



# Cisco Crosswork NSO Telemetry Traffic Collector Function Pack Installation Guide

Version 5.0.0-62

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# Preface

## Abstract

Function packs are installed on the Cisco Network Services Orchestrator (NSO) platform and used to push services and network configurations to devices.

The Telemetry Traffic Collector (TM-TC) function pack utilizes Cisco NSO Reactive FastMap (RFM) nano services to manage the telemetry configuration on devices.

The TM-TC function pack version 5.0.0-62 must be installed on Cisco NSO 6.1 and is intended for use with Cisco Crosswork 5.0.

This document describes how to install and configure the TM-TC function pack.

## Audience

This document is intended for experienced network users and operators who have a good understanding of Cisco NSO and its usage.

## Additional Documentation

For more information of Cisco NSO, refer to the [Cisco NSO documentation](#).

## Before you Begin

Cisco NSO 6.1 must be installed on your system before installing the Crosswork TM-TC FP. This section outlines the software requirements and platform dependencies that must be met in order to install the Crosswork TM-TC function pack successfully.

- **sudo** user privileges are required to perform the installation. This user must also be part of the **ncsadmin** group.
- OpenJDK 11 or higher must be installed.
- Python 3.8 or higher must be installed. The default Python should point to Python 3.
- If you are running an older version of Cisco NSO, upgrade to Cisco NSO 6.1. Stop the Cisco NSO instance, uninstall the older version of the NSO, and then download the Cisco NSO 6.1 installation bin file from Cisco.com and install using the following command:

```
sudo sh nso-6.1.linux.x86_64.installer.bin --system-install --non-interactive
```

**Note:** For complete instructions on installing Cisco NSO 6.1, follow the steps described in the [Cisco Network Services Orchestrator Installation Guide](#).

- Enable SSL under webui section in ncs.conf file.

More information about ncs.conf parameters can be found in NSO's man page in [NSO Documentation](#).

```
<webui>
<enabled>true</enabled>
<transport>
  <tcp>
    <enabled>true</enabled>
    <ip>0.0.0.0</ip>
    <port>8080</port>
  </tcp>
  <ssl>
    <enabled>true</enabled>
    <ip>0.0.0.0</ip>
    <port>8888</port>
```

- Verify the NSO version.

```
ncs -version
```

The result should be:

```
6.1
```

## Installing the TM-TC Function Pack

TM-TC function pack can be installed on standalone and Layered service architecture (LSA) NSO installations. In case of standalone NSO installations, it can be installed on a system installation and local installation. System installation is for a real time production environment and the preferred method of installation. This document does not cover steps to set up LSA.

### To access the TM-TC function pack installation file and extract its packages:

1. Log into the host machine as the **ncs** user. This user must also be part of the **ncsadmin** user group and have sudo access.
2. Download the **cw-na-fp-tmtc-5.0.0-62-nso-6.1.tar.gz** package from Cisco.com and copy it to the host server. This is the installation file for the TM-TC function pack.
3. Untar the TM-TC **tar.gz** file to the current directory.

```
tar -xvzf cw-na-fp-tmtc-5.0.0-62-nso-6.1.tar.gz
```

A new directory TM-TC-5.0.0-62 is created with all the files in the package. All the files related to standalone installation can be found in this folder and files related to LSA can be found under LSA folder.

The following packages/files are extracted:

Type of Installation	Relative Location	Group	Package Category	Packages
Standalone NSO	TM-TC-5.0.0-62/packages	Core Packages	TM-TC Function Pack Common Packages	ncs-6.1-cisco-tm-tc-fp-5.0.0-62.tar.gz ncs-6.1-tm-tc-multi-vendors-5.0.0-62.tar.gz
		Utility packages	Packages required for tm-tc fp to work	ncs-6.1-custom-template-utils-2.0.13.tar.gz ncs-6.1-core-fp-common-1.33.0.tar.gz
		NEDs	CLI NED	ncs-6.1-cisco-iosxr-7.46.3.tar.gz
LSA Deployment  CFS	TM-TC-5.0.0-62/LSA/CFS	Core Packages	TM-TC Function Pack Common Packages	ncs-6.1-cisco-tm-tc-fp-cfs-5.0.0-62.tar.gz ncs-6.1-cisco-tm-tc-fp-cfs-ned-5.0.0-62.tar.gz
		Utility Packages	Packages required for tm-tc fp to work	ncs-6.1-lsa-utils-ned-1.0.tar.gz ncs-6.1-lsa-utils-1.0.4.tar.gz ncs-6.1-custom-template-utils-ned-1.0.tar.gz ncs-6.1-custom-template-utils-2.0.13.tar.gz ncs-6.1-core-fp-common-ned-1.0.tar.gz ncs-6.1-core-fp-common-1.33.0.tar.gz ncs-6.1-cisco-nso-nc-6.1.tar.gz
LSA Deployment  RFS	TM-TC-5.0.0-62/LSA/RFS/packages	Core Packages	TM-TC Function Pack Common Packages	ncs-6.1-cisco-tm-tc-fp-5.0.0-62.tar.gz ncs-6.1-tm-tc-multi-vendors-5.0.0-62.tar.gz
		Utility Packages	Packages required for tm-tc fp to work	ncs-6.1-custom-template-utils-2.0.13.tar.gz ncs-6.1-core-fp-common-1.33.0.tar.gz ncs-6.1-lsa-utils-1.0.4.tar.gz

