ENI ISG PoC Report Template

1 General

The following normative disclaimer shall be included on the front page of a PoC report:

Submission of this ENI ISG PoC Report as a contribution to the ENI ISG does not imply any endorsement by the ENI ISG of the contents of this report, or of any aspect of the PoC activity to which it refers.

2 ENI ISG PoC Report

2.1 PoC Project Completion Status

- Overall PoC Project Completion Status: completed

2.2 ENI PoC Project Participants

- PoC Project Name: Intelligent Coverage Optimization of 5G Massive MIMO BS
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2.3 Confirmation of PoC Event Occurrence

- **Demonstration on ETSI ENI #21 plenary meeting**

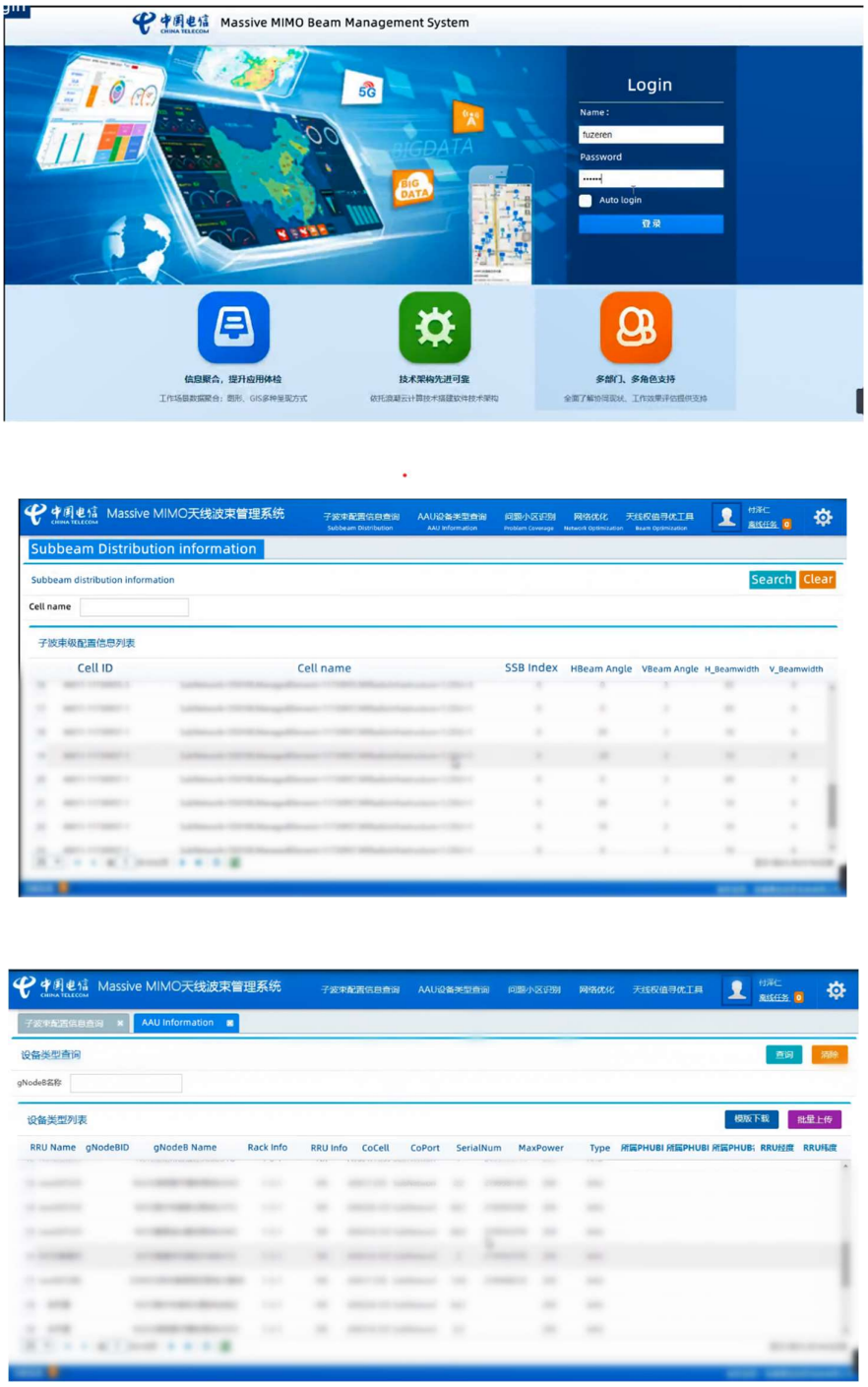
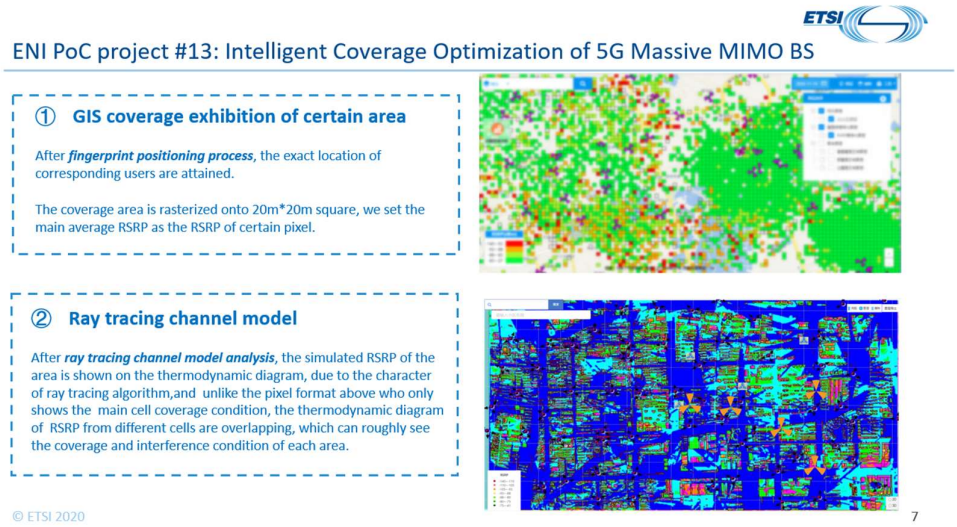


