ENI ISG - PoC Proposal Template

A.1 PoC Project Details

A.1.1 PoC Project

PoC Number (assigned by ETSI):

PoC Project Name: Intelligent Transport Network Optimization

PoC Project Host: China Mobile Research Institute

This PoC is meant to showcase the intelligent optimization for transport network by applying Artificial Intelligence / Machine Learning (AI/ML) algorithms. Based on information data, including the topology of network and detailed configuration parameters of virtual network functions (VNF), and the pre-determined optimization policy, the ENI system shall intelligently analyse the overall topology and shall reach a global optimized network capacity, and output the optimization plan automatically.

In this PoC, we start with the demonstration of Use Case #12 [Intelligent Optimization for Transport network] discussed in ENI Rappteur's Call #153 that will be added into RGS/ENI 014 [1]. In particular, the proposed mechanisms are compliant with its triggering conditions, operational flow, and post-conditions, as defined in the above mentioned Use Case #12.

A.1.2 PoC Team Members

Table A.1

	Organization name	ISG ENI participant	Contact (Email)	PoC Point of Contact	Role	PoC Components
1	China Mobile Research Institute	Yes	Chen Shaofan (chenshaofan@chinamobile.com) Zhao Peng (zhaopengyjy@chinamobile.com) Zhu Lin (zhulinyj@chinamobile.com) Wang Xing (wangxing@chinamobile.com)	X	Service Provider	- User Stories / Use Cases definition - Implementation of the baseline architecture / Implementation of the specific algorithms
2	China Mobile Group Zhejiang Co., Ltd.	No	Zhang Man (zhangman@zj.chinamobile.com) Ding Jiannan (dingjiannan@zj.chinamobile.com)		Network Operator	Architecture design/ Effect verification
3	Huawei	Yes	Feng Zeng (zengfeng137140@huawei.com) Zhong Chen (chenzhong@huawei.com)		Vendor	-Algorithm Requirement and Architecture Design
4	Intel	Yes	Haining Wang (haining.wang@intel.com) Feng Yan (feng.a.yan@intel.com) Guodong Zhao (Guodong.Zhao@intel.com) Tong Zhang (tong2.zhang@intel.com) Kevin Hong (huisuk.hong@intel.com)		Infrastructure provider	- AI hardware infrastructure provision - AI algorithm performance optimization

All the PoC Team members listed above declare that the information in this proposal is conformant to their plans at this date and commit to inform ETSI timely in case of changes in the PoC Team, scope or timeline.

A.1.3 PoC Project Scope

A.1.3.1 PoC Goals

The PoC will demonstrate the following Use Case identified by UC#12 in GS ENI 001, namely:

- Use Case: Intelligent Optimization for Transport Network.

The PoC will also demonstrate aspects of various requirements identified in GS ENI 002, including:

- Network optimization
- Data Collection and Analysis
- Policy Management
- Data Learning

This PoC intends to test and validate functional blocks of ENI Reference Architecture identified in GS ENI 005 and report on the suitability of ENI Reference Architecture.

The main goal of this PoC Project is to show the feasibility:

- **Policy-based Transport Network Optimization**: Based on pre-determined optimization policy, demonstrate the use of AI/ML algorithms on the topology of transport network and detailed information of VNFs, the PoC platform shall be able to intelligent analyse and decide on a policy optimization scheme leading to a global optimum bandwidth utilization regarding the overall network capacity.

A.1.3.2 PoC Topics

PoC Topics identified in this clause need to be taken for the publicly available PoC Topic List identified by ISG ENI, i.e. the three topics identified in clause 4.5 of the ENI PoC Framework. PoC Teams addressing these topics commit to submit the expected contributions in a timely manner.

Table A.2

PoC Topic Description	Related WI	Expected Contribution	Target Date
Infrastructure Management-> Intelligent Optimization for Transport network	RGS/ENI-014 v3.0.5 (GS ENI 001 Use Cases) RGS/ENI-015 v3.0.6 (GS ENI 002 Requirements) RGS/ENI-016 v2.0.13 (GS ENI 005 Architecture)	1. Contribution regarding feedback on Framework for intelligent transport network optimization. 2. Contribution regarding feedback on Functional blocks of this PoC Project. 3. Contribution regarding feedback on the feasibility of intelligent transport network optimization by applying AI/ML algorithms. 4. Contribution regarding a report on the suitability of ENI Reference Architecture for this PoC.	TBD

A.1.3.3 Other topics in scope

None.

A.1.4 PoC Project Stages/Milestones

Table A.4

PoC Milestone	Stages/Milestone description	Target Date	Additional Info
P.S	PoC Project Start	09/2020	
P.TP.1	PoC user story finalization	10/2020	Finalization of the high-level description of the scenario.
P.TP.1	PoC Test Plan 1	11/2020	Test Plan based on the User Story
P.D1	PoC Demo 1	TBD	
P.D2	PoC Demo 2	TBD	
P.R	PoC Report	06/2021	PoC-Project-End Feedback
P.E	PoC Project End	07/2021	Presented to ISG ENI for information

A.1.5 Additional Details

A.2 PoC Technical Details

A.2.1 PoC Overview

With the advent of 5G, low latency and high bandwidth will become critical features for network service. As a result of the huge increase of data traffic in each network service based on 5G architecture, higher requirements are put forward for the capacity of the transport network. Currently, based on the topology characteristics of the transport network, the most common method to ensure the capacity requirement of network service is extension of the virtual network function (VNF) among the transmission ring with high traffic load. However, due to lack of information linkage between transmission rings, this approach is highly possible to lead to implementation redundant operations expansions. which result into unnecessary construction investment. Therefore, optimizing the transport network to reach optimum capacity utilization rate appears as a one of the most relevant issues in order to achieve a good performance.

