H2020 5G-TRANSFORMER Project

Grant No. 761536

5GT-SO USER GUIDE

Abstract

This document provides the user guide for the 5GT-SO reference implementation, including a description of features and functionality accessible through its GUI.

Document properties

Document title	5GT-SO User Guide
Document responsible	Josep Mangues-Bafalluy (CTTC)
Document editor	Josep Mangues-Bafalluy (CTTC)
Editorial team	Jorge Baranda (CTTC), Luca Vettori (CTTC), Ricardo Martínez (CTTC)
Target dissemination level	Public
Status of the document	In progress
Version	0.1

Document history

Revision	Date	Issued by	Description
0.1	1 May 2019	Josep Mangues (CTTC)	Initial version

Disclaimer

This document has been produced in the context of the 5G-Transformer Project. The research leading to these results has received funding from the European Community's H2020 Programme under grant agreement Nº H2020-761536.

Table of Contents

List of Figures

List of Tables

List of Acronyms

Acronym	Description
5GT-SO	Service Orchestrator
5GT-VS	Vertical Slicer
API	Application Programming Interface
AppD	Application Descriptor
CRUD	Create-Read-Delete-Update
DB	Database
DF	Deployment Flavour
eMBB	Enhanced Mobile BroadBand
ETSI	European Telecommunication Standardization Institute
GUI	Graphical User Interface
IFA	Interfaces and Architecture
IL	Instantiation Level
LC	Lifecycle
LCM	Lifecycle Management
mIoT	Massive Internet of Things
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
REST	Representational State Transfer
SBI	Southbound Interface
SLA	Service Level Agreement
URLLC	Ultra-Reliable Low-Latency Communication
VNF	Virtual Network Function
VNFD	VNF Descriptor
VSB	Vertical Service Blueprint
VSD	Vertical Service Descriptor
VSI	Vertical Service Instance

1 Service Orchestrator Reference Implementation

The 5G-TRANSFORMER Service Orchestrator (5GT-SO) reference implementation is an open source software prototype developed in python, which provides all the major 5GT-SO functionalities required by 5G-TRANSFORMER use cases [4] . It can be downloaded from the 5G-TRANSFORMER website and github [3] and its design, operation, and implementation is described in deliverables D4.3 [1] and D4.4 [2].

1.1 5GT-SO functionalities

The list of 5GT-SO functionalities and features implemented in the 5GT-SO is reported in Table 1 (for further details about the 5GT-SO architecture and functionalities see Deliverable D4.3 [1]).

TABLE 1: 5GT-SO FUNCTIONALITIES

Functionality	Description
IFA013-based REST-based NBI	Integration with 5GT-VS Catalogue and lifecycle management functions: • NFV-NS scaling • NFV-NS lifecycle management (ID creation, instantiation, operation status, NS info, termination) • on-boarding, removal, queries of descriptors/packages stored in catalogues
Service Orchestration	Support for: • management functions (on-boarding) for descriptors and packages of NFV-NS, Virtual Network Function (VNF), AppD stored in catalogues • NFV-NS scaling and NFV-NS lifecycle management • Service composition and federation support for deployment of NFV-NSs in one or multiple domains (involving different 5GT-SOs) • service assurance through NFV-NS auto-scaling leveraging SLA manager and monitoring manager
Resource Orchestration	Extended Resource Orchestration functions: • placement decisions based on vertical service requirements and abstracted infrastructure information provided by 5GT-MTP, including single Point of Presence (PoP) deployments and multi-PoP deployments through Wide Area Network (WAN) • triggering and coordination of resource allocation and release operations triggered by NFV-NS instantiation, termination, auto-scaling • interworking with multiple orchestration platforms (OSM and Cloudify) • composite NFV-NS resource management (for service composition and federation) • collection of resource topological and capacity information • allocation and release of networking (also for inter-domain communication) and computing resource operations
Placement Algorithm (PA) REST API	Easy support for external placement logic based on resources exposed by 5GT-MTP and vertical requirements coming from 5GT-VS
Cloudify Wrapper	Automation in NFV-NS operations while involving the Cloudify orchestrator for all the 5GT-SO workflows
Open Source MANO (OSM) Wrapper	Automation in NFV-NS operations while involving the OSM orchestrator for all the 5GT-SO workflows

Monitoring platform	Integrated monitoring platform supporting lifecycle management through configuration of monitoring jobs and service assurance operations through the Service Level Agreement (SLA) manager
Extended IFA005-based REST SBI	Integration with new Mobile and Transport Platform (5GT-MTP) features: • allocation/release of computing and networking resources in both cloud and WAN • advertisement of resource information (e.g., capacity, topology)
5GT-SO Graphical user interface	5GT-SO graphical user interface (GUI) to visualize NFV-NSs, placement, database content, NBI …

1.2 5GT-SO user guide

This section provides a brief guideline about how to use the 5GT-SO from its web Graphical User Interface (GUI) for administrative actions. As such, it is an interface used by the 5GT Service Provider to manage the service.

It should be noted that the 5GT-SO GUI interacts with the 5GT-SO core using its REST APIs. It is thus possible to use the same REST APIs in order to interact with the system from external components.

In the following, we assume that the 5GT-SO has been deployed, installed and correctly configured with both its core system and its GUI, with the GUI accessible at a generic X.X.X.X IP address. Installation and usage instructions are described in the HOW_TO_WORK_WITH_5GT-SO.txt file for 5GT-SO core part, and in this file for the GUI. Both files are present at the github repository under 5GT-SO/documentation folder.

5GT-SO GUI can be accessed from a web browser at the following link: http://X.X.X.X:8080. At the beginning, the GUI will initially visualize the authentication page where the user can enter its username and password.

1.2.1 5GT-SO GUI

The 5GT-SO GUI is used by the 5GT service provider to manage the service orchestrator, including visualization of all relevant data related with service offerings, instantiated services, and resources used. It also allows manually onboarding and translating NSDs and VNFDs to the Service Manager (SM) and the MANO platform in use (functionality currently supported for OSM). It also allows manually instantiating NFV-NSs from de GUI and visualization of NFV-NS structure, and its placement in domains (in case of service federation) and in local PoPs.

In order to enter 5GT-SO administration GUI, the user should insert “test” and “test” as username and password in the authentication page (admin credentials can be modified through the GUI, in the Users Database Page). The main page shown in Figure 1 will be visualized.

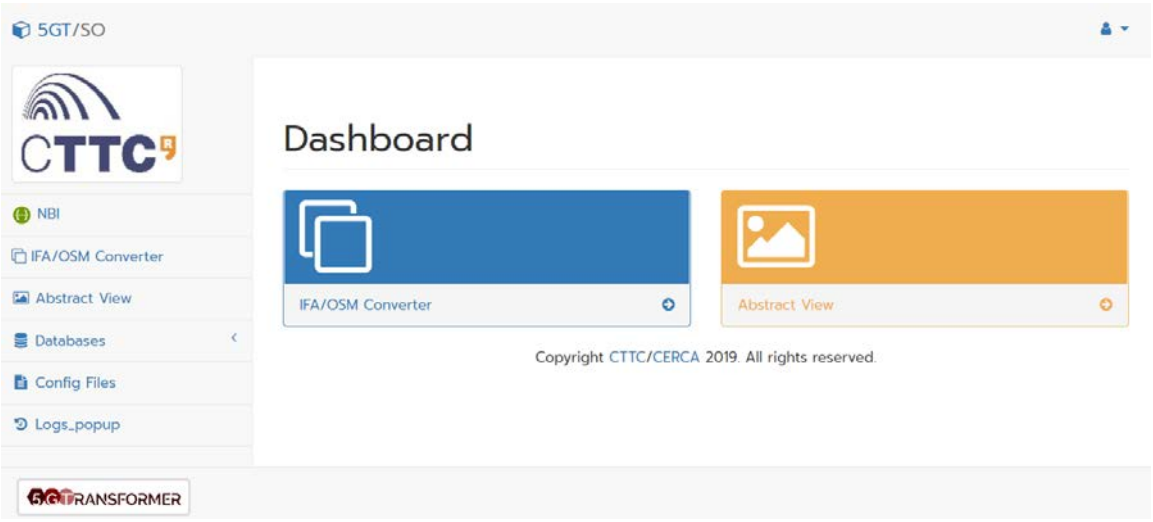


FIGURE 1: 5GT-SO ADMIN GUI – MAIN PAGE

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

- Exploration of the 5GT-SO NBI swagger API
- Exploration of the content of all databases (NSD; VFND catalogues, MTP resources, Instantiated NSs, Resources associated with instantiated NSs, Operation IDs)
- Graphical visualization of instantiated NSs, their components (VLs and VNFs) and the placement of the VNFs in different PoPs. For composite NSs, visualization of placement of NSs in domains (local and federated).
- Onboarding of NSD in the catalogue and translation to NSDs for OSM
- Onboarding of VNFD
- Instantiation of NS from the GUI
- IFA-to-OSM NSD and VNFD converter
- Inspection of main 5GT-SO configuration files
- Inspection of 5GT-SO log

