

CloudRAN IRU

Designed by EURECOM – Production and distribution by TELMAT

Introduction : CloudRAN

The evolution of radio communication networks will be based on so-called “CloudRAN” technologies which refer to centralized radio-access infrastructure deployed in data-centers.

Although exhibiting important differences in the type of processing they perform, the compute and storage architecture of these data-centers, as well as many of the software technologies, are very much modelled by those used by internet-based industries for information content management and distribution.

We show the envisaged evolution of radio networks in Figure 1.

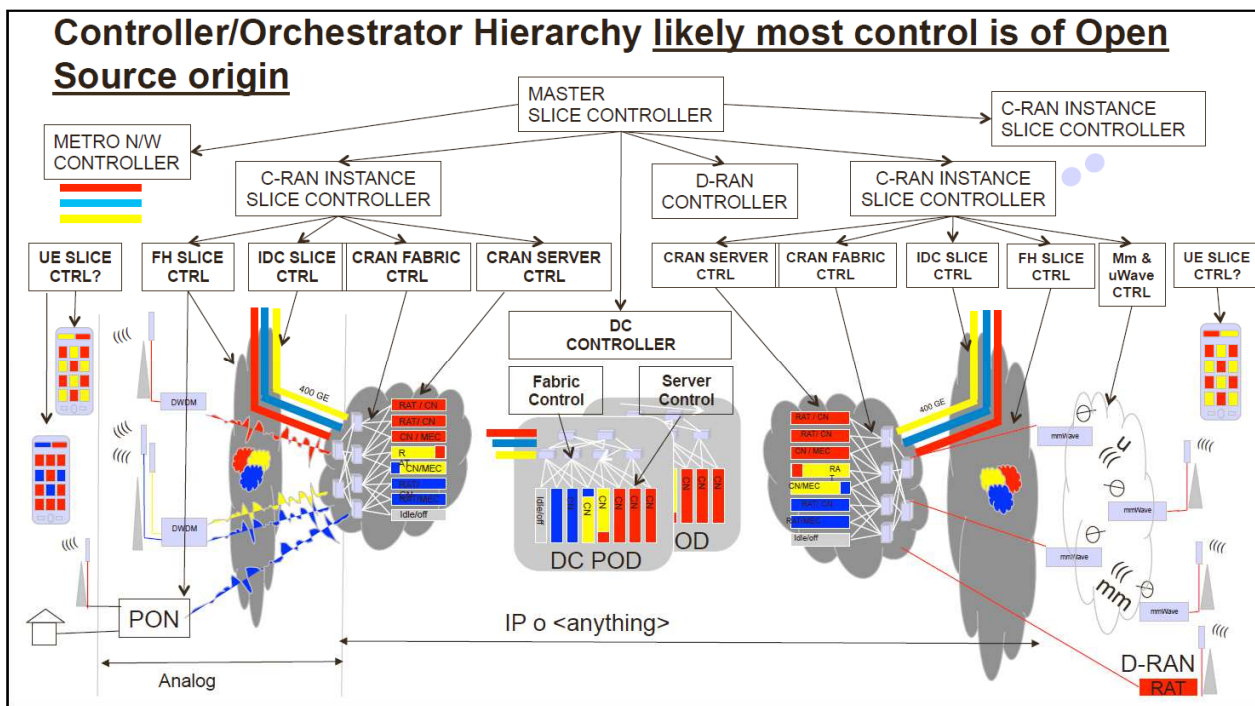


Figure 1: Evolution of Radio Networks

(Source: https://www.itu.int/en/ITU-T/Workshops-and-Seminars/itu-ngmn/Documents/Abstracts_and_Presentations/Peter-Ashwood-Smithv2.pdf)

The network is comprised of three segments, the so-called fronthaul network (labelled by “Analog” in Figure 1), the CloudRAN data-centers and the main data-centers (DC in the middle of Figure 1).

The fronthaul network links the radio nodes at the extremities (triangles with emanating waves in Figure 1) with the CloudRAN. These interconnection networks are typically optical links over very large distances (10-20 km) when the CloudRAN resides in the central office of an operator.

