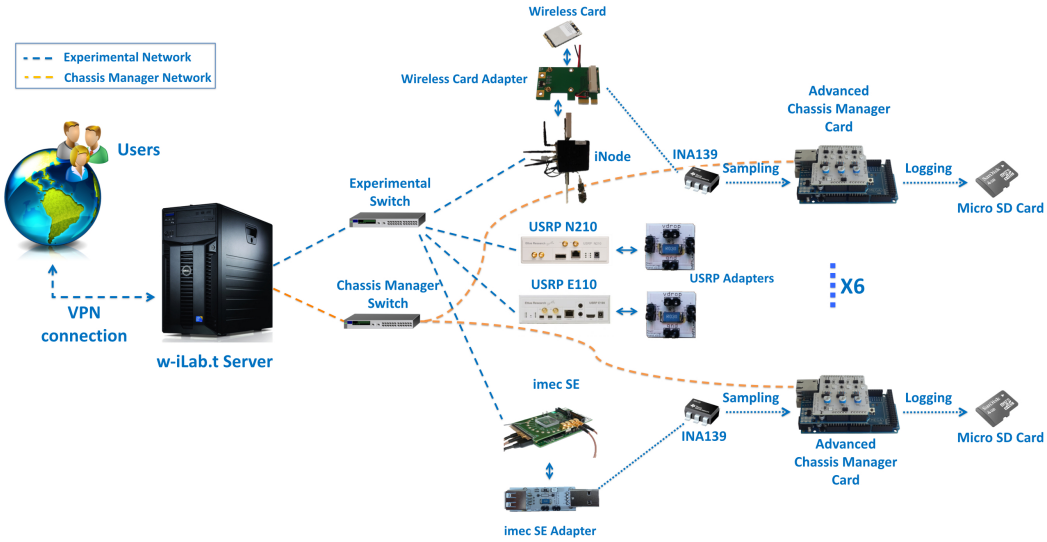
Traditionally evaluation of competing cognitive solutions is based on network performance or detection accuracy metrics. The main aim of the experiment conducted by UTH and NICTA was to enable CREW testbed experimenters to evaluate their cognitive solutions in terms of two prime performance metrics: sensing delay and energy consumption. For the purpose of the proposed experiment, we exploited the advanced spectrum sensing functionalities and the available spectrum monitoring plaforms that are provided by the CREW Testbed Federation. The developed evaluation framework consisted of several innovative hardware and software components that were integrated with the existing w-iLab.t testbed infrastructure and its experimentation framework OMF.

Towards enabling for real-time monitoring of energy consumption, we had to develop a custom platform that could be easily adapted to the heterogeneous spectrum monitoring devices existing in CREW. The developed NITOS ACM prototype platform managed to achieve the high sampling rate of 63KHz and also provided for tranferring of measurements over the existing testbed network infrastructure. Moreover, appropriate software components were developed to enable communication with the devices and processing of collected raw measurements to derive precise power consumption results. Several cards that have been attached with different cognitive platforms and integrated with the testbed are currently accessible and controllable by remote experimenters. The main aim of the Sensing Delay evaluation procedure, was to present the distribution of the Total Sensing Time among the various subprocesses that consitute it. To this aim, we proceeded by modifying the driver that controls the operation of each considered sensing device and resulted in custom driver versions that are available to CREW experimenters. The developed framework and its various hardware and software components have been integrated with the OMF experimentation framework, thus consisting the complex evalaution steps in a totally transparent process.

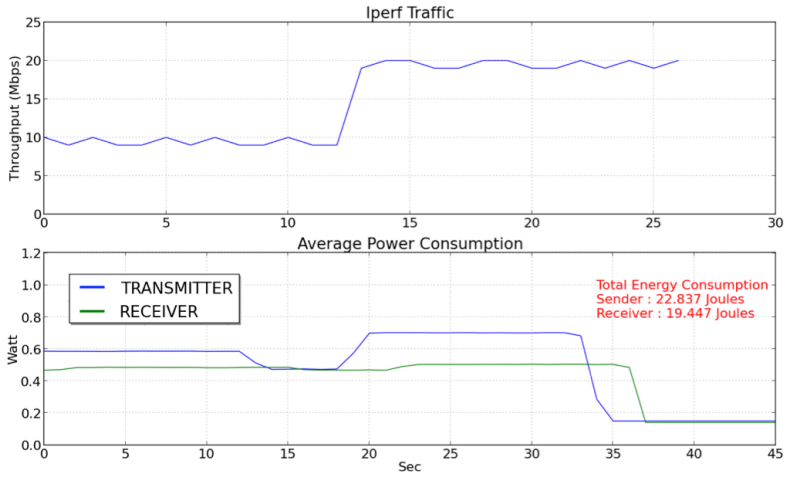
Our experimental investigation included the execution of several scenarios, starting from basic ones including only a few indicative sensing devices and ending in more complex ones that evaluate all the available sensing devices jointly, under a common reference setup. The extensive list of collected results managed to highlight the tradeoffs between the metrics of sensing performance, delay and power consumption. Based on the development of the proposed framework, its deployment in w-ilab.t testbed and the successful execution of remote experiments, under realistic conditions, we proof that our effort to evaluate the performance of sensing solutions in terms of the proposed advanced metrics was successful.



NITOS ACM – High-end, Network Enabled Power Consumption Monitoring Platform



Integration of developed hardware components with w-ilab.t Testbed Architecture



Indicative Power and Energy Consumption evaluation results
as collected per testbed node through an OMF compatible experiment