

WHITEPAPER

# 5G Readiness



**ENSURING QUALITY ON SCHEDULE**

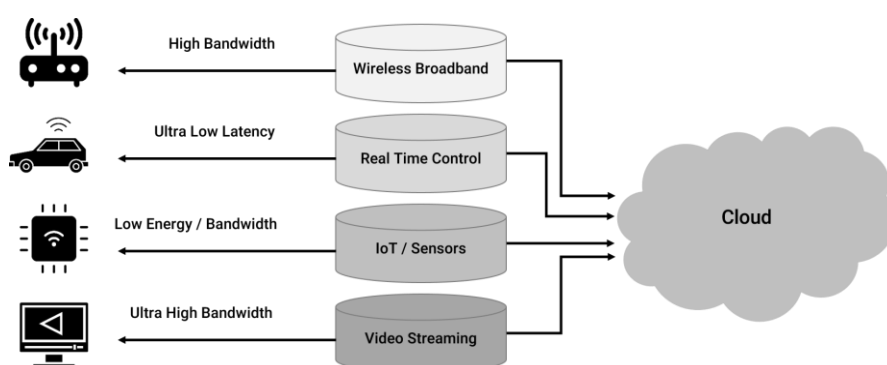
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In this era of 5G telecommunication providers began deploying fifth-generation (5G) networks to meet growing demands for data from consumer and industrial users. 5G networks are expected to enable providers to expand consumer services, be it video streaming or virtual reality applications. 5G promises to support the growing number of connected devices in the fields of medical science, smart homes, the Internet of Things, new industrial application like industrial sensors, industrial monitoring systems, smart city applications, autonomous vehicles. 5G is also expected to yield significant economic benefits. Market analysts estimate that in the United States alone 5G could create up to 3 million new jobs and add \$500 billion to the nation's gross domestic product (GDP).

Now the question is what are some of things that one should be looking for 5G testing. Indeed, there are so many protocol testers in the market. Let's put us some light on 5G basics.

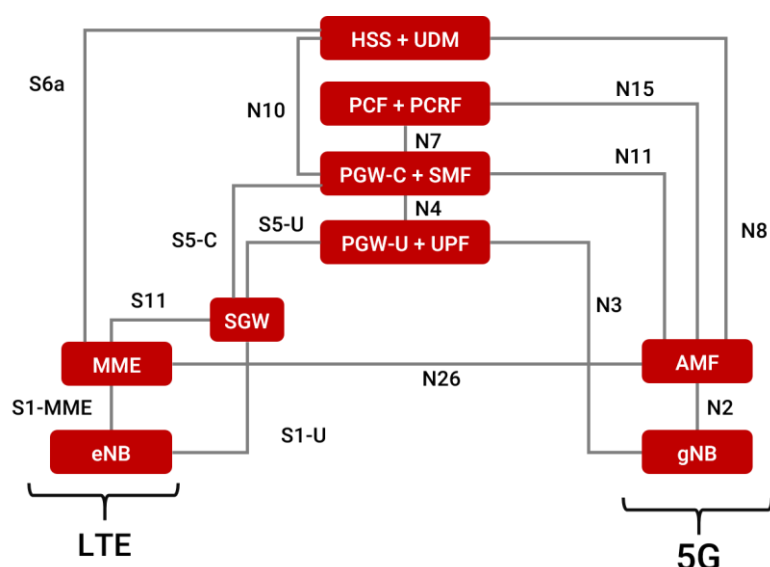
## 1. Network Slicing:

One of the key requirement of this entire 5G evolution would be the Network slicing, the method of allowing multiple logical networks to run on top of shared physical network infrastructure. Hence, the network test tool needs to support 5G network slicing scenarios. One should be able to simulate EMBB, URLLC, MIOT end to end use-cases with the chosen tool.



## 2. 4G-5G Migration:

We need to remember that 5G comes into the picture as an evolved version of 4G. To bring out 5G in any infrastructure, first we need to make sure 4G-5G interworking works seamlessly. As a network protocol tester of choice, one should be able to simulate hybrid nodes like HSS+UDM, PCF+PCRF, SMF+PGW-C, UPF+PGW-U to perform 4G-5G migration scenario with ready-made 4G-5G canned use-cases in a plug and play manner.

