Why Do We Need the OpenRAN Movement?

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A question that often comes up in Open RAN discussions is this: why do we need the Open RAN movement if the networks use 3GPP-based interfaces, which are already open and standardized? Here is our take on this important and relevant question.

Overview

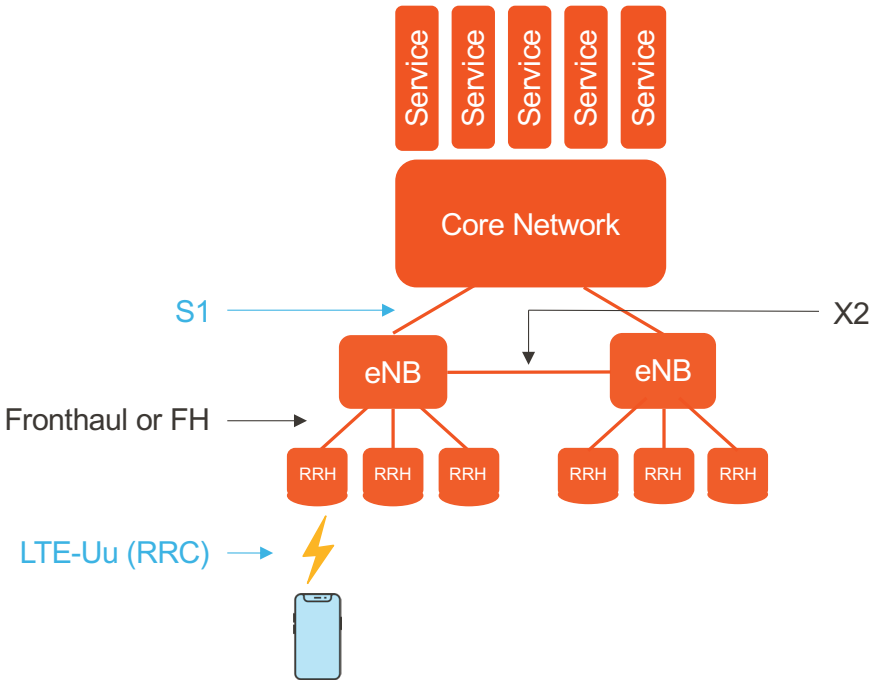
Let's start with the basic architecture, which you can check out in our Open RAN videos. Using 4G LTE as an example, the two interfaces from the RAN point of view are:

- The Air interface, also known as Uu or LTE-Uu interface that uses the RRC protocol
- The S1 interface, between the RAN and the Core

Interfaces

Both of these interfaces are standardized by 3GPP and open, so no issues here. However, the simplified 4G network is more like what is shown in this diagram, if we go just a little bit in detail. There are 2 more interfaces that are the key reason the Open RAN movement started.

The first is the fronthaul. As we discussed in our Open RAN concept video, there are two components in the RAN. The virtualized BBU software that runs on COTS servers and the Remote Radio Head or RRH. The interface between them is known as fronthaul, and it uses the CPRI protocol. This protocol generally has vendor-specific implementation and is not necessarily open. Open RAN-focused organizations are trying to get rid of this CPRI in the fronthaul by using other open alternatives. For example, O-RAN Alliance the defines eCPRI to use with Split 7. Small Cell Forum, on the other hand, has defined N-FAPI to use with Split 6. Even though you may think these eCPRI and N-FAPI are specific to 5G, they can be used for 4G as well, along with other ethernet-based open fronthaul options.



Typical Mobile Network Architecture - 3GPP Interfaces

The second interface to note is the X2 interface. Even though this interface has been defined by 3GPP, it is an optional interface. Many incumbent vendors intentionally did not implement this initially and, when they did implement it, they used many proprietary messages over this interface thereby ensuring that multi-vendor networks were difficult for an operator to deploy.

X2 Interface

While we won't cover everything the X2 interface does in this blog post, the main thing to note is that X2 is quite useful for a 4G network, even though it is an optional interface. For multi-vendor networks to function seamlessly, this interface becomes essential, especially for managing interference. It becomes even more important in case of 5G.

As you may be aware, all the 5G deployments today are 5G Non-Standalone or NSA deployments. People who are familiar with technical terminology also call this Option 3, 3A, 3X or by 3GPP defined name, EN-DC. What this means in simple terms is that the 5G New Radio is used for the access network, but it only works in conjunction with the 4G LTE access network and the 4G core, also known as the EPC.

What does the X2 interface do?

- The X2 interface supports exchange of information between eNBs to perform the following functions:
- X2-based handovers
- Load management to share information between eNBs to help spread load more evenly
- Inter-Cell Interference Co-ordination (ICIC)
- CoMP (Coordinated Multi-Point transmission or reception)
- Network optimizations
- eNodeB configuration update, cell activation, including neighbor list updates
- Mobility optimization: co-ordination of handover
- General management: initializing and resetting the X2
- Many of the key functions are described by the X2-AP. These control plane signaling procedures have been standardized in order to ensure eNBs from different vendors are interoperable

Conclusion

So, if the X2 interfaces are not open, then operators are forced to deploy 5G today using their existing 4G LTE vendors. In some cases, the operators have come up with innovative solutions where they have provided a new or existing small chunk of 4G spectrum to the new 5G vendor to break this 4G dependency, but every operator does not have a spare chunk of spectrum available for these kinds of innovative solutions.

Open interfaces would be very helpful in such a scenario, and we hope this explanation helped clarify why the Open RAN movement is still necessary even though we use 3GPP defined interfaces for many different connections, be it air interface or connecting to the core and to the outside world.

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