1.2.1.1 Exploration of the 5GT-SO NBI swagger API

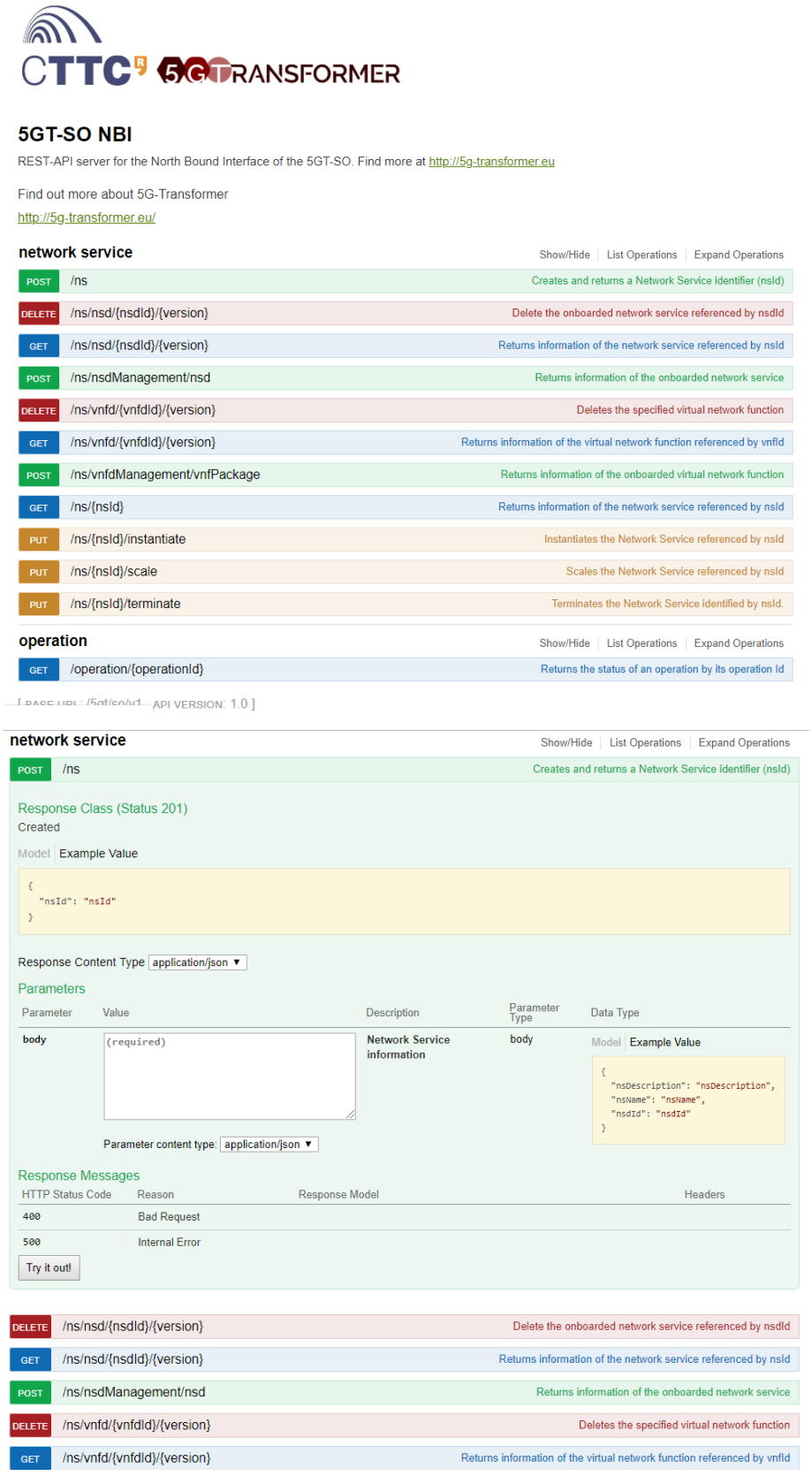


FIGURE 2: 5GT-SO ADMIN GUI – SWAGGER OF THE 5GT-SO NBI (E.G., POST NS)

1.2.1.2 IFA-to-OSM NSD and VNFD converter

An NSD or VNFD can be pasted in the window or a JSON file can be uploaded to the converter. The descriptor is converted into yaml format ready to be onboarded to OSM.

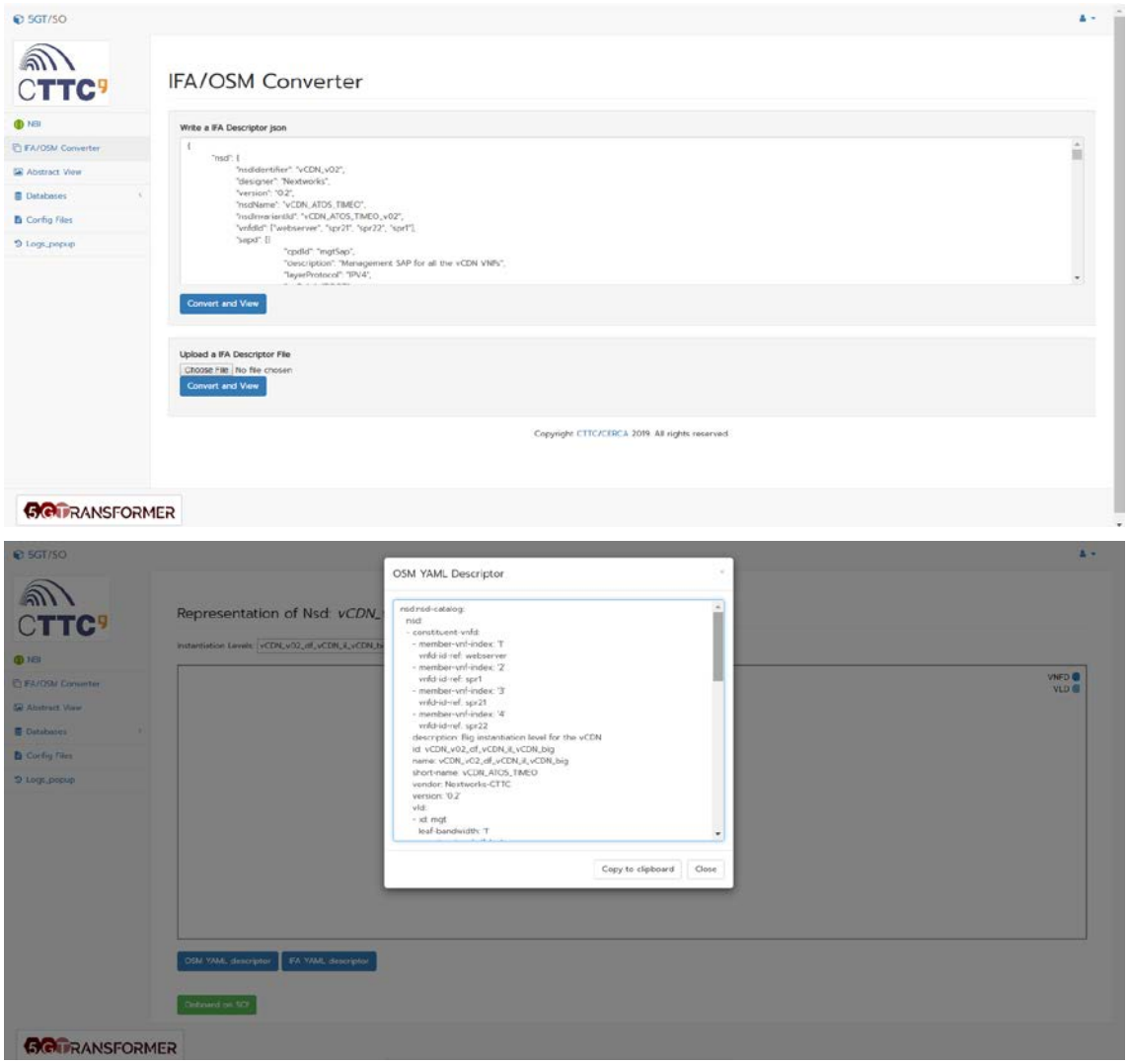


FIGURE 3: 5GT-SO ADMIN GUI – IFA-TO-OSM CONVERTER

1.2.1.3 Visualization of resources exposed by the 5GT-MTP

Visualization of resources as exposed by the 5GT-MTP (PoPs and Logical Links). Red PoPs correspond to local PoPs and yellow ones to virtual PoPs, which represent federated domains as seen from the 5GT-MTP.

