

# 3GPP 5G RAN Study Completed – Let's look at the reports

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## Summary

This month, at the RAN plenary the study on 5G New Radio was finalized by the RAN working groups. A lot of effort was spent on putting together the respective technical reports that were agreed last week. If you want to get an overview of the status of 5G, this is a good time to do so, since the reports are quite comprehensive and capture the all latest decisions.

- RAN3 TR 38.801 v2.0.0 on Study on New Radio Access Technology; Radio Access Architecture and Interfaces
- RAN1 TR 38.802 v2.0.0 on Study on New Radio (NR) Access Technology; Physical Layer Aspects
- RAN4 TR 38.803 v2.0.0 on Study on New Radio Access Technology: RF and co-existence aspects
- RAN2 TR 38.804 v1.0.0 on Study on New Radio Access Technology; Radio Interface Protocol Aspects

Thanks to the effort of the 3GPP team, you find the latest versions already updated at this link: <http://www.3gpp.org/DynaReport/38-series.htm>

The reports must be interpreted a bit differently since every working group has its own working style. I would suggest to start with the TR 38.804 of RAN2 on protocol aspects. RAN2 tried to restrict itself to capturing decisions only and to write a clear report. TR 38.804 will even serve as basis for a future stage 2 specifications TS 38.300 (stage 2 of LTE was 36.300). The work might be a bit easier compared to the other groups since the protocol architecture is very similar to LTE. The channel structure is almost the same; again we have got our bearer, logical channel, transport channel ... the RRC, PDCP, RLC and MAC layer. A few functions changed their positions in the stack to allow for a better architecture split. Keep in mind, LTE added Dual Connectivity at a later release and thus the mapping can be done a bit better when starting from the scratch with 5G. Well, we have got a new RRC Inactive state, but it was already known as LTE lightly connected from Rel.14 work. The QoS concepts looks very similar to LTE although there is a new access stratum mapping of QoS flows to radio bearers. Eventually this may result in a new Layer 2 sublayer located above PDCP. RAN2 was not able to decide on the name, but a candidate name would be Packet Data Adaptation Layer.

RAN1's decisions on PHY are sometimes a bit cryptic and difficult to read if one was not involved in the process. The decisions are still on a general level and there is always lots of discussion on the exact wording. Some key decisions are still pending. Often if no agreement is found, we keep the LTE principles also for 5G. Most importantly we keep the same access technology of OFDMA in downlink and an SC-FDMA—or better DFT-spread OFDMA—technique in uplink. The coding decision was significant since RAN1 decided for a completely new channel coding, LDPC for the data channel and Polar codes for the signaling. There are a lot of considerations required for new self-contained resource allocation providing forward compatibility. Uplink HARQ will be asynchronous as the downlink and there are many more decisions that you can find in the report. If you are interested in simulations, this is the specification to read. It contains link- and system-level simulation methodology and respective evaluation results (did I mention that NoMoR is offering system simulations according to 3GPP methodology?)

RAN3 on the other hand captured every option on architecture and interfaces. It is probably easy to read for you. It contains quite some text, but you must be careful on the interpretation what will be relevant for 5G and what not. I hope that RAN groups do not follow completely the SA2 approach with huge reports with several hundreds of pages and an incredibly large number of options. I wonder if it helps in the long term if hard decisions are avoided for a long time. At least RAN3 started on numbering their solutions, their split options, their migration paths and so on. Probably the delegates need this numbering to understand themselves what they are talking about. Anyway, RAN3 was quite interesting for the last year due to the controversial discussion on the RAN internal logical split. Although it is still only a recommendation, we will see a specified interface for the upper split similar to Dual Connectivity. It is not yet clear if a lower

layer split and interface (CPRI like interface) will be defined by 3GPP.

I did not attend any RAN4 5G session, so I leave it up to you to read the report.

Thanks for all the work and all the progress. It was quite some work putting together the reports. Special thanks to the rapporteurs from NTT DoCoMo. With the new guidance from the RAN plenary to complete the 5G work for the non-standalone case already in December 2017, all of us expect an even busier year to come.

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