



H2020 5G-TRANSFORMER Project  
Grant No. 761536

# 5GT-MTP CTTC USER GUIDE

## Abstract

This document provides the user guide for the 5GT-MTP reference implementation developed by CTTC, including a description of the features and functionalities accessible through its GUI.

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## Disclaimer

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## List of Acronyms

Acronym	Description
5GT-SO	Service Orchestrator
5GT-MTP	Mobile Transport and Computing Platform
5GT-VS	Vertical Slicer
API	Application Programming Interface
CRUD	Create-Read-Delete-Update
DB	Database
ETSI	European Telecommunication Standardization Institute
GUI	Graphical User Interface
IFA	Interfaces and Architecture
LC	Lifecycle
LCM	Lifecycle Management
MEC	Multi-access Edge Computing
NBI	Northbound Interface
NF	Network Function
NFV	Network Function Virtualization
NFVI	Network Functions Virtualisation Infrastructure
NFV-NS	NFV Network Service
NFVO	NFV Orchestrator
NS	Network Slice
NSD	Network Service Descriptor
PoP	Point of Presence
REST	Representational State Transfer
SBI	Southbound Interface
VNF	Virtual Network Function
VNFD	VNF Descriptor
VS	Vertical Service Blueprint
VSD	Vertical Service Descriptor
VSI	Vertical Service Instance

# 1 Mobile Transport and Computing Platform CTTC Implementation

The 5G-TRANSFORMER Mobile Transport and Computing Platform (5GT-MTP) CTTC implementation is an open source software prototype developed in python, which provides all the main 5GT-MTP functionalities required by the 5G-TRANSFORMER use cases and devised architecture [3]. It can be downloaded from the 5G-TRANSFORMER git internal repository [2] and its design, operation, and implementation are described in the following sections.

## 1.1 5GT-MTP CTTC functionalities

The main features and functionalities of the 5GT-MTP CTTC implementation follow those contained and covered by the “official” 5GT-MTP version available in [1]. In particular, key building blocks entailing DBs, APIs, as well as operational workflows are implemented as the “official” 5GT-MTP implementation does. This allows ensuring the interworking with other 5GT architectural elements (e.g., 5GT-SO). Nevertheless, one of the main differences with respect to the “official” version is that the CTTC implementation is mostly network-resource oriented rather than supporting both network and compute resource management. The rationale behind this is that the 5GT-SO OSM Wrapper (considered in 5GT CTTC deployment stack) takes over of all the operations related with computing (cloud / DC) resources.

For the sake of completeness, the main features and differences between the two implementations are reported in Table 1.

**TABLE 1: 5GT-MTP CTTC FEATURES AND DIFFERENCES W.R.T OFFICIAL VERSION**

Functionality	Description
REST-based NBI	Fully integration with 5GT-SO but only for handling networking resources <ul style="list-style-type: none"> <li>Retrieve abstracted network resources (i.e., set of LLs)</li> <li>Creation/Termination of Inter-NFVI-PoPs connectivity</li> <li>Creation/Termination of Intra-NFVI-PoP virtual links</li> </ul>
Inner structure of CTTC implementation	Referring to the “official” 5GT-MTP implementation, but different technology encompassing more blocks and tables are used and thus added <ul style="list-style-type: none"> <li>Python language</li> </ul>
SBI	It interacts directly with both compute and networking resource controllers (i.e., VIM and WIM), avoiding relying on the ETSI IFA005 defined interface <ul style="list-style-type: none"> <li>allocation/release of networking resources in both cloud and WAN environment</li> </ul>
Orchestrator	Main core element of the 5GT-MTP CTTC implementation. It handles and coordinates the rest the components constituting the 5GT-MTP as well as implements specific algorithms/policies
Domain Resource Logic	It handles the algorithms and policies to retrieve the physical resources for both networking and computing elements. <ul style="list-style-type: none"> <li>Calculating the aggregation of computing hosts.</li> <li>Handling networking WAN deployment: decomposing / reduction network element resource graph</li> </ul>