Nowadays, many operators carry out the manual-decision optimization plan, which means the formulation of the final optimization plan is highly dependent on the manual analysis and decision by personnel. This characteristic leads to a tedious and time-consuming process. A fully designed and orchestrated platform including data collection, analysis and plan decision, where the whole process is customizable and automatic, is recognised as valid and urgently needed for transport network optimization. Therefore, we are eager to build iTNO system based on AI/ML algorithms to improve network resource utilization, optimize network topology, and satisfy resource requirements with reduced cost of labour and APEX.

This PoC is proposed to demonstrate the feasibility of transport network capacity optimization by applying AI/ML algorithms. As shown in Fig.1, in order to accomplish the intelligent optimization, iTNO system consists of following stages:

1. The first stage is Data Processing. In this stage, the detailed information of transport network (e.g. network topology, coordinates of VNF, VNF type, VNF capacity, peak-hour data flow on transmission ring, etc.) are collected from external database used to store the data information of transport network. Moreover, parameters used for optimization policy management will be also input to iTNO. These data are transformed into a common format based on normalisation algorithms and will be further processed by other FBs.

2. The second stage is Data Analysis. In this stage, based on the existed network topology and pre-processed data, ENI system analyses the relation amongst capacity of transmission ring, topology of transmission ring and the capacity of VNF. Besides, iTNO will calculate the global utilization rate of capacity. The relation and the result of utilization rate will be provided as the outputs of this stage.

3. The third stage is Decision and Output. In this stage, according to the pre-determined optimization policy, iTNO will decide the optimization plan, including optimized network topology and VNF capacity requirement among each transmission ring, based on the result of Data Analysis and AI/ML algorithm. This plan will be used by the operator to optimize the transport network reaching globally optimum capacity utilization rate.

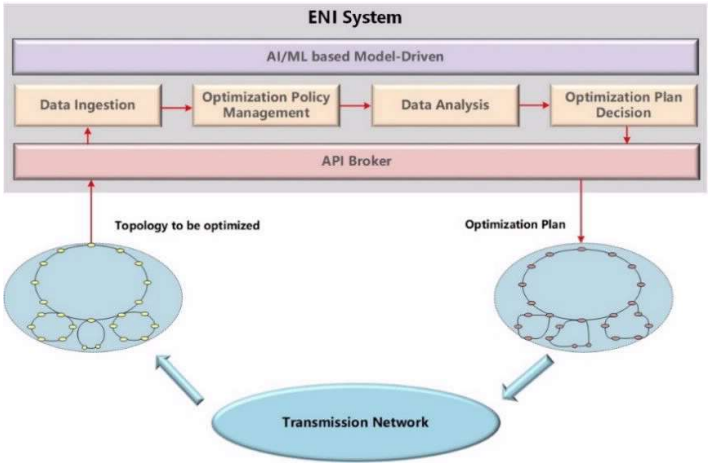


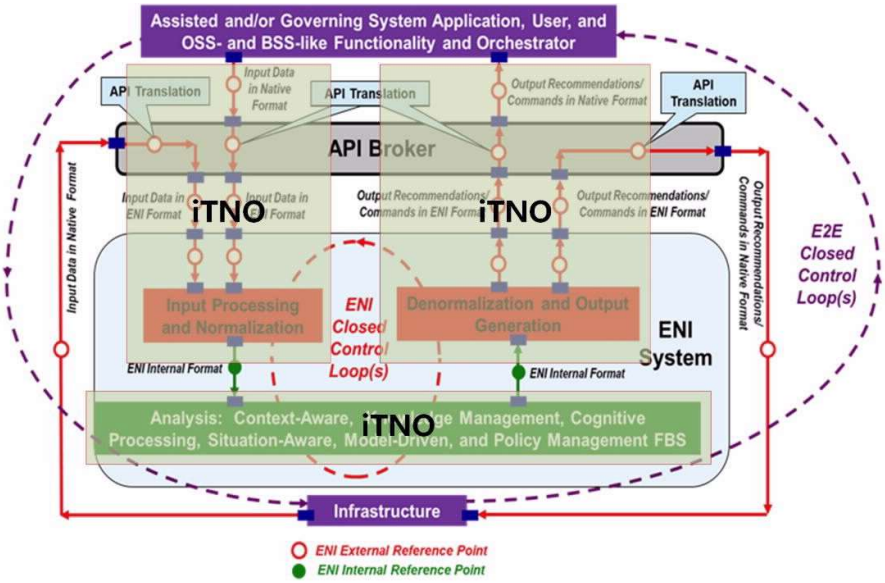
Figure 1: Stages of current PoC

A.2.2 PoC Architecture

The first stage in iTNO is Data Processing, mapping to Data Ingestion and Normalisation functional blocks of the ENI system.

The second stage in iTNO is Data Analysis, mapping to Cognition Framework, Knowledge Management and Context-Aware Management functional blocks of the ENI system.

The third stage in iTNO is Decision and Output, mapping to Knowledge Management, De-normalisation and Output Generation functional blocks of the ENI system.



A.2.3 PoC Success Criteria

All goals are met when the described optimization functionality is proved to have been accomplished.

A.2.4 Additional information

[1] RGS/ENI-014 (GS ENI 001), “Experiential Networked Intelligence (ENI); ENI use cases”, v3.0.8

[2] RGS/ENI-015 (GS ENI 002), “Experiential Networked Intelligence (ENI); ENI requirements”, v3.0.6.

[3] RGS/ENI-016 (GS ENI 005), “Experiential Networked Intelligence (ENI); System Architecture”, v2.0.13.