

In Response to: NTIA Docket No. 210105–0001 “5G Challenge Notice of Inquiry”

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Topic: A Clean Open-Source 5G Ecosystem

I. Challenge Structure & Goals

An important challenge in any open-source development is to create a reliable and clean open-source ecosystem. Since many individuals and organizations will be contributing to the pool of contributed 5G software modules, it is important no one can “pollute” it. Strict measures should be used to ensure this. In the context of Open 5G development, this requires making sure only a new 5G module which conforms to 3GPP standards can be added to the pool.

This has some similarity to conformance testing and interoperability techniques in the telecom industry. Conformance testing here means checking if the software module has the same I/O behavior as expected by the 3GPP standards. Interoperability techniques ensure that this module will interoperate with other software to provide needed 5G services. Good formal techniques can significantly help in this effort.

The first step is to make sure the module conforms to the 3GPP standard. This requires creating models (such as finite state machine (FSM) models for protocol interactions) for the 3GPP standards. Creating FSM models is a challenging task and an impediment to this approach. Automatically generating such models from 3GPP specifications is highly desirable.

The second one is interoperability. This is done at events like ETSI’s Plugtests. Creating automated test harnesses will be highly desirable. Use of formal methods should be explored here. Contributors can create open-source test sequences and harnesses as that can be used by developers to test for conformance.

II. Incentives and Scope

Success of an open-source ecosystem will depend on the confidence of its users in its reliability and error-free behavior of its parts. Tools described above will help in enabling developers who have developed a module to add it to the pool without polluting it. For DoD, such confidence is absolutely essential for success in promoting a 5G open-source code base.

Waiting for a Plugtest event by a new module developer can be quite cumbersome. Open-source interoperability test and harnesses are highly desirable. Functions and capabilities of special interest to DoD can be prioritized for developing test harnesses. Existing codebases can be given a score based on its conformance level.

III. Timeframe & Infrastructure

Consider dividing the project into the following phases: Creation of test harnesses and evaluation metrics, Execution on existing code bases, Refinement for the DoD use cases.