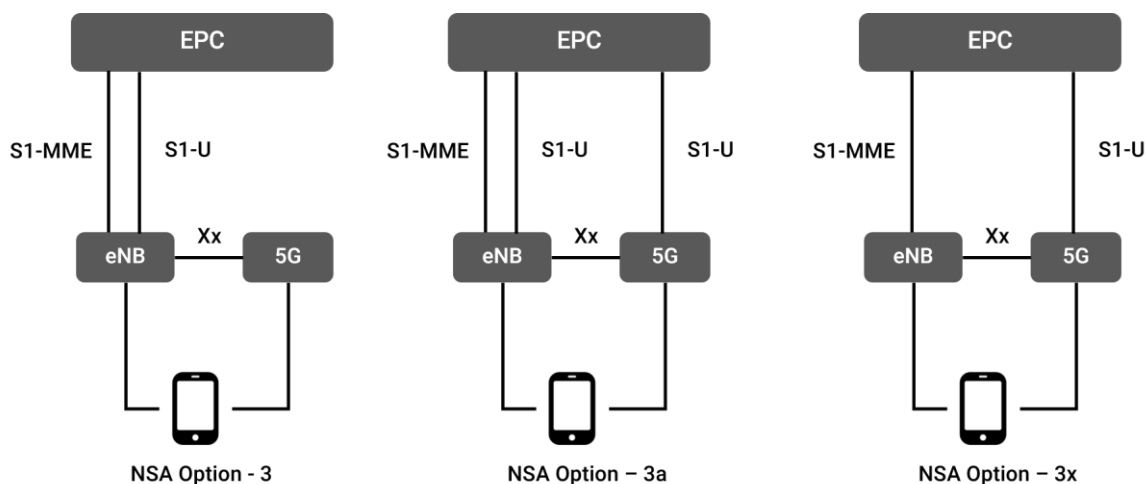


## 3. CUPS Architecture:

Control and User Plane Separation (CUPS) architecture is required to have the user plane of the packet core to be placed closer to the end-user while the control plane can be placed in a centralized location. The proximity of the user plane reduces latency and ensures high-bandwidth. The test tool should have the ability to simulate similar hybrid nodes for that along with CUPS use-cases.



For validating dual connectivity, the tool needs to simulate a group of eNodeBs and gNodeBs split data packets as per the guidelines laid down by different options of 5G NSA and in accordance to 3GPP Release 15. Supports for NSA Option -3, NSA Option -3a, NSA Option -3x is also required. At the same time for validating the components of a 5G telecom network has to provide the capability of simulating relevant 5G protocols like NGAP, PFCP and HTTPv2.



### 5. Hardware agnostic and user-friendly:

Apart from being an effective network protocol tester, the tool should be hardware agnostic and cloud native. A software only solution that can run on VMs, support containerization, and can be implemented on open shift and K8S pods is ideal.

## 6. Analytics Support:

We all understand how important it is for a test tool to contribute to result analysis. Keeping that in mind the need, the test tool must have an Analytics module for deeper analysis of the execution data via an interactive dashboard.

Following are a few of the salient insights that needs to be included in Analytic report:

- Pass/Fail statistics of the Feature Files (test cases) executed
- Failure analysis for the feature file; test authoring error, configuration error or application failure
- Nodes, Protocols and Interfaces covered and their associated configuration
- 3GPP Procedures and Scenario covered by the execution data and its maturity statistics
- System-level KPIs and Mobility statistics are presented graphically
- Story-board representation of test cases executed

## ABot, 4G/5G Network Test Tool from Rebaca

ABot provide a plethora of canned test cases on 5G Network slicing, 4G-5G migration and NSA. These test-cases include 5G Slice management procedures, 4G-5G handover etc. ABot can run on a virtualized environment along with Openshift or K8s pods.