Abstraction Logic	It handles the algorithms and policies to create an abstracted view for the resource DB. <ul style="list-style-type: none"> <li>• Create the abstraction for the network resources</li> <li>• Create the abstraction for the federated network resources</li> </ul>
Resource Orchestrator	It handles the algorithms and policies for actual resources used in WIM/interWIMs for the NS lifecycle phases (i.e., instantiation, modification, termination, etc.) <ul style="list-style-type: none"> <li>• Instantiation/Termination of inter-NFVI-PoP connectivity</li> <li>• Instantiation/Termination of intra-NFVI-PoP networks</li> <li>• Working in collaboration with PA element</li> </ul>
Placement Algorithm	Algorithm to calculate and select the network resources to accommodate required inter-NFVI-PoP connectivity paths for demanded NS. <ul style="list-style-type: none"> <li>• K-Paths as output of this Algorithm</li> <li>• External entity connected with a REST API</li> </ul>
5GT-MTP CTTC Graphical User Interface (GUI)	GUI enabling to visualize the Abstract View, Resource View, database contents, NBI, etc. handled by the 5GT-MTP element

## 1.2 5GT-MTP CTTC user guide

This section provides a brief guideline about how to use the 5GT-MTP CTTC from its web GUI for administrative actions. It should be noted that the 5GT-MTP CTTC GUI interacts with the 5GT-MTP CTTC core functionalities using its REST APIs.

In order to deploy and install the 5GT-MTP CTTC, the README file must be followed. This file is under the same directory of the software itself, especially in the git internal repository. Once done it, the GUI can be accessed from a web browser at the following link: <http://X.X.X.X:8090/> IP address.

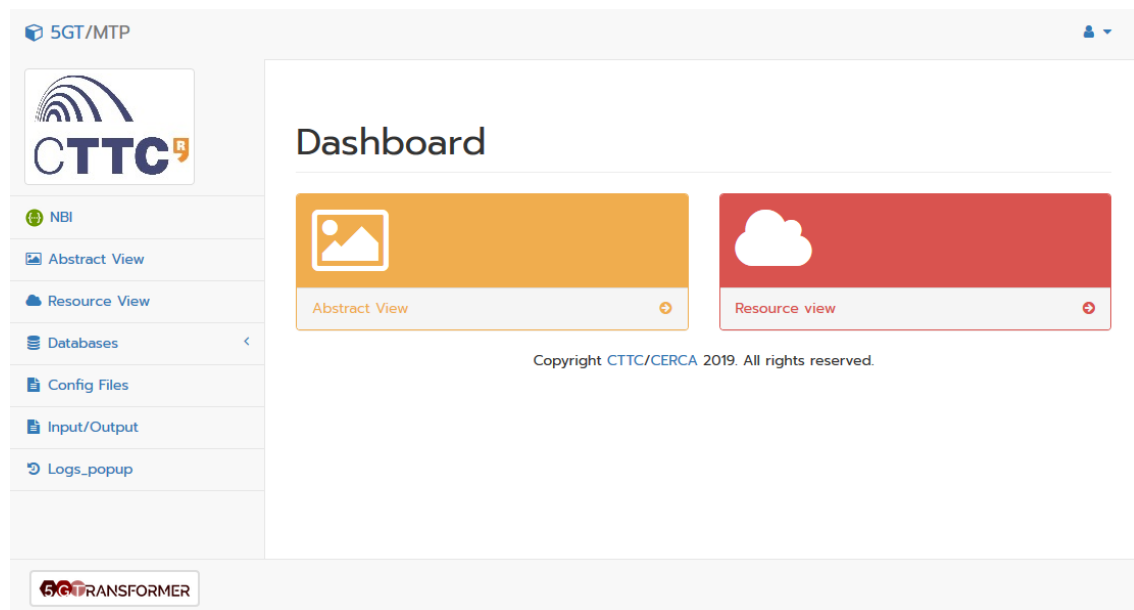
At the beginning, the GUI will initially visualize the authentication page where the user can enter the credentials (i.e., username and password).

The next step is to configure the 5GT-MTP CTTC. To do that, Domain and Logical Link DB should be filled up with specific details of the targeted domain under-deployment. Also, the “Stitching DB” needs to be filled up, before starting the instantiation/termination of the network resources. A document regarding how to properly and correctly configure the 5GT-MTP CTTC is under construction at the time of writing the present user guide.