		NEDs	CLI NED	ncs-6.1-cisco-iosxr-7.46.3.tar.gz
--	--	------	---------	-----------------------------------

4. Follow the relevant installation procedure below, depending on the type of NSO environment you are using (System, Local, and LSA deployment).

## System Installation

This section provides the procedure for installing the package on a Cisco NSO instance that was installed using the “system installation” typical for production environments. **sudo** user privileges are required to perform the installation.

1. Copy the function pack packages to the Cisco NSO packages running directory. Here we are not copying multi-vendor package since it is needed only if devices are adding with NETCONF NED on NSO.

```
root@nso-vm:/home/nso/tmtc/TM-TC-5.0.0-62/packages# cp ncs-6.1-cisco-tm-tc-fp-5.0.0-62.tar.gz /var/opt/ncs/packages/
root@nso-vm:/home/nso/tmtc/TM-TC-5.0.0-62/packages# cp ncs-6.1-cisco-iosxr-7.46.3.tar.gz /var/opt/ncs/packages/
root@nso-vm:/home/nso/tmtc/TM-TC-5.0.0-62/packages# cp ncs-6.1-core-fp-common-1.33.0.tar.gz /var/opt/ncs/packages/
root@nso-vm:/home/nso/tmtc/TM-TC-5.0.0-62/packages# cp ncs-6.1-custom-template-utils-2.0.13.tar.gz /var/opt/ncs/packages/
```

2. [OPTIONAL] Copy the tmtc multi-vendor package if devices are added with NETCONF NED on NSO. Please note that multi-vendor package installation fails if there is no NETCONF NED installed on NSO.

```
root@nso-vm:/home/nso/tmtc/TM-TC-5.0.0-62/packages# cp ncs-6.1-tm-tc-multi-vendors-5.0.0-62.tar.gz /var/opt/ncs/packages/
```

### 3. Login to NSO CLI and reload the packages.

```
nso@nso-vm:~$ ncs_cli -u admin -C

User admin last logged in 2023-04-26T17:44:07.617684+00:00, to nso-vm, from
10.110.44.171 using cli-ssh
admin connected from 10.110.44.171 using ssh on nso-vm
admin@ncs#
admin@ncs#
admin@ncs# packages reload force

>>> System upgrade is starting.
>>> Sessions in configure mode must exit to operational mode.
>>> No configuration changes can be performed until upgrade has completed.
>>> System upgrade has completed successfully.

reload-result {
  package cisco-iosxr-cli-7.46
  result true
}
reload-result {
  package cisco-tm-tc-fp
  result true
}
reload-result {
  package core-fp-common
  result true
}
reload-result {
  package custom-template-utils
  result true
}
```

### 4. Verify the installation and make sure the packages are up and running. For more information, see the [Verifying the Installation](#) section.



## Local Installation

This section provides the procedure for installing the package on a Cisco NSO instance that was installed using the “local installation” typical for lab and demo environments. **sudo** user privileges are required to perform the installation.

1. Stop Cisco NSO.

```
[root@nso-vm ncs-run]# ncs -stop
```

2. Copy the function pack packages to the Cisco NSO packages running directory.

```
[[root@nso-vm packages]# cp *.tar.gz /home/nso/ncs-run/packages/
```

3. Restart Cisco NSO.

```
[root@nso-vm packages]# cd /home/nso/ncs-run/  
[root@nso-vm ncs-run]# ncs --with-package-reload-force
```

4. Verify the installation and make sure the packages are up and running. For more information, see the [Verifying the Installation](#) section.