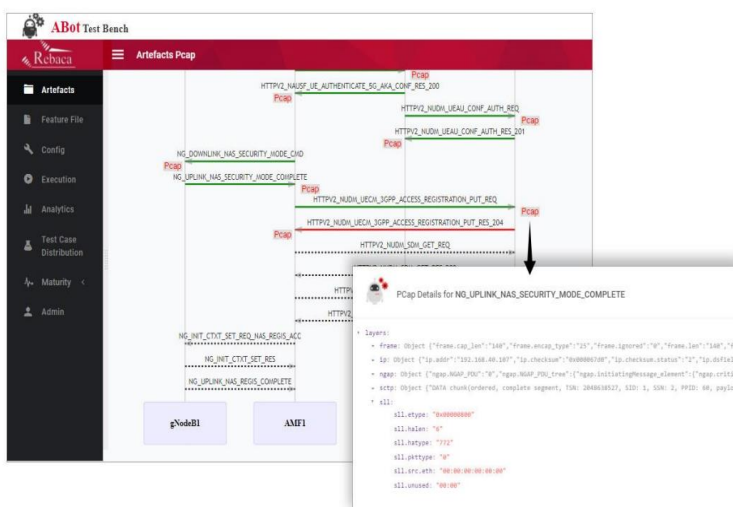
ABot use case specific test cases and analytics modules are ideal for unit testing, development testing, system integration and interoperability testing. The English like domain specific test cases are ideal for on boarding resources and making them productive for test automation. It is also capable of simulating any 5G telecom function completely or only certain interfaces/messages. It's ability to simulate end-to-end 5G Non-standalone and Standalone use cases can accelerate development, integration and interoperability testing of NFs.

```
When I send X2AP message X2_SGNB_RECONFIG_COMPLETE on interface Xx with the following details from node eNodeB1 to gNB:
| parameter | value |
| menb_ue_x2ap_id.enb_ue_x2ap_id | incr(1001,1) |
| sgnb_ue_x2ap_id.enb_ue_x2ap_id | incr(2000,1) |
| resp_info.choice_resp_type.config_successfully_applied.menb_to_sgnb_container | 0000 |

Then I receive and validate X2AP message X2_SGNB_RECONFIG_COMPLETE on interface Xx with the following details on node
| parameter | value |
| menb_ue_x2ap_id.enb_ue_x2ap_id | {string:eq}(incr(1001,1)) |
| sgnb_ue_x2ap_id.enb_ue_x2ap_id | {string:eq}(incr(2000,1)) |
| resp_info.choice_resp_type.config_successfully_applied.menb_to_sgnb_container | {string:eq}(0000) |

When I send X2AP message X2_S1_STATUS_TRANSFER on interface Xx with the following details from node eNodeB1 to gNodeB:
| parameter | value |
| new_enb_ue_x2ap_id.enb_ue_x2ap_id | incr(3001,1) |
| old_enb_ue_x2ap_id.enb_ue_x2ap_id | incr(1001,1) |
| e_rabs_subject_to_status_transfer_list.0.e_rab_id | 5 |
| e_rabs_subject_to_status_transfer_list.0.ul_count_value.count_value.pdcp_sn | 1 |
| e_rabs_subject_to_status_transfer_list.0.dl_count_value.count_value.pdcp_sn | 1 |
| e_rabs_subject_to_status_transfer_list.0.ul_count_value.count_value.hfn | 2 |
| e_rabs_subject_to_status_transfer_list.0.dl_count_value.count_value.hfn | 2 |

Then I receive and validate X2AP message X2_S1_STATUS_TRANSFER on interface Xx with the following details on node gNB:
| parameter | value |
| new_enb_ue_x2ap_id.enb_ue_x2ap_id | {string:eq}(incr(3001,1)) |
| old_enb_ue_x2ap_id.enb_ue_x2ap_id | {string:eq}(incr(1001,1)) |
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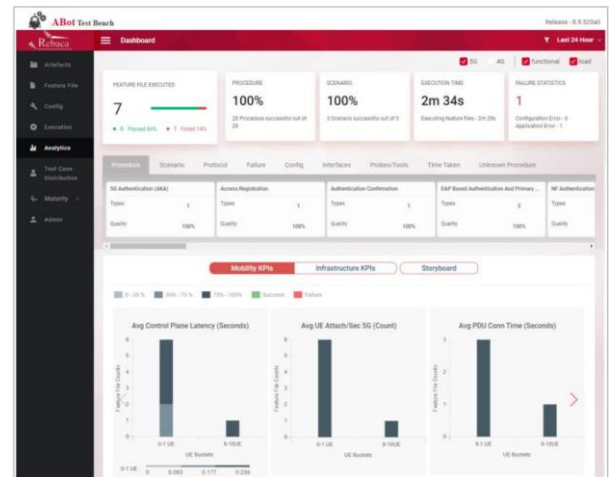
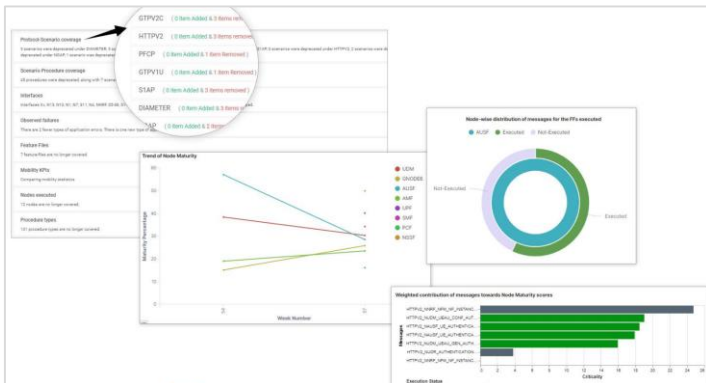


ABot analytics module analyzes the test results and helps in root cause analysis. All test execution data are ingested into an Elastic DB which ABot Analytics engine process to provide data insight using AI-driven ML algorithms.

A ladder diagram representation of the call flow is provided along with associated PCAP and log files sorted by interfaces on the call flow.

Execution time for each test step, nodes and interfaces covered and their configurations are also made available in the Artefact UI. For failed test cases, failure analysis with details on the failed step are also provided.

ABot's Maturity trend provides build by build analysis of the product maturity by analysing the test execution data. Detail report of Interfaces, Protocols, Mobility characteristic, and the Nodes tested are provided through an interactive dashboard for easy navigation.



A graphical representation of the node maturity is provided with maturity scores based on the pass/fail analysis of the messages and their criticality based on the use cases verified.

ABot comes with a pay as you use model, which includes upgrades and support service, and essential part of adopting any test tool for 5G validation and debug analysis. This Test-as-a-Service model make ABot a preferred choice for OEMs, Operators and System Integrators.

It is very important for us to be market-ready and be a part of this 5G race. ABot, the solution from Rebaca, is going to be the game-changer.

Connect to us for a live demo or free trial. Stay tuned for more details on ABot and do [subscribe](#) to us.