### 1.2.1 5GT-MTP CTTC GUI

The 5GT-MTP CTTC GUI is used by the 5GT service provider to manage the underlying transport stratum for integrated networks, including visualization of all the relevant data related with the abstracted view of infrastructure, visualization of the network resources over every service (NS) is accommodated, as well as visualization and modification of the internal DBs.

To enter in the 5GT-MTP CTTC administration GUI, the user should insert “test” and “test” as username and password in the authentication page (admin credentials can be modified through the 5GT-MTP CTTC user DB page). The main page shown in Figure 1 will be visualized.



**FIGURE 1: 5GT-MTP CTTC ADMIN GUI - MAIN PAGE**

From 5GT-MTP CTTC admin GUI the following actions can be performed:

- Exploration of the 5GT-MTP CTTC NBI swagger API
- Exploration of the all databases' contents (i.e., Domain, NFVI-PoP, Resource Attributes, Logical Links, ServiceId, Stitching, Virtual Links and the Users DB)
- Graphical visualization of the Abstracted View (showing 5GT MTP-configured NFVI-PoPs and Logical Links)
- Graphical visualization of the Resources View (showing the underlying transport stratum for networks)
- Inspection of the main 5GT-MTP CTTC configuration files
- Inspection of 5GT-MTP CTTC log



### 1.2.1.1 Exploration of the 5GT-MTP CTTC NBI swagger API



#### 5GT-SO NBI

REST-API server for the North Bound Interface of the 5GT-SO. Find more at <http://5g-transformer.eu>

Find out more about 5G-Transformer

<http://5g-transformer.eu/>

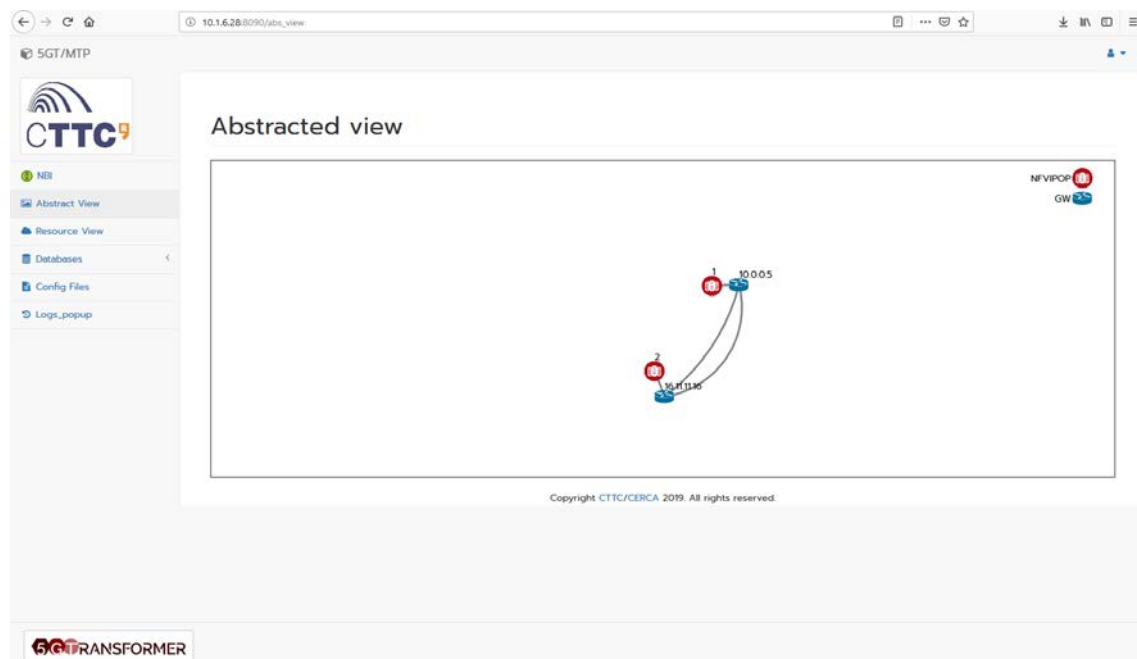
network service		Show/Hide   List Operations   Expand Operations
POST	/ns	Creates and returns a Network Service Identifier (nsId)
DELETE	/ns/{nsId}/{version}	Delete the onboarded network service referenced by nsId
GET	/ns/{nsId}/{version}	Returns information of the network service referenced by nsId
POST	/ns/nsdManagement/nsd	Returns information of the onboarded network service
DELETE	/ns/vnfd/{vnfdId}/{version}	Deletes the specified virtual network function
GET	/ns/vnfd/{vnfdId}/{version}	Returns information of the virtual network function referenced by vnfd
POST	/ns/vnfdManagement/vnfPackage	Returns information of the onboarded virtual network function
GET	/ns/{nsId}	Returns information of the network service referenced by nsId
PUT	/ns/{nsId}/instantiate	Instantiates the Network Service referenced by nsId
PUT	/ns/{nsId}/scale	Scales the Network Service referenced by nsId
PUT	/ns/{nsId}/terminate	Terminates the Network Service identified by nsId.
operation		Show/Hide   List Operations   Expand Operations
GET	/operation/{operationId}	Returns the status of an operation by its operation Id

