



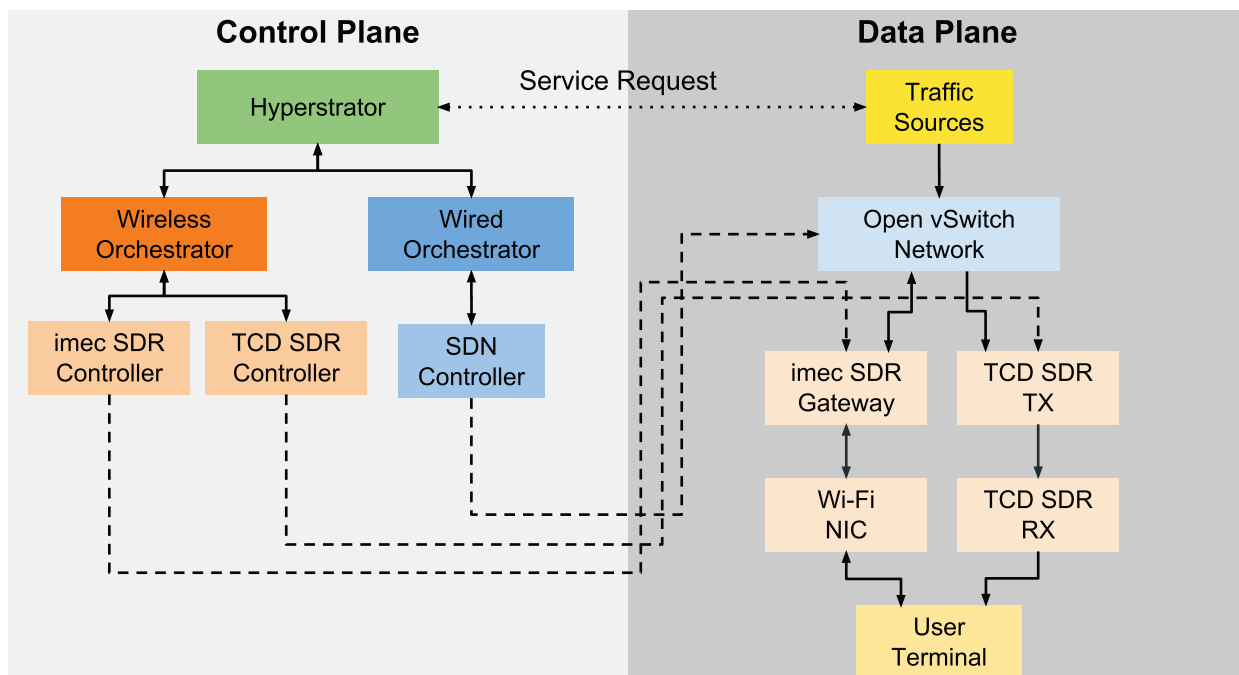
SHOWCASE 3

DEPLOYING E2E SERVICES THROUGH JOINT ORCHESTRATION OF SDR AND SDN

CONCEPT

- Create E2E network slices tailored to support diverging traffic requirements.
- Achieve cross-network segment orchestration through a hierarchical orchestration scheme, using a hyperstrator.
- Apply different radio virtualisation techniques on different SDR platforms depending on the traffic requirements.
- Show the advantages and trade-offs of the different radio virtualisation approaches:
 - The imec virtual radio interface is low-latency and can be compatible with commercial radios.
 - The TCD virtual radio interface possesses the flexibility to instantiate customised radio stacks.

DEMO SETUP



- In the data plane, there are traffic sources aiming at streaming data to a user terminal, traffic classes include high throughput, e.g., video streaming, and low latency, e.g., health monitoring/emergency assistance applications.
- The control plane has a hierarchy of orchestrators, where the hyperstrator receives E2E service requests and delegates the requirements of the wired and wireless network segments to the respective underlying orchestrators.
- The wireless network orchestrator decides to employ one of the available radio virtualisation techniques depending on the traffic class of the service, and then instantiates a radio slice on either the imec or the TCD virtual radio interfaces.
- The wired network orchestrator decides to establish either a high-throughput or a low-latency data path on a virtual wired network consisting of Open vSwitches, and then instantiates the core slice between the traffic source and the chosen virtual radio interface.
- The user terminal has both imec and TCD virtual radio interfaces, enabling a flexible routing of the traffic sources between the two infrastructures.



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GOALS

- Demonstrate how the functionality provided by ORCA can support E2E communication services.
- Deploy E2E network slices to support diverse traffic requirements of industrial use cases.
- Coordinate the operation of SDR and SDN for creating E2E network slices.

CHALLENGES

- Coordinating the orchestration of wired and wireless network segments for establishing routes and providing radio access.
- Creating an interface between the SDR and SDN for attaching the radio slices to the core slices.
- Performing many-to-many spectrum virtualization, allowing spectrum partitioning and aggregation.
- Making SDR radio interface compatible with commercial Wi-Fi.
- Creating multiple slices throughout all layers (from the driver in the embedded OS to the radio hardware on the FPGA)

RESULTS

- Full stack 802.11a/g SDR implementation: RF control; FPGA baseband; Linux mac80211 driver. Achieve critical SIFS timing and communication with commercial Wi-Fi.
- FPGA maintained real-time time slice handling: create, destroy, config (duty cycle, slot).
- Show the time taken for instantiating E2E services, including the components from the hyperstrator, orchestrators, and controllers.
- Show the E2E latency and throughput of the different types of network slices