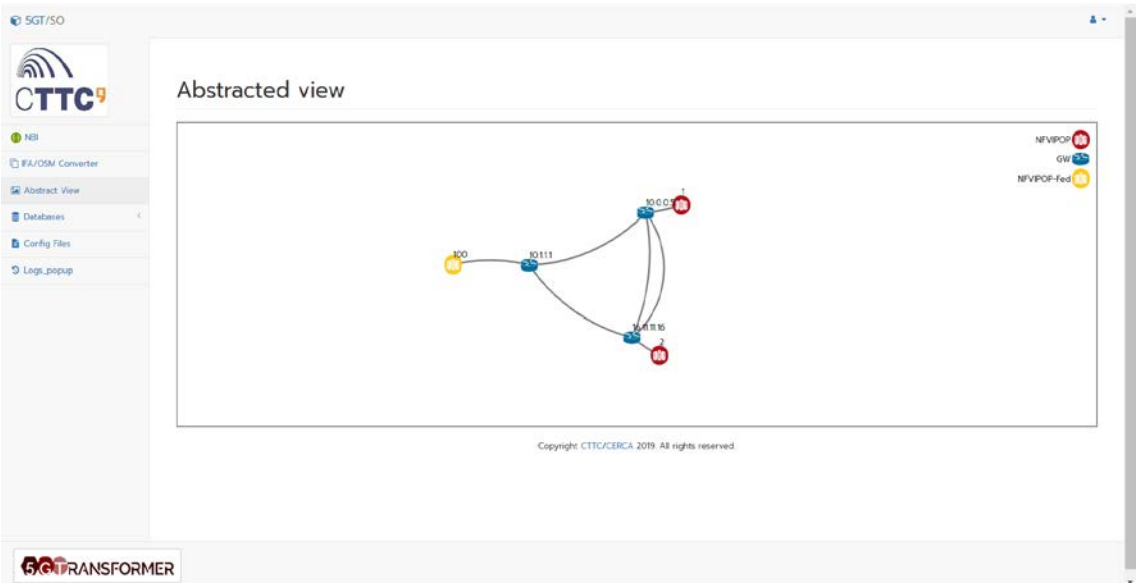
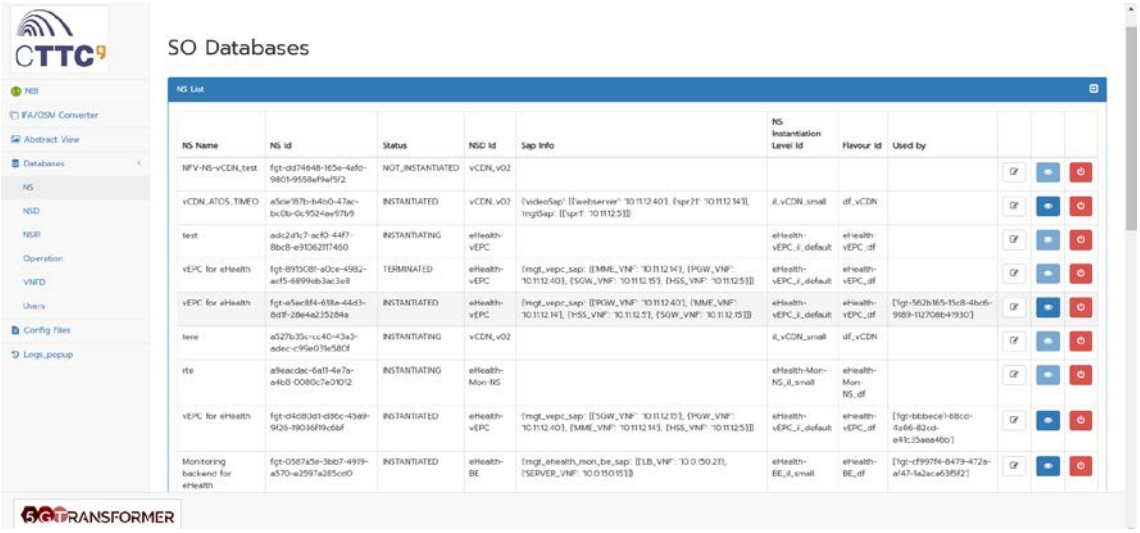
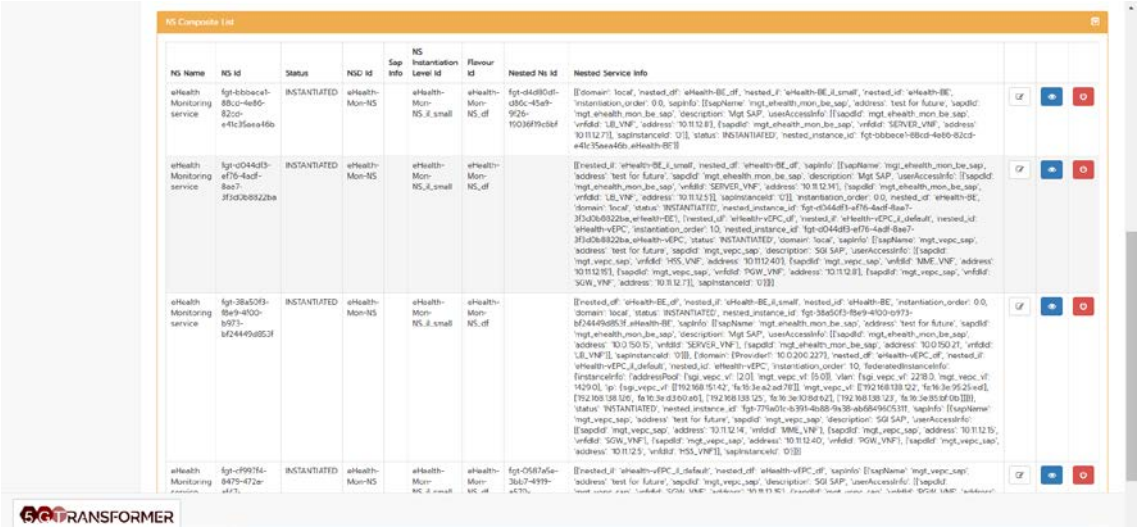


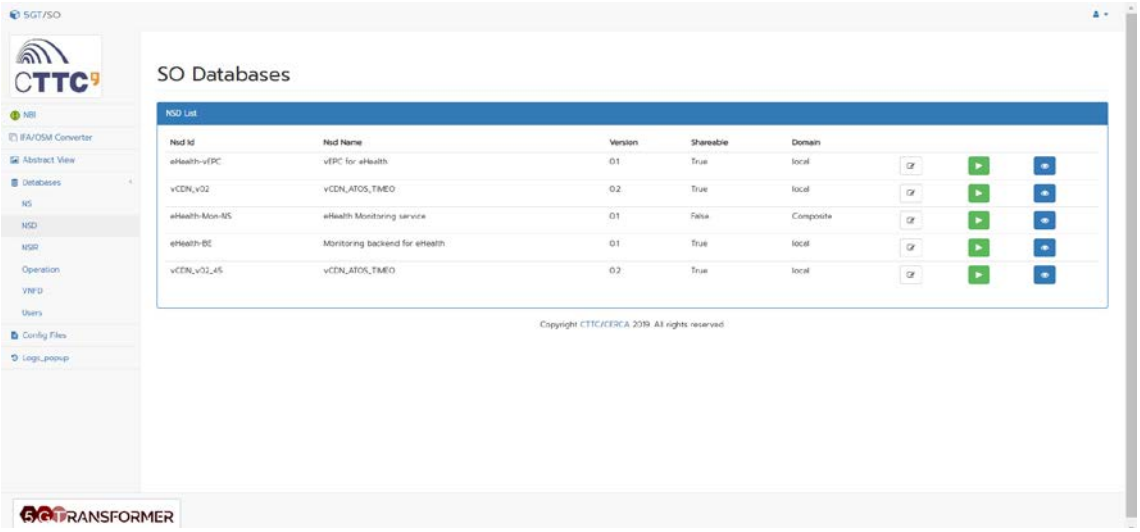
FIGURE 4: 5GT-SO ADMIN GUI – 5GT-MTP RESOURCES