[ BASE URL: /5gt/mtp/ API VERSION: 1.0 ]

FIGURE 2: 5GT-MTP CTTC ADMIN GUI - SWAGGER OF THE 5GT-MTP NBI

### 1.2.1.2 Visualization of abstracted View exposed to 5GT-SO

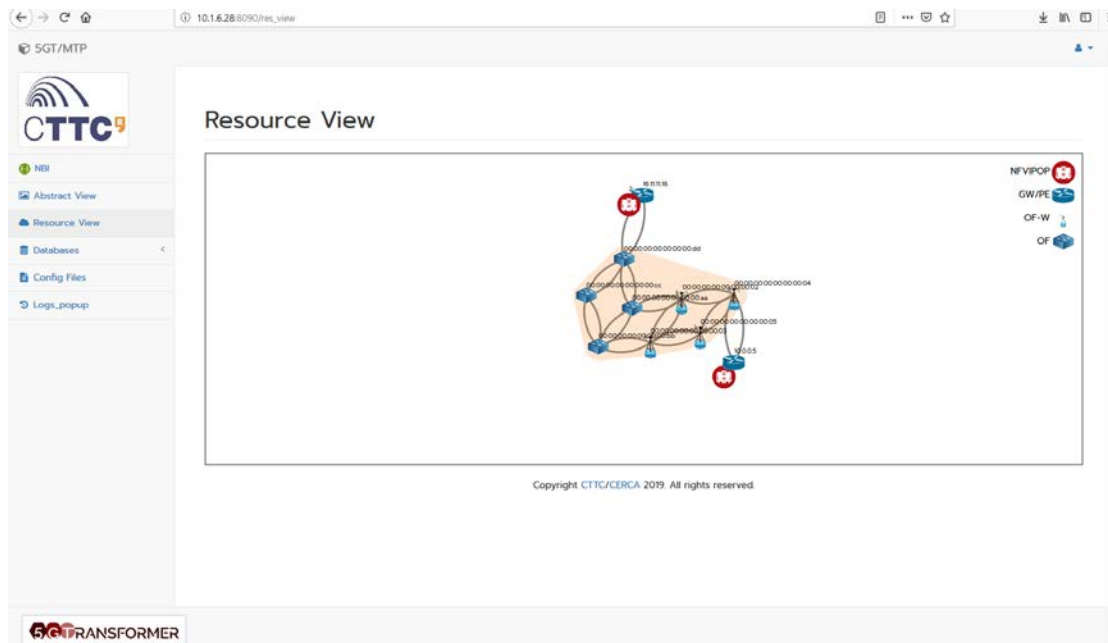
This page represents a graphical representation of Abstracted Resources exposed to the 5GT-SO, especially the representation of NFVI-PoPs and Logical Links among them.



**FIGURE 3: 5GT-MTP CTTC ADMIN GUI - ABSTRACTED VIEW**

### 1.2.1.3 Visualization of underlying resources


Visualization of underlying resources configured in the Stitching DB. It exposes the representation of NFVI-PoPs and inter-NFVI-PoP WAN.

**FIGURE 4: 5GT-MTP CTTC ADMIN GUI - RESOURCE VIEW**

### 1.2.1.4 Databases

Databases' contents (i.e., Domain, NFVI-PoP, Resource Attributes, Logical Links, ServiceId, Stitching, Virtual Links and the User DB) can be checked and seen. Notice that these pages allows adding/removing/modifying entries on most of those DBs. For the ServiceId table (each entry represents an inter-NFVI-PoP connectivity), the GUI enables to visualize the instantiated entry in the underlying infrastructure.