Various technologies are envisaged including analog (radio-over-fiber) PON (passive optical network), TDM and WDM PON and carrier grade optical Ethernet. Other solutions will also exist for indoor networks (e.g. airports, shopping malls, large administrations, private enterprise networks, etc.) using both optical and copper-based fronthaul networks.

One of the key areas of application of EURECOM’s OpenAirInterface (OAI) software packages (openairinterface5g, openairCN) is precisely for CloudRAN and the fronthaul networks. To a growing extent as well, some of the components of the main data centers could also make use of EURECOM’s software.

Many industrial and academic partners around the world are now collaborating with EURECOM to develop the software for this purpose and are planning to deploy solutions in their labs and campuses. A CloudRAN deployment can for example consist of an indoor network in buildings.

A typical deployment is shown in Figure 2 and consists of a CloudRAN fabric, a fronthaul network, and a set of radio transceivers, which will now be briefly described.

The CRAN fabric comprises

1. A set of commodity Intel-architecture servers which will execute the OAI RAN software packages (openairinterface5g)
2. Other similar servers for Core Network and application software primarily developed by EURECOM (openairCN, MEC, SDN, etc.) or by third-party industrial solutions along with orchestration frameworks from other open-source initiatives (e.g. ONOS, ECOMP, Open-source MANO, etc.).
3. An infrastructure testing server unit
4. Experimental gateway technology (CPRI-gateway) developed by industry partners for interconnection of the EURECOM CloudRAN equipment with industry-grade radio equipment (CPRI RRH).

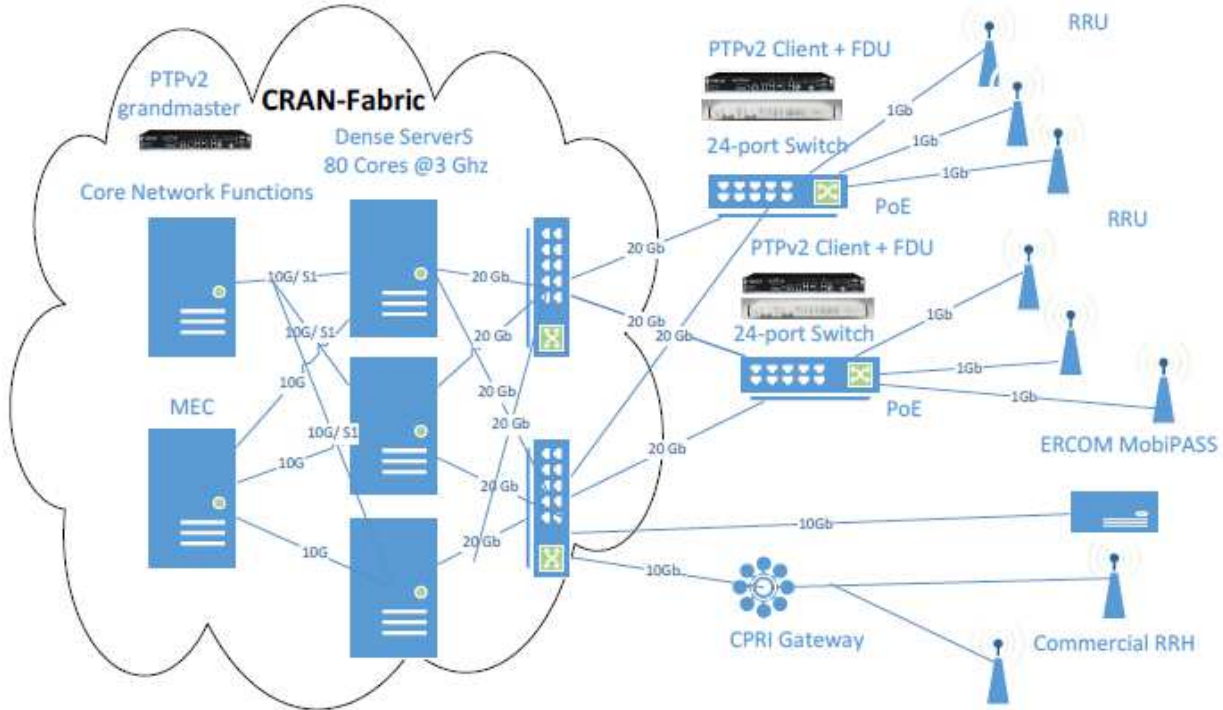


Figure 2: Target Deployment Components (IRU are labelled RRU in this figure)

