5G NR based initial access procedure simulation environment implementation including system information using ns-3 simulator

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Abstract— In mobile communications, the RRC layer protocol defines a procedure for how a UE initially accesses a base station. In particular, information for cell access is required for initial access, and the UE can obtain such information through system information blocks such as MIB and SIB transmitted by the base station.

As the network evolves from LTE to 5g nr, the protocol of the RRC layer for initial access has also changed a lot. In LTE, it was necessary to access a cell through MIB, SIB1, and SIB2 information, but in 5g nr, since SIB1 also includes LTE's SIB2 information, it is possible to access a cell with only MIB and SIB1.

In this paper, we analyzed how the initial access procedure of 5g nr and the system information required for it are different compared to LTE. In addition, after analyzing the LTE-based RRC layer protocol provided by default through the current ns-3 simulation environment, the system information and RRC state transition process for 5g nr-based initial access were implemented with ns-3 code.

Then, through the implemented code, it was confirmed whether the UE was normally connected to the base station, and the performance was evaluated by checking what difference it has from LTE. Implementation of initial access process in 5g nr using ns-3 is expected to be an important cornerstone for implementing 5g nr based RRC layer protocol in the future.

Keyword— 5g NR, Initial acess, ns-3 simulation, RRC protocol, System information blocks.

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