## Installation On LSA Deployments - CFS

This section provides the procedure for installing the package on a Cisco NSO instance that was installed as CFS node. **sudo** user privileges are required to perform the installation.

1. Copy the function pack packages to the Cisco NSO packages running directory. The packages relevant to CFS can be found in LSA/CFS folder.

```
root@nso-cfs:/home/nso/tmtc/TM-TC-5.0.0-62/LSA/CFS# cp * /var/opt/ncs/packages/
```

## 2. Login to NSO CLI and reload the packages.

```
nso@nso-cfs:~$ ncs_cli -u admin -C

User admin last logged in 2023-04-26T19:01:19.441774+00:00, to nso-rfs, from
10.110.44.171 using cli-ssh
admin connected from 10.110.44.171 using ssh on nso-cfs
admin@ncs# packages reload force
reload-result {
  package cfs-cisco-tm-tc-fp
  result true
}
reload-result {
  package cfs-ned-tm-tc-nc-5.0.0-62
  result true
}
reload-result {
  package cisco-nso-nc-6.1
  result true
}
reload-result {
  package core-fp-common
  result true
}
reload-result {
  package core-fp-common-ned
  result true
}
reload-result {
  package custom-template-utils
  result true
}
reload-result {
  package custom-template-utils-ned
  result true
}
reload-result {
  package lsa-utils
  result true
}
reload-result {
  package lsa-utils-ned
  result true
}
}
```

## 3. Verify the installation and make sure the packages are up and running. For more information, see the **Verifying the Installation** section.

## Installation On LSA Deployments - RFS

This section provides the procedure for installing the package on a Cisco NSO instance that was installed as RFS node. **sudo** user privileges are required to perform the installation.

1. Copy the function pack packages to the Cisco NSO packages running directory. Here we are not copying multi-vendor package since it is needed only if devices are adding with NETCONF NED on NSO.

```
root@nso-rfs:/home/nso/tmtc/TM-TC-5.0.0-62/LSA/RFS/packages# cp ncs-6.1-cisco-
tm-tc-fp-5.0.0-62.tar.gz /var/opt/ncs/packages/

root@nso-rfs:/home/nso/tmtc/TM-TC-5.0.0-62/LSA/RFS/packages# cp ncs-6.1-cisco-
iosxr-7.46.3.tar.gz /var/opt/ncs/packages/

root@nso-rfs:/home/nso/tmtc/TM-TC-5.0.0-62/LSA/RFS/packages# cp ncs-6.1-core-fp-
common-1.33.0.tar.gz /var/opt/ncs/packages/

root@nso-rfs:/home/nso/tmtc/TM-TC-5.0.0-62/LSA/RFS/packages# cp ncs-6.1-custom-
template-utils-2.0.13.tar.gz /var/opt/ncs/packages/

root@nso-rfs:/home/nso/tmtc/TM-TC-5.0.0-62/LSA/RFS/packages# cp ncs-6.1-lsa-
utils-1.0.4.tar.gz /var/opt/ncs/packages/
```

2. [OPTIONAL] Copy the tmtc multi-vendor package if devices are added with NETCONF NED on NSO. Please note that multi-vendor package installation fails if there is no NETCONF NED installed on NSO.

```
root@nso-rfs:/home/nso/tmtc/TM-TC-5.0.0-62/LSA/RFS/packages# cp ncs-6.1-tm-tc-
multi-vendors-5.0.0-62.tar.gz /var/opt/ncs/packages/
```

### 3. Login to NSO CLI and reload the packages.

```
nso@nso-rfs:~$ ncs_cli -u admin -C

admin connected from 10.110.44.171 using ssh on nso-rfs
admin@ncs# packages reload force

>>> System upgrade is starting.
>>> Sessions in configure mode must exit to operational mode.
>>> No configuration changes can be performed until upgrade has completed.
>>> System upgrade has completed successfully.

reload-result {
  package cisco-iosxr-cli-7.46
  result true
}
reload-result {
  package cisco-tm-tc-fp
  result true
}
reload-result {
  package core-fp-common
  result true
}
reload-result {
  package custom-template-utils
  result true
}
reload-result {
  package lsa-utils
  result true
}
```

### 4. Verify the installation and make sure the packages are up and running. For more information, see the [Verifying the Installation](#) section.

## Verifying the Installation

This section discusses how to verify the TM-TC system installation by checking that the packages are up and package versions are set as expected. You need to verify the build number, TM-TC release information, and package versions.