Fig. 1 Coverage Optimization System

- **Demonstration on ETSI ENI #21 plenary meeting**

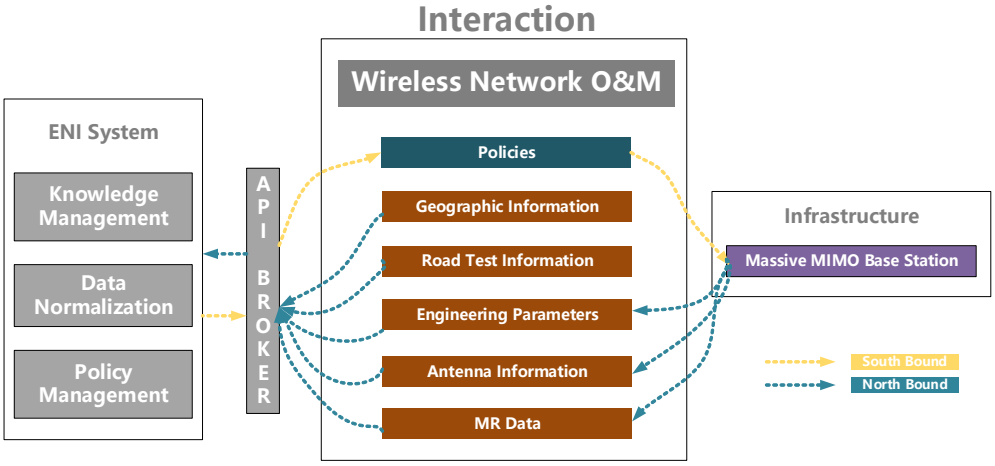


• **Fig. 2 Demonstration on ETSI ENI#21**

2.4 PoC Goals Status Report

□ **PoC Project Goal: Data Analysis and Policy-Based Coverage Optimization**.
Demonstrate the use of AI based data analysis to enable policy-based coverage optimization for Massive MIMO BS.
Goal Status: Met

To achieve this target, in a context where the ENI System performs part of functionalities, the reference point between different PoC systems and the ENI System need to be carefully implemented because there is a lot of information exchanged between them. Certain operations will need multiple connections and coordination among related systems. The overall structure of this system is shown in Fig.3.