5GT/MTP



NEB

Abstract View

Resource View

Databases

Domain List

NFVi-PoPs List

Resource Attributes List

Logical Links List

ServiceId List

Stitching List







Virtual Links List

Config Files

Logs\_popup

MTP Databases

Domain List


Name	Type	Id	IP Address	Port	URL	Username	Password	Tenant Name	
OS in Compute5	VM	1			http://10.17.148/identity/v3	osm-user	*****	osm-project	
OS in Compute2	VM	2	None	None	http://10.16.29/identity/v3	osm-user	*****	osm-project	
WIM_A_compute2	WIM	5	http://10.16.29	9881			*****		
WIM_B_compute2	WIM	6	http://10.16.29	9882			*****		
WIM_C_compute2	WIM	7	http://10.16.29	9883			*****		
pABNO_final_stub	WIM	8	http://10.16.29	9881			*****		

New Entry

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5GT TRANSFORMER

5GT/MTP



NEB

Abstract View

Resource View

Databases

Domain List

NFVi-PoPs List

Resource Attributes List

Logical Links List

ServiceId List

Stitching List



Virtual Links List

Config Files

Logs\_popup

MTP Databases


NFVi PoPs

Geo Location	NFViPop Id	VmId	Network Connection Endpoint	
ONS	1	1	[10.0.0.5]	
ONS	2	2	[16.11.11.16]	

New Entry

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5GT/MTP



NBI

Abstract View

Resource View

Databases

Domain List

NFVi-PoPs List

Resource Attributes List

Logical Links List

ServiceId List

Stitching List



Virtual Links List

Config Files

Logs\_popup

MTP Databases

Resource Attributes


NFViPoP Id	Zone Id	Zone Name	Zone State	Zone Property	Metadata	Ava/Res/All/Tot Memory [MB]	Ava/Res/All/Tot Nr. of CPU	Ava/Res/All/Tot Storage [GB]	
1	1	COMPUTE5	ACTIVE			51200/0/0/51200	20/0/0/20	1000/0/0/1000	
2	2	COMPUTE2	ACTIVE			51200/0/0/51200	20/0/0/20	999/0/1/1000	

New Entry

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5GT TRANSFORMER

5GT/MTP



NBI

Abstract View

Resource View

Databases

Domain List

NFVi-PoPs List

Resource Attributes List

Logical Links List

ServiceId List

Stitching List





Virtual Links List

Config Files

Logs\_popup

MTP Databases

Logical Links


Logical Link Id	Total BW	Available BW	Link Cost Value	Link Cost	Link Delay Value	Link Delay	SRC GW	Local Link Id	DST GW	Remote Link Id	Network Layer	InterfVniPoP Network Type	InterfVniPoP Network Topology	
151515_f	1000	1000	0	cost	20	delay	10.0.0.5	10000	16.11.11.16	10001	L2			
151515_b	1000	1000	0	cost	20	delay	16.11.11.16	10002	10.0.0.5	10003	L2			
161616_f	1500	1500	10		10		10.0.0.5	10000	16.11.11.16	10001	L2			
161616_b	1500	1500	10		10		16.11.11.16	10001	10.0.0.5	10000	L2			

New Entry

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5GT TRANSFORMER

5GT/MTP



1 NBI

Abstract View

Resource View

Databases

Domain List

NFVi-PoPs List

Resource Attributes List

Logical Links List

ServiceId List

Stitching List







Virtual Links List

Config Files

Logs\_popup

MTP Databases


ServiceId

ServiceId	InterfVni PoP Connectivity Id	Logical Link Id	Req BW	Req Latency	Involved WIM		
luca	dbd42c92	151515_f	50	20	[8]		
test_test	eec7bee8	151515_f	50	20	[8]		
test_test	7902d3ff	151515_f	50	20	[8]		