### Standalone NSO Installations

1. Verify that all the packages are up and running. X indicates that the package is up.

```
nso@nso-vm:~$ ncs_cli -u admin -C
User admin last logged in 2023-04-26T17:44:17.735242+00:00, to nso-vm, from
10.110.44.171 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-vm
admin@ncs# show packages package oper-status | tab
```

```
nso@nso-vm:~$ ncs_cli -u admin -C
User admin last logged in 2023-04-26T17:44:17.735242+00:00, to nso-vm, from 10.110.44.171 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-vm
admin@ncs# show packages package oper-status | tab
```

NAME	UP	PROGRAM		PYTHON	BAD NCS	PACKAGE	PACKAGE	CIRCULAR	PACKAGE		FILE	ERROR	WARNINGS
		CODE	JAVA						DATA	LOAD			
		ERROR	UNINITIALIZED	UNINITIALIZED	VERSION	NAME	VERSION	DEPENDENCY	ERROR	ERROR	INFO		
cisco-iosxr-cli-7.46	X	-	-	-	-	-	-	-	-	-	-	-	-
cisco-tm-tc-fp	X	-	-	-	-	-	-	-	-	-	-	-	-
core-fp-common	X	-	-	-	-	-	-	-	-	-	-	-	-
custom-template-utils	X	-	-	-	-	-	-	-	-	-	-	-	-

```
admin@ncs#
```

2. Verify the package versions and the build information.

```
admin@ncs# show packages package package-version
```

```
admin@ncs# show packages package package-version
```

NAME	PACKAGE
	VERSION
cisco-iosxr-cli-7.46	7.46.3
cisco-tm-tc-fp	5.0.0-62
core-fp-common	1.33.0
custom-template-utils	2.0.13

### LSA Installation - CFS

1. Verify that all the packages are up and running. X indicates that the package is up.

```
nso@nso-cfs:~$ ncs_cli -u admin -C
User admin last logged in 2023-04-26T19:08:37.167047+00:00, to nso-rfs, from
10.110.44.171 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-cfs
admin@ncs#
admin@ncs# show packages package oper-status | tab
```

```
nso@nso-cfs:~$ ncs_cli -u admin -C
User admin last logged in 2023-04-26T19:08:37.167047+00:00, to nso-rfs, from 10.110.44.171 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-cfs
admin@ncs#
admin@ncs# show packages package oper-status | tab
```

NAME	UP	PROGRAM CODE ERROR	JAVA UNINITIALIZED	PYTHON UNINITIALIZED	BAD NCS VERSION	PACKAGE NAME	PACKAGE VERSION	CIRCULAR DEPENDENCY	PACKAGE META DATA ERROR	FILE LOAD ERROR	ERROR INFO	WARNINGS
cfs-cisco-tm-tc-fp	X	-	-	-	-	-	-	-	-	-	-	-
cfs-ned-tm-tc-nc-5.0.0-62	X	-	-	-	-	-	-	-	-	-	-	-
cisco-nso-nc-6.1	X	-	-	-	-	-	-	-	-	-	-	-
core-fp-common	X	-	-	-	-	-	-	-	-	-	-	-
core-fp-common-ned	X	-	-	-	-	-	-	-	-	-	-	-
custom-template-utils	X	-	-	-	-	-	-	-	-	-	-	-
custom-template-utils-ned	X	-	-	-	-	-	-	-	-	-	-	-
lsa-utils	X	-	-	-	-	-	-	-	-	-	-	-
lsa-utils-ned	X	-	-	-	-	-	-	-	-	-	-	-

2. Verify the package versions and the build information.

```
admin@ncs# show packages package package-version
```

```
admin@ncs# show packages package package-version
```

NAME	PACKAGE VERSION
cfs-cisco-tm-tc-fp	5.0.0-62
cfs-ned-tm-tc-nc-5.0.0-62	5.0.0-62
cisco-nso-nc-6.1	6.1
core-fp-common	1.33.0
core-fp-common-ned	1.0
custom-template-utils	2.0.13
custom-template-utils-ned	1.0
lsa-utils	1.0.4
lsa-utils-ned	1.0