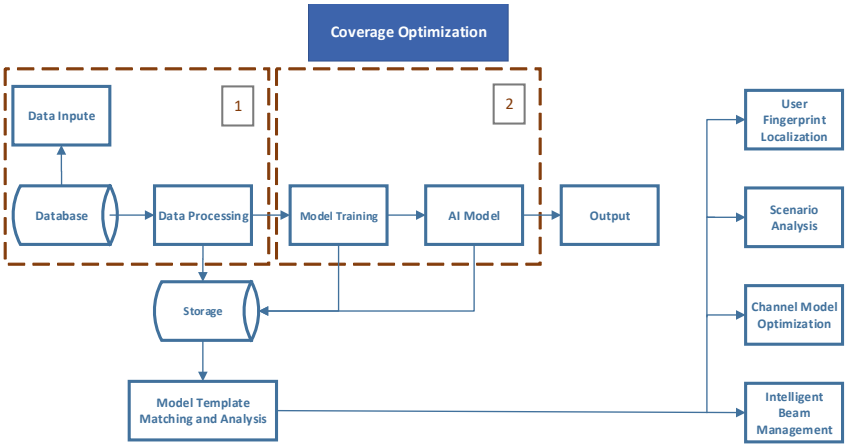


• **Fig. 3 Interaction**

Fig.3 shows an interaction of internal and external reference points. In this scenario, different subsystems of coverage optimization can be connected to ENI system, and infrastructure data are collected. This enables the ENI

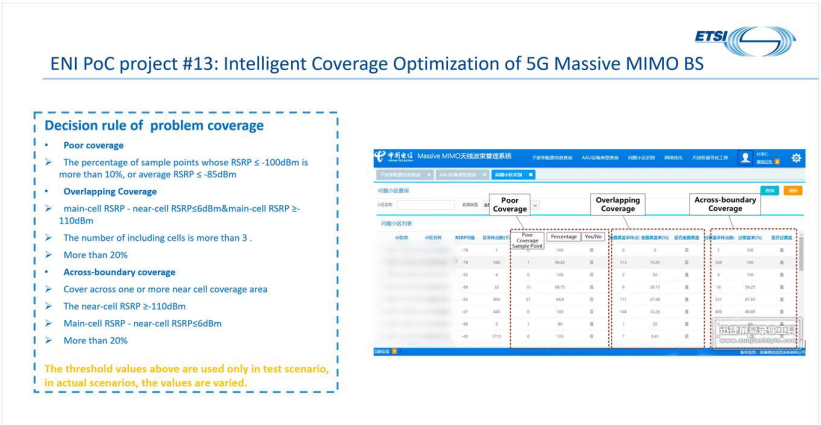
System to analyse the data according to the requirements so that optimal coverage policies are obtained and applied through Wireless Network System.

This PoC is proposed to demonstrate the use of AI in a coverage optimization context in order to perform categorization and coverage optimization strategy analysis. To achieve these goals, the following methodologies (see Fig. 4 "ML and AI based UE fingerprint localization, scenario analysis, channel model optimization and intelligent beam management") are used:



• **Fig. 4 Stages of this Poc**

Firstly, the trigger mechanism of coverage optimization module is from MR data statistical analysis, e.g., the percentage of UE whose main and neighbour cell RSRP and SINR cannot reaches certain level. For instance, when we set up our testbed, we classified coverage problem into 3 categories, poor coverage, overlapping and across-boundary coverage, based on which we start coverage optimization, the detailed standard is shown in Fig.5.

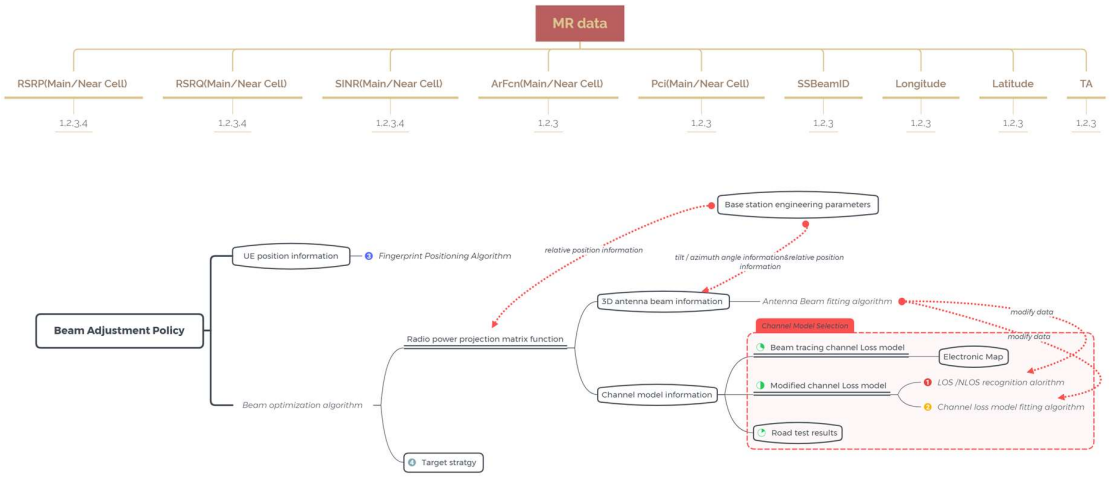


• **Fig. 5 Trigger Mechanism**

1. The first stage is Input Processing. In this stage, the detailed information of MR data, BS information (e.g. Engineering parameters, antenna information, etc.), geographic information (e.g. electronic map), etc. are extracted from external database. Thus, for the first part of PoC Project Goal: Data Input. One part of this module is valid data identification, such as MR data filtration, another part is to adopt AI-based methods to process related data, for example, user fingerprint localization module can use MR data and corelated BS station information to fulfil or to correct UE positioning information. The other part of this stage is to normalize data, such as integrate BS's engineering information and pre-processed MR data to into a relative coordinate system, etc.

