Orchestration and Reconfiguration Control Architecture

SHOWCASE 3

LOW LATENCY AND HIGH THROUGHPUT INDUSTRIAL COMMUNICATION

GOALS

Support diverging traffic requirements (low latency + high throughput) within the limited spectral and hardware resources.

CHALLENGES

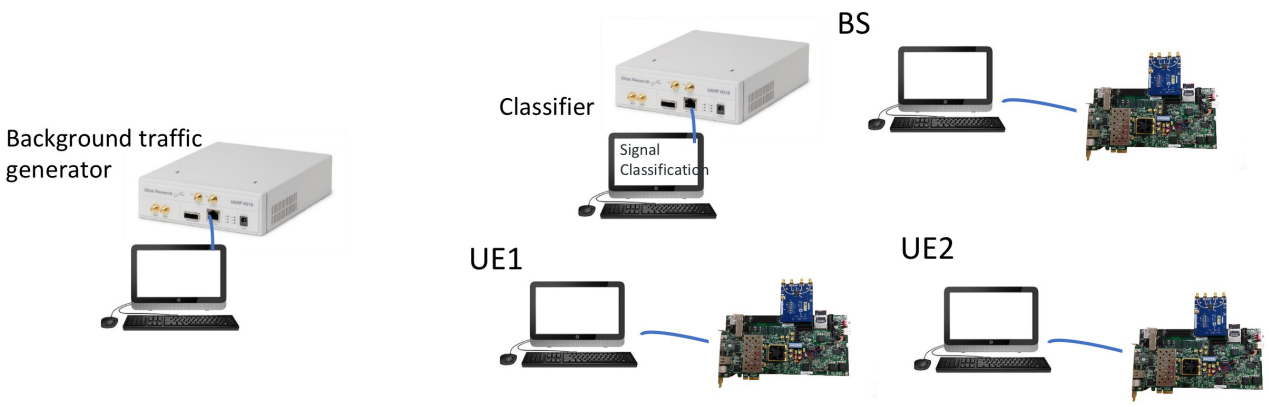
- Given the increasingly complex radio environment and diverging traffic requirements, context awareness becomes determinant for effective resource management of wireless networks.
- In order to supporting different traffic classes with limited resources, the system should be highly flexible and efficient

CONCEPT

- Apply deep learning for classification of background traffic behavior (duty cycle, long or short bursts) in different channels.
- Create slices based on the output of the classifier and the QoS requirements
- Use radio virtualization technologies to support concurrent traffic in different channels

DEMO SET UP

Physical setup: this demo consists of 3 sets of zc706 boards, representing a BS, and 2 UE devices; 2x USRP devices, one uses as a background traffic generator, and another is used to provide IQ samples for the deep learning module. This is depicted in the figure below:



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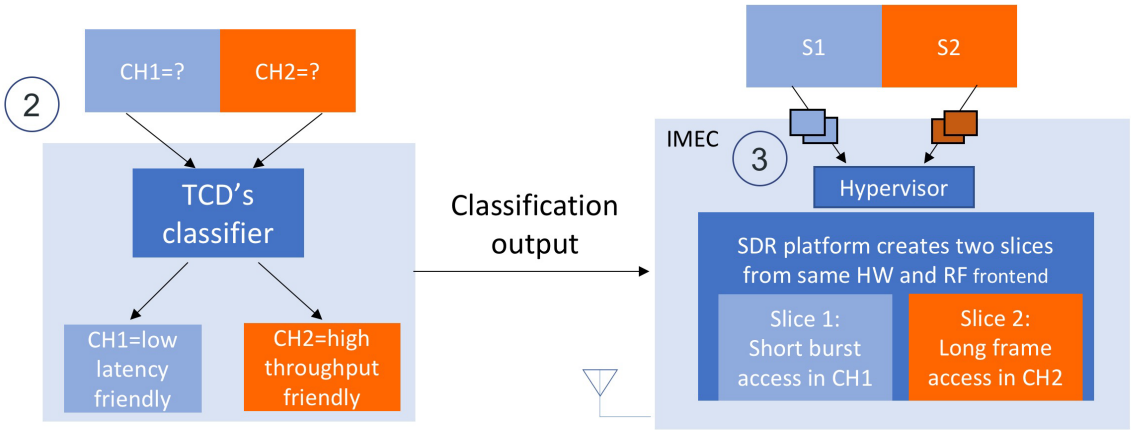
DEMO SET UP



Demo scenario:

- First step is to generate an RF signal dataset over-the-air with IQ samples+metadata to train a deep learning network.
- Second step is to apply the trained model for background traffic classification.
- Third step is to react upon the classifier's result, configure the slices, serve 2 slices simultaneously with one hardware logic.

RESULTS

The designed deep learning network can distinguish different waveforms and estimate their time of arrival, duration, bandwidth and frequency in spectrograms. The algorithm learns how to differentiate leakage from normal transmissions.

INNOVATION

- Concurrent transmit and receiving of multiple traffic streams on different channels via same radio hardware.
- New solutions applying state-of-the-art machine learning techniques to waveform classification. The designed deep learning algorithms can jointly estimate the types of transmitters, but also their RF parameters, such as centre frequency, bandwidth, frame duration, etc.

IMPACT

- A patent application on the radio virtualization technology has been filed
- The RF dataset generation framework, resulting datasets, deep learning training/testing tools, and RF classification SDR blocks are made available to researchers and developers.
- The architecture of radio virtualization is made available for OC experiments and extensions.