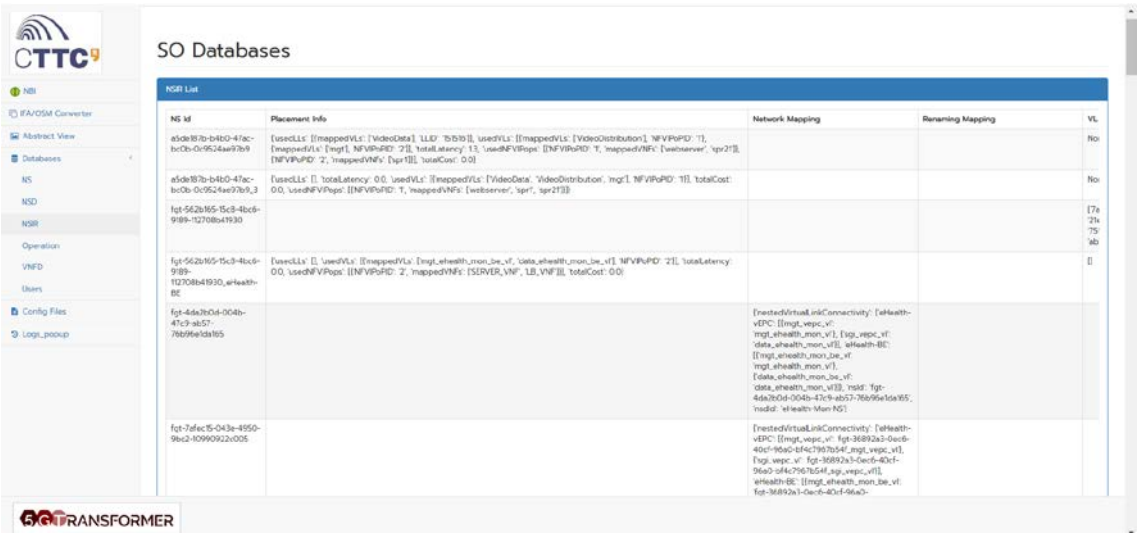
1.2.1.4 Databases

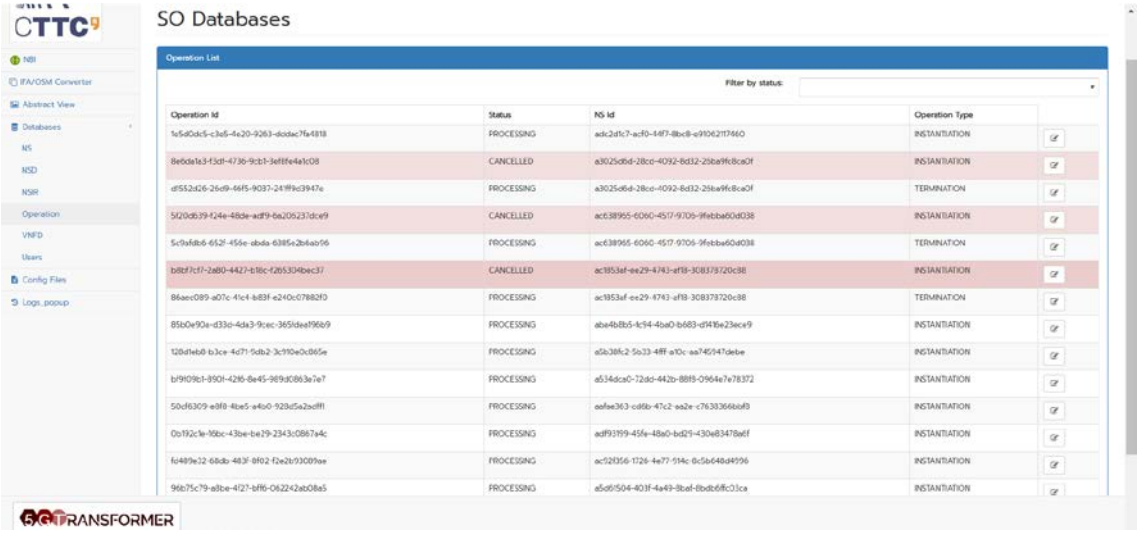
Exploration of the content of all databases (NSD, VFND catalogues, MTP resources, Instantiated NSs, Resources associated with instantiated NSs, Operation IDs). Notice that the NS DB GUI also presents the instantiated composite NSs (table with yellow heading).


SO Databases
NS List
NS Name
NS Id
Status
NSD Id
Sap Info
NS Instantiation Level Id
Flavour Id
Used by


NS Composite List
NS Name
NS Id
Status
NSD Id
Sap Info
NS Instantiation Level Id
Flavour Id
Nested Ns Id
Nested Service Info


SO Databases
NSD List
Nsd Id
Nsd Name
Version
Shareable
Domain


CTTC
SO Databases
NBI
IFA/OSM Converter
Abstract View
Databases
NS
NSD
NSR
Operation
VNFD
Users
Config Files
Logs_popup
NSR List
NS Id
Placement Info
Network Mapping
Renaming Mapping
5GTRANSFORMER


CTTC
SO Databases
NBI
IFA/OSM Converter
Abstract View
Databases
NS
NSD
NSR
Operation
VNFD
Users
Config Files
Logs_popup
Operation List
Filter by status:
Operation Id
Status
NS Id
Operation Type
5GTRANSFORMER


CTTC
SO Databases
NBI
IFA/OSM Converter
Abstract View
Databases
NS
NSD
NSR
Operation
VNFD
Users
Config Files
Logs_popup
VNFD List
Vnfd Id
Vnfd Version
Vnfd Name
Vnfd Json
5GTRANSFORMER

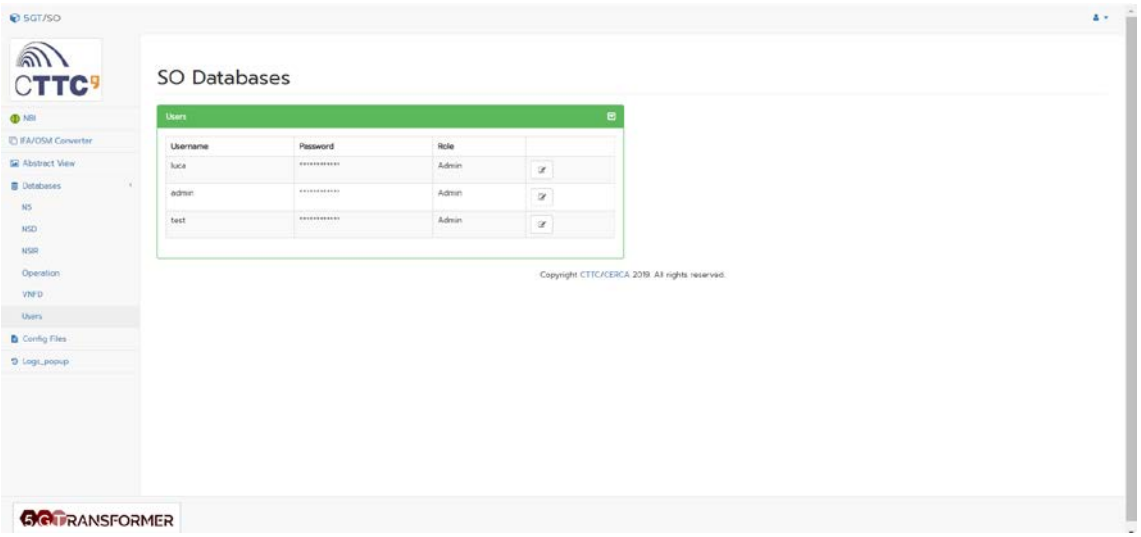
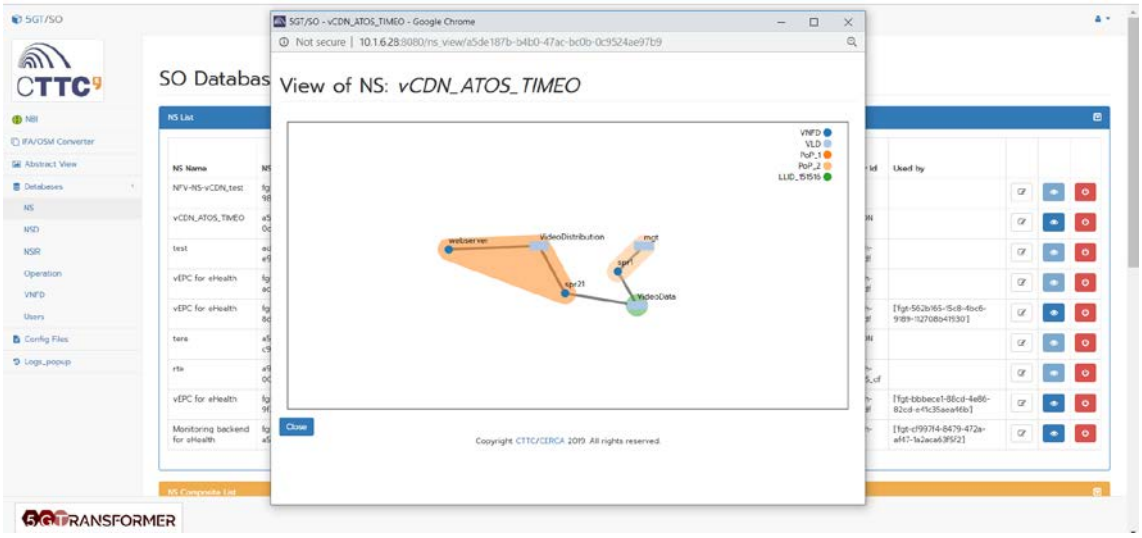