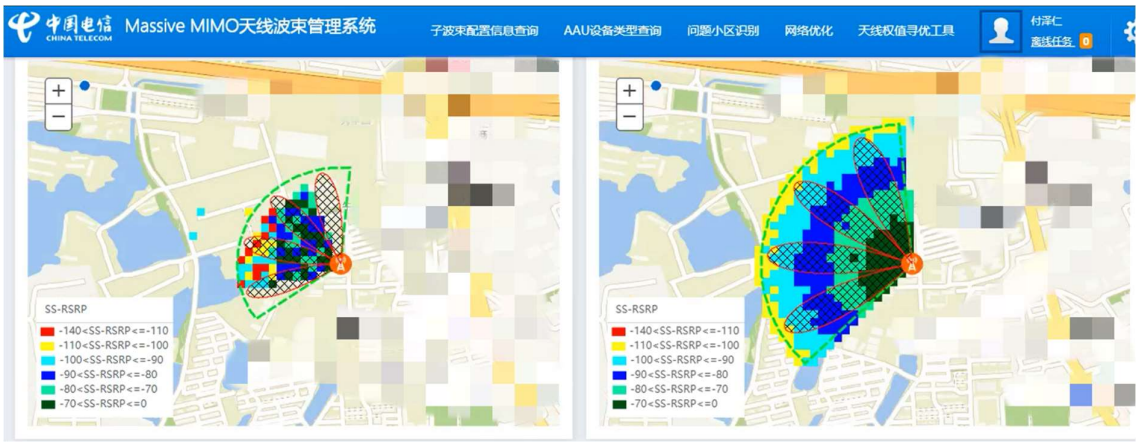
2. The second stage is Data Analysis, by the use of data, general and specific ML algorism can achieve LOS /NLOS scenario classification, which is utilized as key condition for future AI algorism-based channel model optimization. As for channel model optimization, the MR data, road test information, and scenario analysis result are processed by specific AI algorism. Combined with pre-processed data (e.g., BS engineering information and

MR data), the channel model optimization results or ray tracing channel model results, and current target strategy, Intelligent Beam Management module can give the optimal beam adjustment strategy, the specific algorithm structure and data flow are shown in Fig.6. This shall demonstrate necessary condition for another part of PoC Project Goal: Policy-Based Coverage Optimization: using AI algorithms to enable policy-based coverage optimization.



• **Fig. 6 Algorithm structure and data flow of data analysis stage**

3. The third stage is Decision and Output. In this stage, according to the pre-determined optimization policy, the system will decide the optimization plan. This plan will be used by operator to optimize BS's coverage.



• **Fig. 7 Decision and Output**

2.5 PoC Feedback Received from Third Parties (Optional)

Question from Chairman at #19: the problem of optimization output GIS exhibition, the coverage problem and output exhibition are the same.

Reply: there are some GIS exhibition have some problem, the Poc team will fix it in the next version of Demo.

3 ENI PoC Technical Report (Optional)

3.1 General

3.2 PoC Contribution to ENI ISG

Contribution	WG	WI/Document Ref	Comments
ENI(22)000_108r1_CR_to_use_case__2-2	ENI	ETSI GS ENI 001	Add and modify some contents of Use Case #2-2: Radio Coverage and capacity optimization for reference
ENI(22)000_106r1_Requirements_from_PoC_13	ENI	ETSI GS ENI 002	Add some data collection, policy management requirements and requirements about interworking with other systems in ENI 002.
ENI(22)000_133r1_Requirements_of_Poc13	ENI	ETSI GS ENI 002	Add clarification about codebook and OSS into ENI 002
ENI(22)000_134r1_Usecase_of_Poc13	ENI	ETSI GS ENI 001	Add clarification about codebook into ENI 001 for reference.

3.3 Gaps identified in ENI standardization

3.4 PoC Suggested Action Items

3.5 Additional messages to ENI

None

3.6 Additional messages to Network Operators and Service Providers

We encourage network operators and service providers to discuss about the business scenarios of combining Massive MIMO base station with passive sensing system or channel model sensing system.