General description of the IRU

A CloudRAN RRU, or IRU, will consist of the following main components

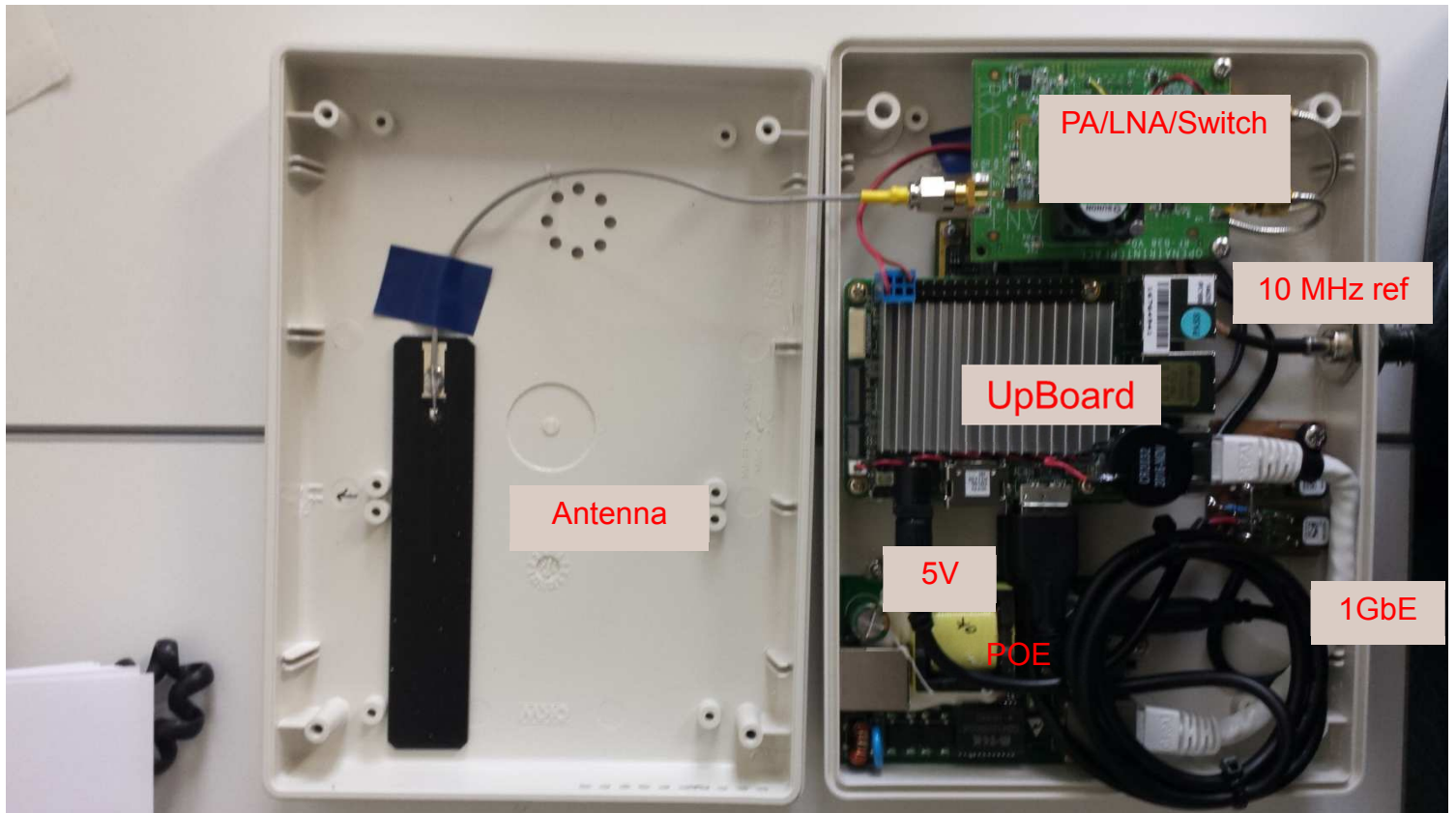
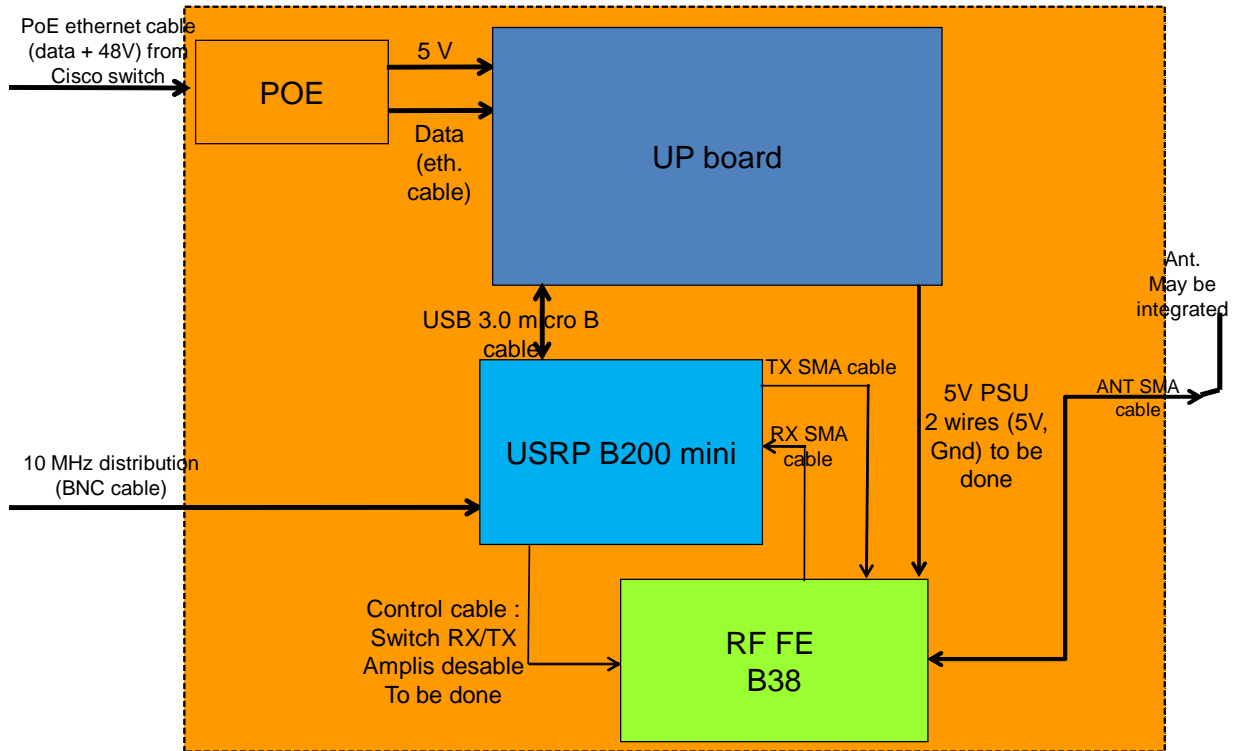
1. Pico-ITX or smaller motherboard (UP-board, UP2)
2. Baseband-to-RF radio units (USRP B200-mini)
3. EURECOM-designed RF front-end circuit (25-27 dBm at the antenna port).
4. Wiring for 1Gbit/s Ethernet with Power-over-Ethernet modules (PoE) to provide power to the radio units. An additional 10 MHz frequency synchronization cable is also distributed to each RRU.

These modules can be used as:

- a) IF4p5 RRU (with UP or UP2)
- b) NFAPI PNF (with UP2)
- c) 5-10 MHz eNodeB (with UP2)

They are powered via PoE+ and require less than 20W. They can also be synchronized using methods that are part of the current OAI codebase. The functional view of the IRU is given in the figure below :

Indoor Radio Unit (fonctional view)



Composition of the IRU.