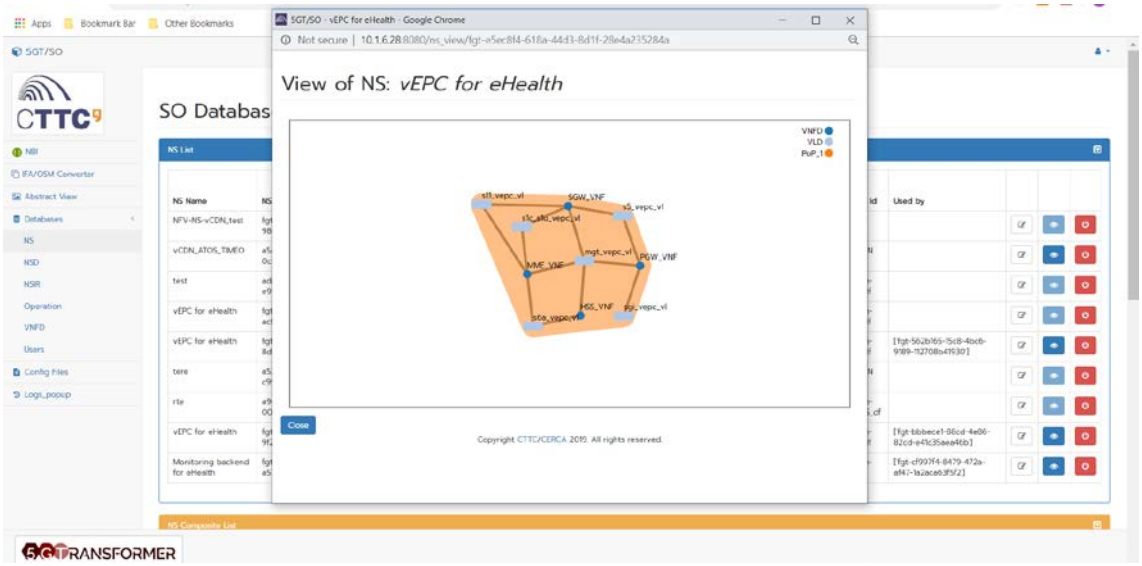
FIGURE 5: 5GT-SO ADMIN GUI – DATABASES

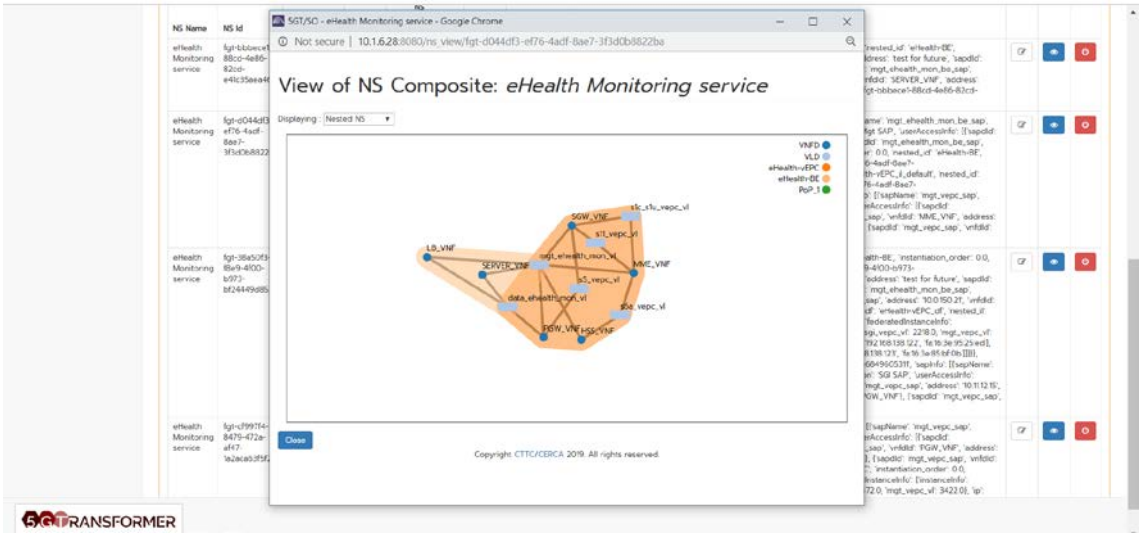
1.2.1.5 Graphical visualization of instantiated NSs

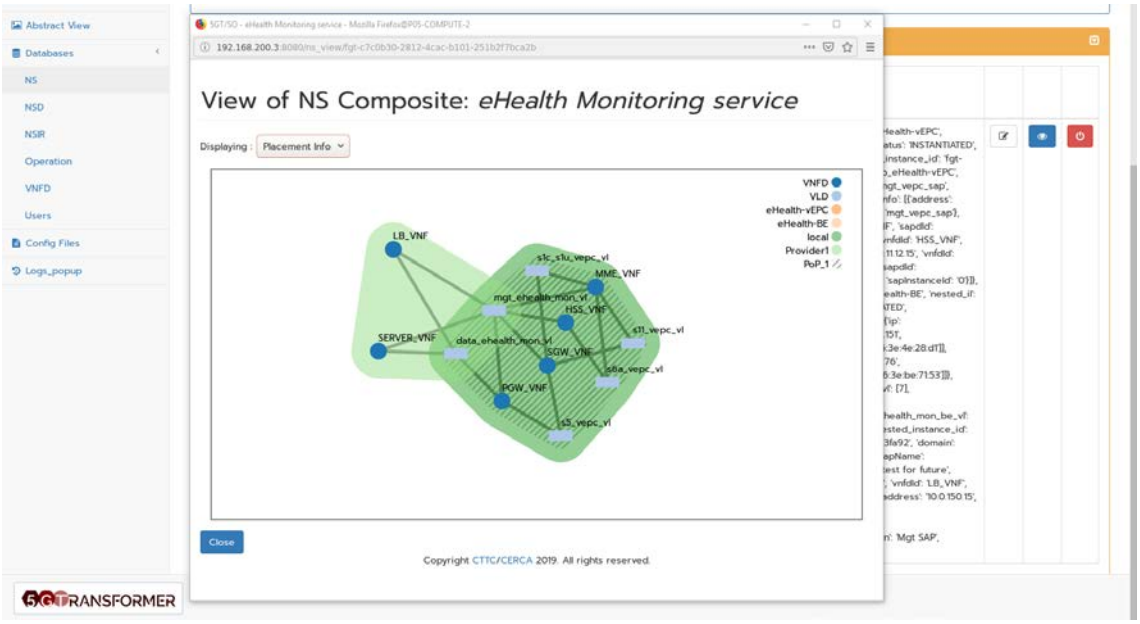
Graphical visualization of instantiated NSs, their components (VLs and VNFs) and the placement of the VNFs in different PoPs can be opened by clicking on the eye icon next to the corresponding entry in the DB. For composite NSs, visualization of placement of NSs in domains (local and federated). Background bubbles in different colors correspond to different PoPs. Blue rectangles represent VLs and dark blue dots represent VNFs. In case of composite NSs, background bubbles circle nested NSs ("nested NS" selected in the "Displaying" drop-down menu), placement in PoPs ("placement info" selected in the "Displaying" drop-down menu), or placement in different administrative domains in case of federation or different administrative domains ("federation info" selected in the "Displaying"