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5GT TRANSFORMER

5GT/MTP



1 NBI

Abstract View

Resource View

Databases

Domain List

NFVi-PoPs List

Resource Attributes List

Logical Links List

ServiceId List

Stitching List





Virtual Links List

Config Files

Logs\_popup

MTP Databases

Stitching

InElement Id	InElement Add	alLink Id	OutElement Id	OutElement Add	xlLink Id	Link Cost	Link Delay	Link Av. BW	
1	10.0.0.5	100	8	00.00.00.00.00.00.00.04	3	15	10	1000	
8	00.00.00.00.00.00.00.04	3	1	10.0.0.5	100	15	10	1000	
8	00.00.00.00.00.00.00.dd	5	2	16.11.11.16	100	20	10	1000	
2	16.11.11.16	100	8	00.00.00.00.00.00.00.dd	5	20	10	1000	

New Entry

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5GT TRANSFORMER

H2020-761536

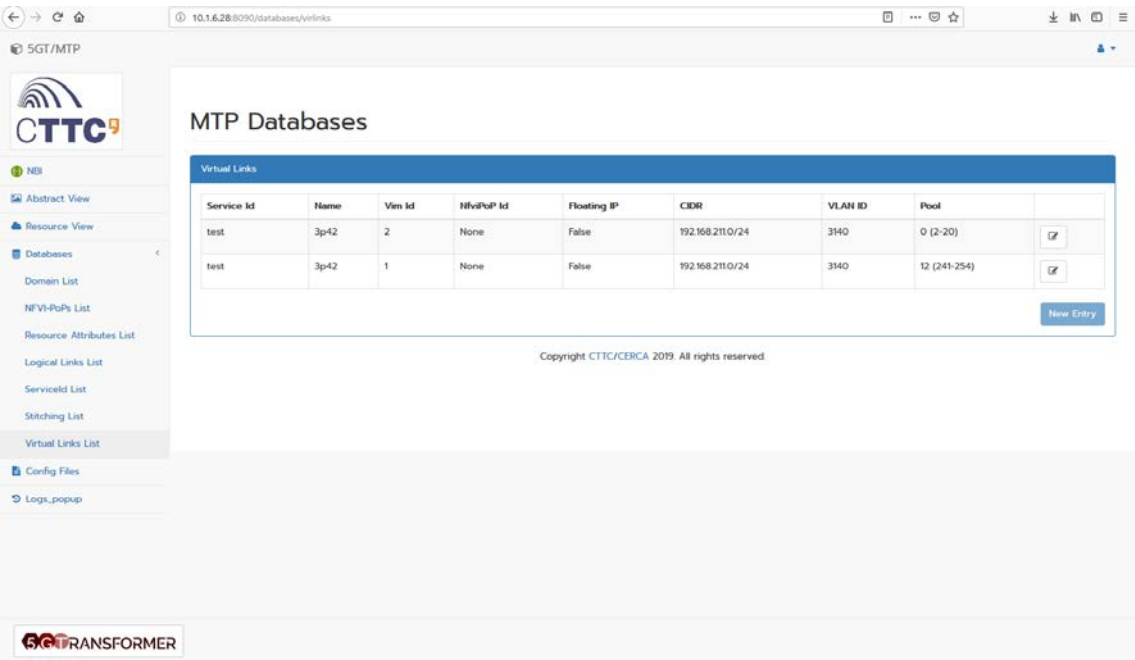


FIGURE 5: 5GT-MTP CTTC ADMIN GUI - DATABASES

1.2.1.5 Graphical visualization of instantiated ServiceId

The graphical visualization of an instantiated ServiceId can be opened just clicking on the eye-shaped icon next to the corresponding entry in the DB. By clicking on the pencil-shaped icon next to each entry, some of the fields of the DB entry can be updated.