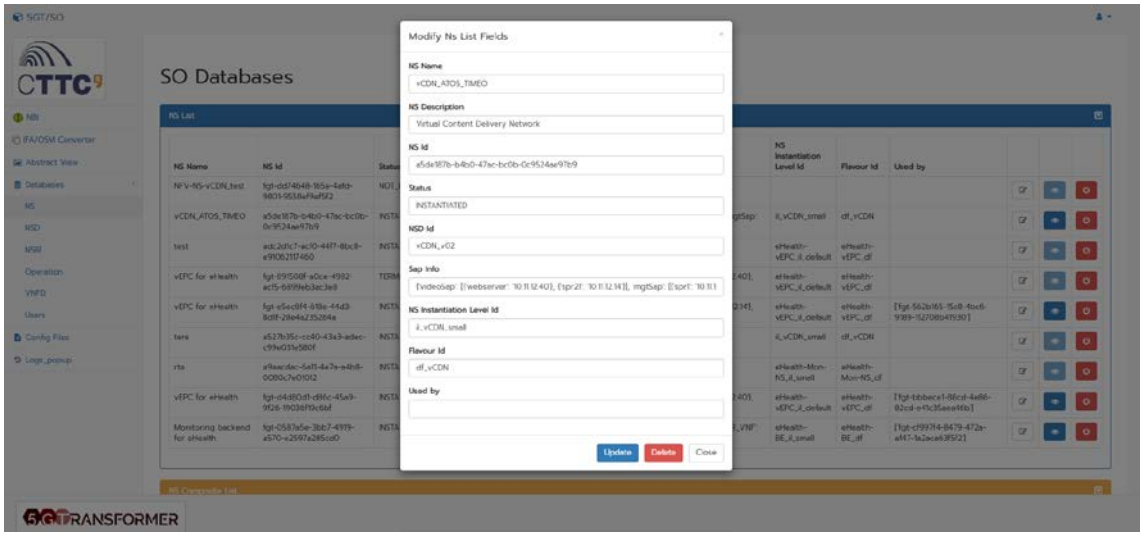
By clicking on the pencil icon next to each entry, some of the fields of the DB entry can be updated, or the whole entry can be deleted from the DB by clicking on the "Delete" button at the bottom of the "Modify NS List fields" window.


SGT/SO - vCDN_ATOS_TIMEO - Google Chrome
Not secure | 10.1.6.28:8080/ns_view/a5de187b-b4b0-47ac-bc0b-0c9524ae97b9
View of NS: vCDN_ATOS_TIMEO
webserver
VideoDistribution
mgt
spr1
spr21
VideoData
Close
Copyright CTTC/CERCA 2019. All rights reserved.


SGT/SO - vEPC for eHealth - Google Chrome
Not secure | 10.1.6.28:8080/ns_view/fgt-a5ec8f4-618a-44d3-8d1f-28e4a235284a
View of NS: vEPC for eHealth
Close
Copyright CTTC/CERCA 2019. All rights reserved.


SGT/SO - eHealth Monitoring service - Google Chrome
Not secure | 10.1.6.28:8080/ns_view/fgt-d044df3-ef76-4adf-8ae7-3f3d0b8822ba
View of NS Composite: eHealth Monitoring service
Close
Copyright CTTC/CERCA 2019. All rights reserved.


Abstract View
Databases
NS
NSD
NSIR
Operation
VNFD
Users
Config Files
Logs_popup
View of NS Composite: eHealth Monitoring service
Displaying : Placement Info
VNFD
VLD
eHealth-vEPC
eHealth-BE
local
Provider1
PoP_1
LB_VNF
s1c_s1u_vepc_vl
MME_VNF
mgt_ehealth_mon_vl
HSS_VNF
SERVER_VNF
data_ehealth_mon_vl
s11_vepc_vl
SGW_VNF
s8a_vepc_vl
PGW_VNF
s5_vepc_vl
Close
Copyright CTTC/CERCA 2019. All rights reserved.
5GTRANSFORMER


SO Databases
Modify Ns List Fields
NS Name
vCDN_ATOS_TIMEO
NS Description
Virtual Content Delivery Network
NS Id
Status
INSTANTIATED
NSD Id
vCDN_v02
Sap Info
NS Instantiation Level Id
Flavour Id
df_vCDN
Used by
Update
Delete
Close
5GTRANSFORMER

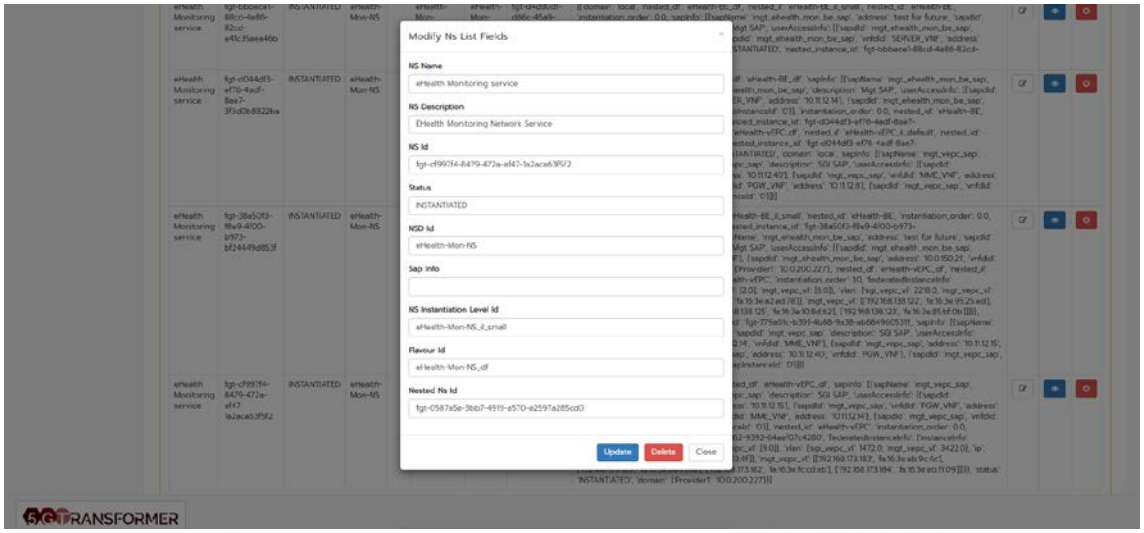

Modify Ns List Fields
NS Name
eHealth Monitoring service
NS Description
EHealth Monitoring Network Service
NS Id
Status
INSTANTIATED
NSD Id
eHealth-Mon-NS
Sap Info
NS Instantiation Level Id
eHealth-Mon-NS_il_small
Flavour Id
eHealth-Mon-NS_df
Nested Ns Id
Update
Delete
Close
5GTRANSFORMER

FIGURE 6: 5GT-SO ADMIN GUI – NS VISUALIZATION AND MODIFICATION/DELETION OF DB ENTRIES

1.2.1.6 NSD visualization

The structure of the NSD (before instantiation) can also be explored from the NSD catalogue by clicking on the eye icon next to each DB entry.

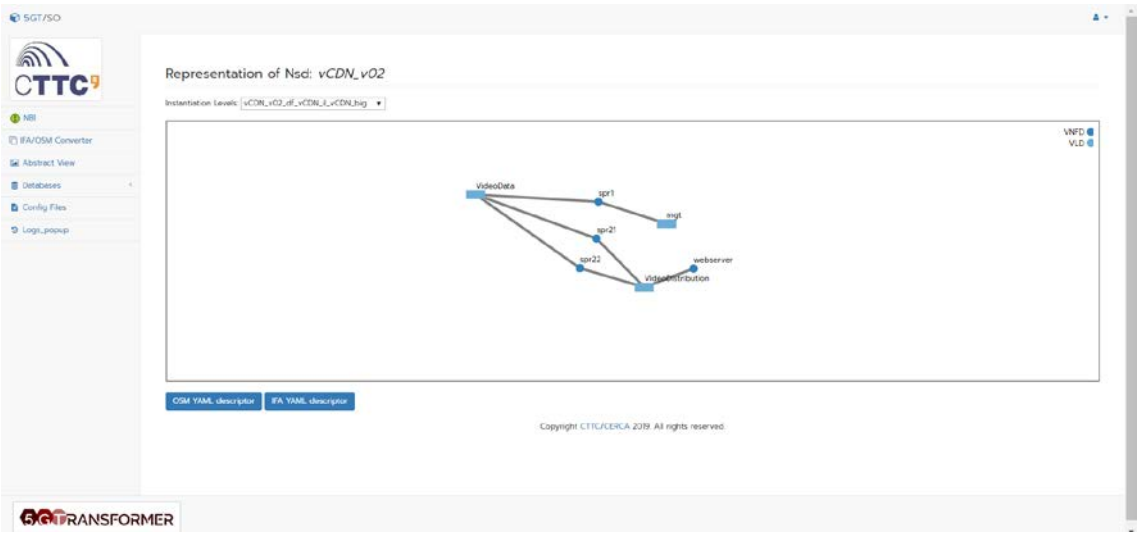
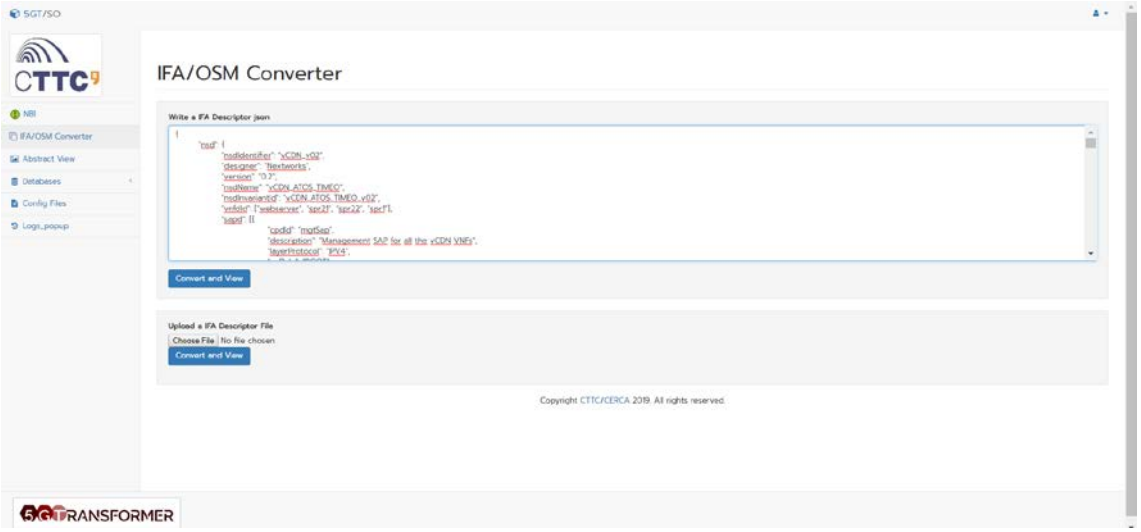


FIGURE 7: 5GT-SO ADMIN GUI – NSD VISUALIZATION

1.2.1.7 Onboarding of NSD in the catalogue and translation to NSDs for OSM

The process starts as described for the IFA/OSM converter above. If the NSD or VNFD is already onboarded, the system returns an error. Otherwise, it returns a message showing the successful onboarding. Again, entries can be modified from the pencil icon.



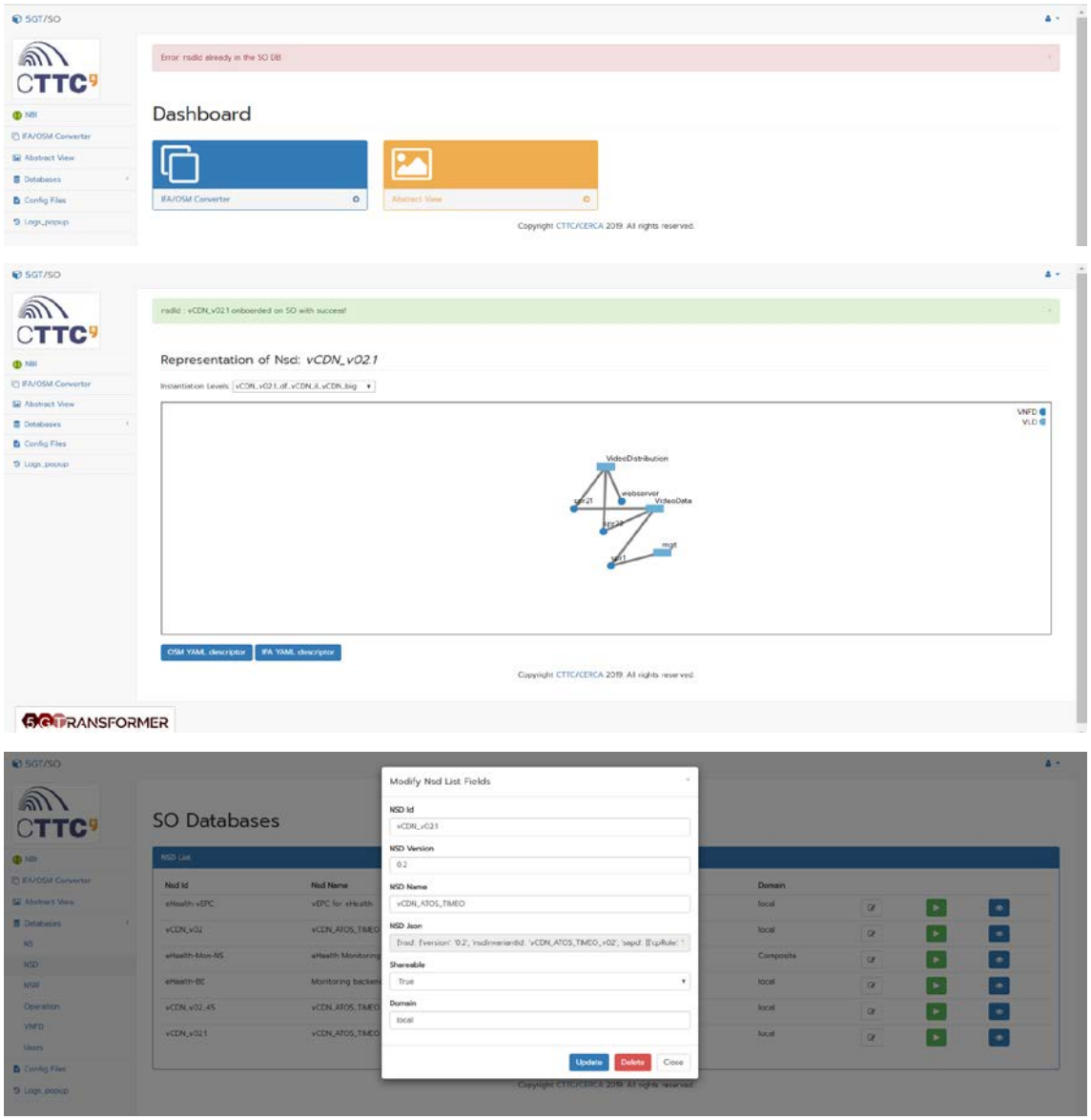


FIGURE 8: 5GT-SO ADMIN GUI – WIZARD TO ONBOARD AN NSD

1.2.1.8 Onboarding of VNFD

Onboarding of VNFDs follows exactly the same steps as NSDs, but update/delete is done from the VNFD catalogue DB visualization page instead.

1.2.1.9 Instantiation/Termination of NS from the GUI

From the NSD catalogue, one can instantiate a service by clicking on the triangle icon next to the corresponding NSD. A window opens to introduce the name, a description, the deployment flavour, and the instantiation level. A message with green background appear after successful instantiation (red otherwise) and the new entry appears in the NS database. From there, once the status pass to INSTANTIATED, the service can be

visualized, clicking on the blue “eye” icon. Also the service can be terminated by clicking in the red switch off button next to the corresponding DB entry.