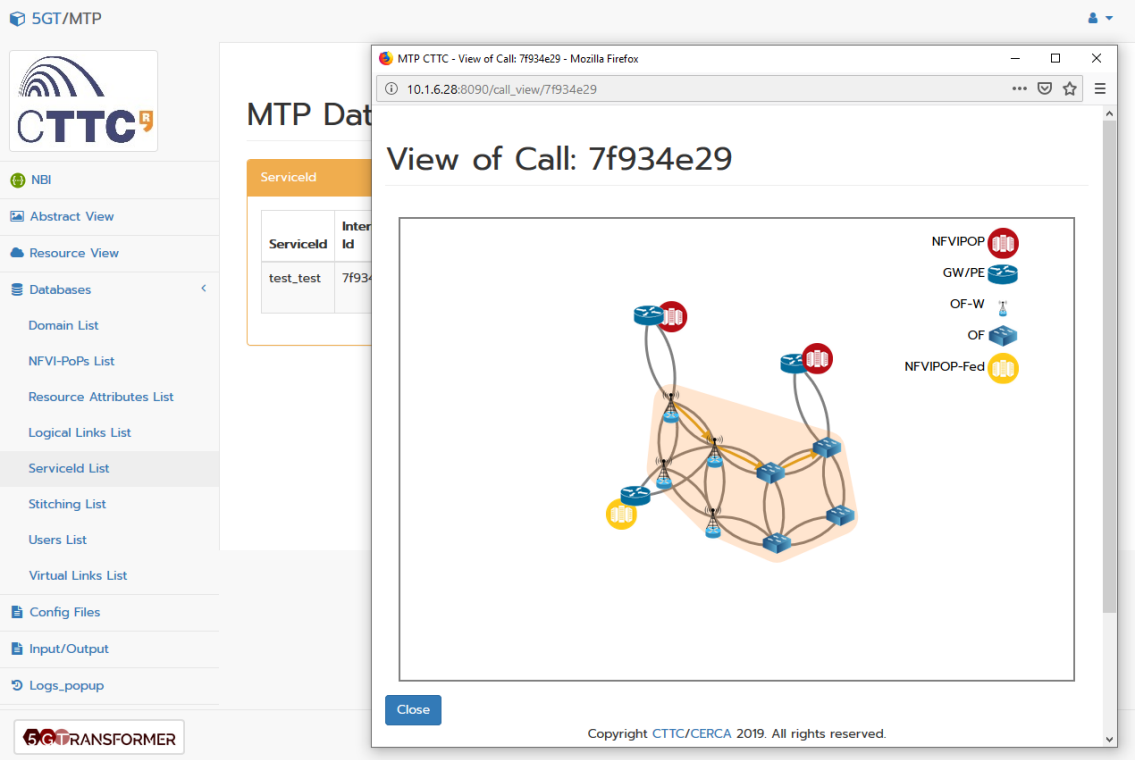


FIGURE 6: 5GT-MTP CTTC ADMIN GUI - SERVICEID VISUALIZATION

### 1.2.1.6 Inspection of main 5GT-MTP CTTC configuration files

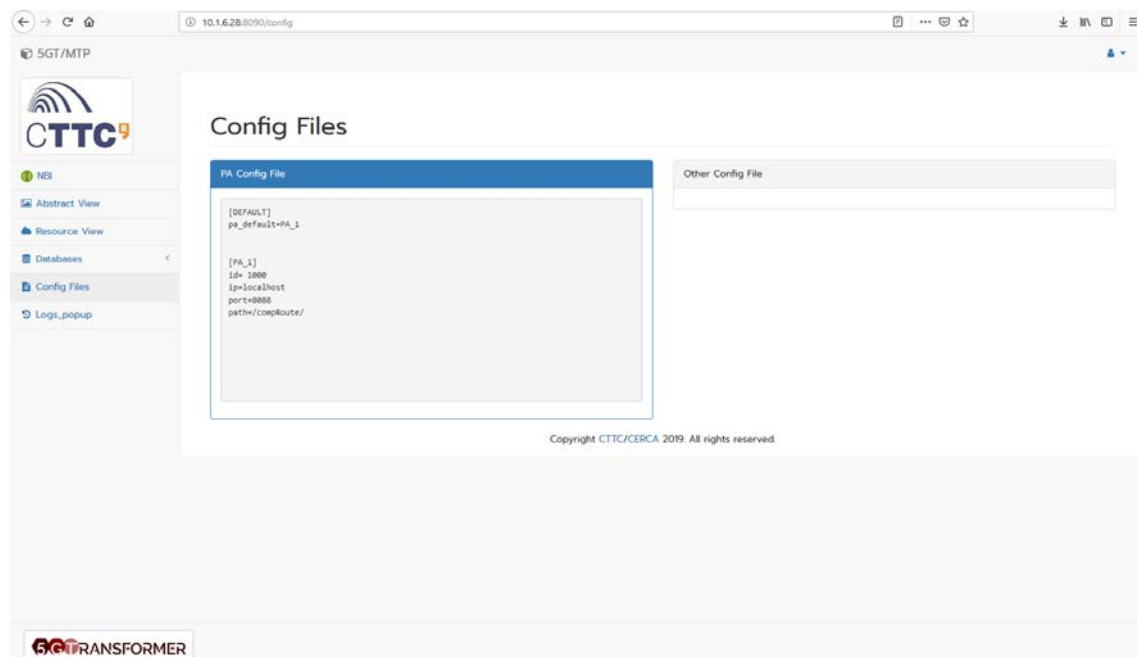


FIGURE 7: 5GT-MTP CTTC ADMIN GUI - INSPECTION OF 5GT-MTP CONFIG FILES

### 1.2.1.7 Inspection of 5GT-MTP CTTC log

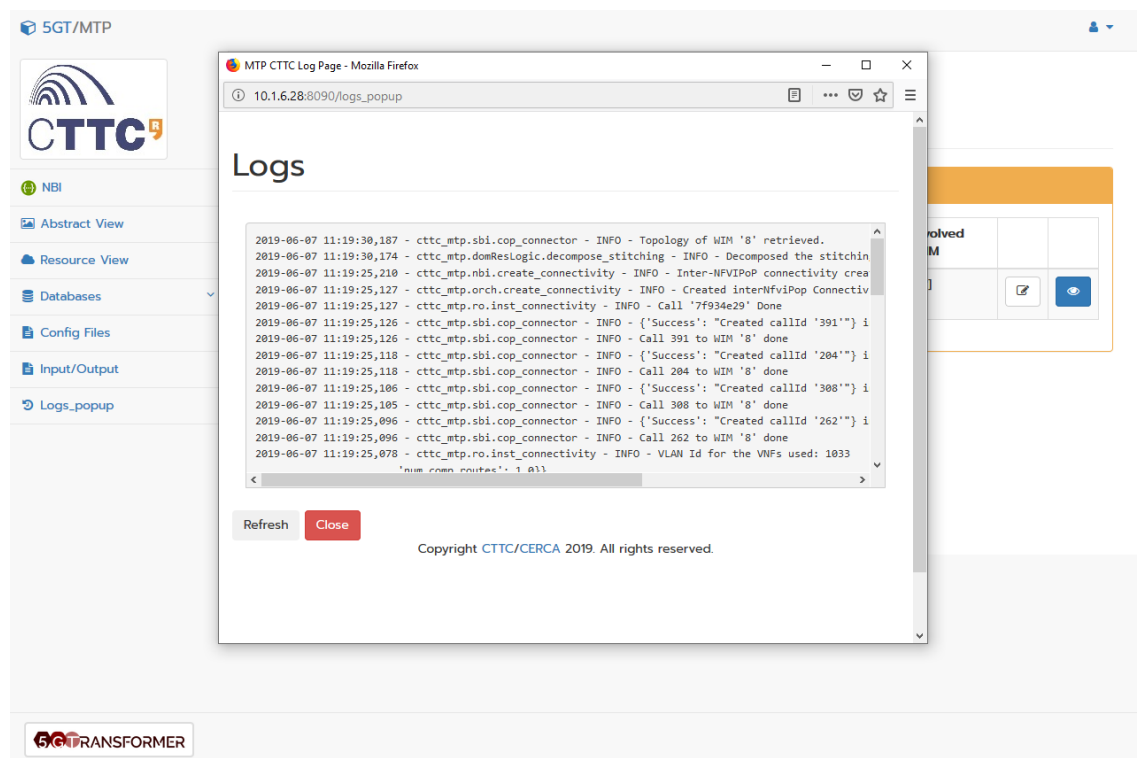


FIGURE 8: 5GT-MTP CTTC ADMIN GUI - INSPECTION OF 5GT-MTP LOGS





## 2 References

- [1] 5G-TRANSFORMER, D2.3, Final design and implementation report on the MTP, May 2019.
- [2] 5GT-MTP git internal repository available at: <https://5g-transformer.eu/git/5g-transformer.5gt-mtp> (branch: mtp-cttc)
- [3] 5G-TRANSFORMER, D1.1, Report on vertical requirements and use cases, 2017.