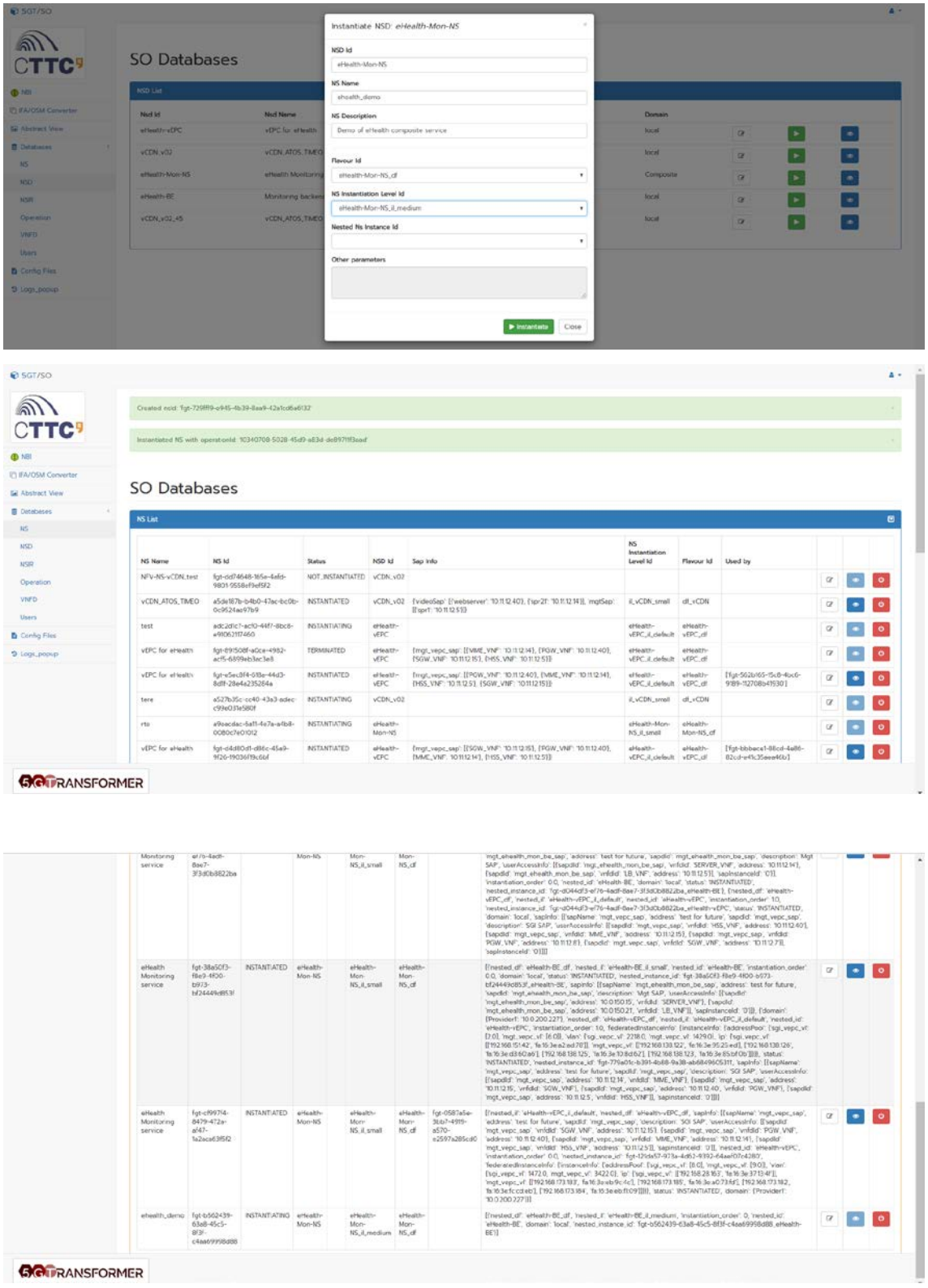


FIGURE 9: 5GT-SO ADMIN GUI – NS INSTANTIATION PROCESS

1.2.1.10 Inspection of main 5GT-SO configuration files

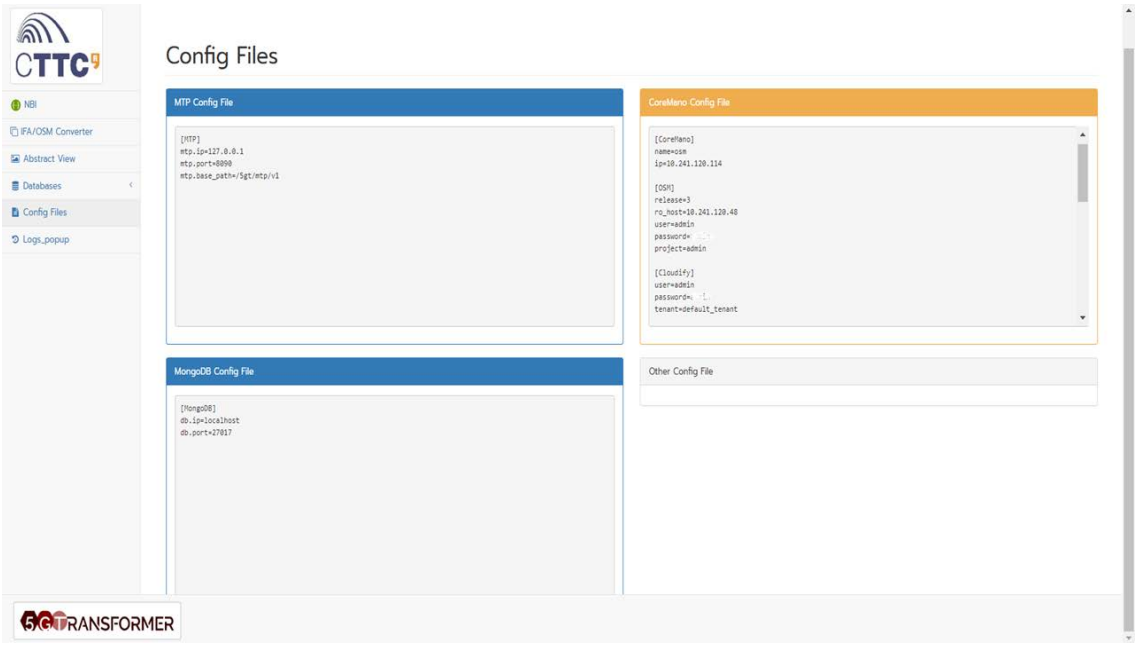


FIGURE 10: 5GT-SO ADMIN GUI – INSPECTION OF 5GT-SO CONFIG FILES

1.2.1.11 Inspection of 5GT-SO log

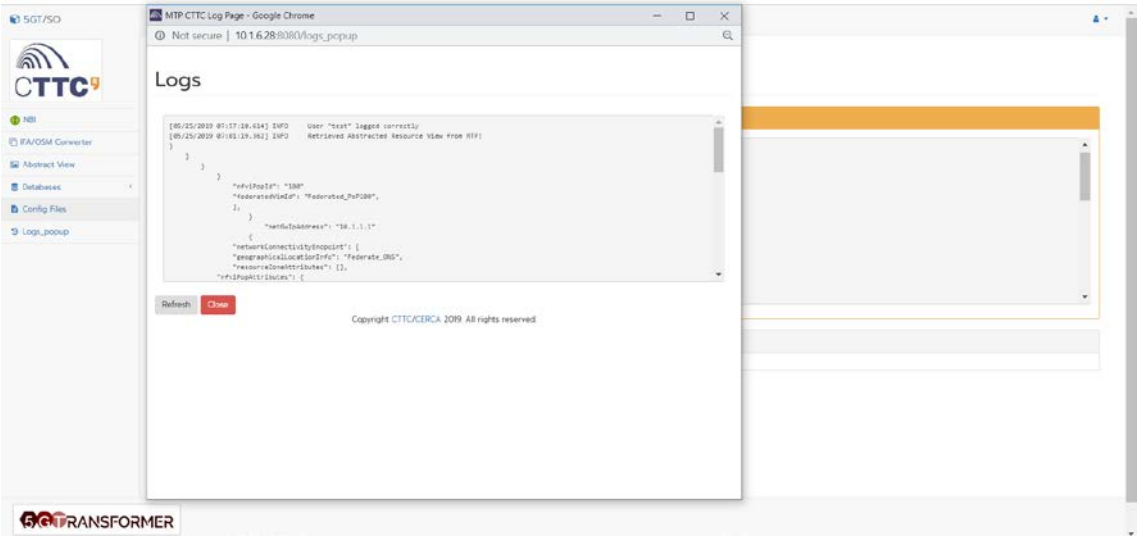


FIGURE 11: 5GT-SO ADMIN GUI – INSPECTION OF 5GT-SO LOGS

2 References

[1] 5G-TRANSFORMER, D4.3, Final design and implementation report on service orchestration, federation and monitoring platform, May 2019.
[2] 5G-TRANSFORMER, D4.4, Final design and implementation report on service orchestration, federation and monitoring platform (reference implementation), May 2019.
[3] 5GT-SO github repository available at the public github: https://github.com/5g-transformer/5gt-so/
[4] 5G-TRANSFORMER, D1.1, Report on vertical requirements and use cases, 2017.