## LSA Installation - RFS

1. Verify that all the packages are up and running. X indicates that the package is up.

```
nso@nso-rfs:~$ ncs_cli -u admin -C
User admin last logged in 2023-04-26T19:13:43.640381+00:00, to nso-rfs, from
10.110.44.171 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-rfs
admin@ncs# show packages package oper-status | tab
```

```
nso@nso-rfs:~$ ncs_cli -u admin -C
User admin last logged in 2023-04-26T19:13:43.640381+00:00, to nso-rfs, from 10.110.44.171 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-rfs
admin@ncs# show packages package oper-status | tab
```

NAME	UP	PROGRAM CODE ERROR	JAVA UNINITIALIZED	PYTHON UNINITIALIZED	BAD NCS VERSION	PACKAGE NAME	PACKAGE VERSION	CIRCULAR DEPENDENCY	PACKAGE META DATA ERROR	FILE LOAD ERROR	ERROR INFO	WARNINGS
cisco-iosxr-cli-7.46	X	-	-	-	-	-	-	-	-	-	-	-
cisco-tm-tc-fp	X	-	-	-	-	-	-	-	-	-	-	-
core-fp-common	X	-	-	-	-	-	-	-	-	-	-	-
custom-template-utils	X	-	-	-	-	-	-	-	-	-	-	-
lsa-utils	X	-	-	-	-	-	-	-	-	-	-	-

2. Verify the package versions and the build information.

```
admin@ncs# show packages package package-version
```

```
admin@ncs# show packages package package-version
          PACKAGE
NAME      VERSION
-----
cisco-iosxr-cli-7.46  7.46.3
cisco-tm-tc-fp       5.0.0-62
core-fp-common       1.33.0
custom-template-utils 2.0.13
lsa-utils            1.0.4
```

3. Perform post-installation tasks for TM-TC FP. For more information, see the **Performing Post-Installation Tasks** section.

## Performing Post-Installation Tasks

The post-installation configurations required for the TM-TC function pack can be divided into two categories.

1. Enabling stack mode for TMTTC. This should be configured on CFS, RFS, and standalone installations.

```
nso@nso-vm:~$ ncs_cli -u admin -J
User admin last logged in 2023-04-27T06:25:14.584284+00:00, to nso-vm, from
10.110.42.189 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-vm
admin@ncs> configure
Entering configuration mode private
[ok][2023-04-27 12:03:37]
[edit]
admin@ncs% set cisco-tm-tc-fp:cfp-configurations stacked-service-enabled
[ok][2023-04-27 12:03:45]
[edit]
admin@ncs% commit
Commit complete.
```

2. [OPTIONAL] Dynamic device mapping config if devices are added with NETCONF NED. If applicable, this should be configured on RFS and standalone installations.

```
nso@nso-vm:~$ ncs_cli -u admin -J
User admin last logged in 2023-04-27T06:33:36.39321+00:00, to nso-vm, from
10.110.42.189 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-vm
admin@ncs> configure
Entering configuration mode private
[ok][2023-04-27 12:10:19]
[edit]
admin@ncs% set cisco-tm-tc-fp:cfp-configurations dynamic-device-mapping cisco-iosxr-
nc-7.5:cisco-iosxr-nc-7.5 python-impl-class-name tm_tc_multi_vendors.NativeUMXR
[ok][2023-04-27 12:10:26]
[edit]
admin@ncs% commit
Commit complete.
```



## Uninstalling the TM-TC Function Pack

Uninstalling the TM-TC function pack from the NSO involves removing the packages listed as “core packages” and reloading packages. Based on the type of NSO environment you are using (System or Local) choose one of the following processes to uninstall the package. **sudo** user privileges are required to perform the uninstallation.

### Uninstall the System Installation of TMTTC Functional Pack

1. Remove the core packages from the NSO installation directory.

```
root@nso-vm:/var/opt/ncs/packages# rm -rf ncs-6.1-cisco-tm-tc-fp-5.0.0-62.tar.gz
root@nso-vm:/var/opt/ncs/packages# rm -rf ncs-6.1-tm-tc-multi-vendors-5.0.0-62.tar.gz
```

2. Login to NSO and reload the packages.

```
nso@nso-vm:~$ ncs_cli -u admin -C
User admin last logged in 2023-04-27T06:40:17.637948+00:00, to nso-vm, from
10.110.42.189 using cli-ssh
admin connected from 10.110.42.189 using ssh on nso-vm
admin@ncs# packages reload force
>>> System upgrade is starting.
>>> Sessions in configure mode must exit to operational mode.
>>> No configuration changes can be performed until upgrade has completed.
>>> System upgrade has completed successfully.
reload-result {
  package cisco-iosxr-cli-7.46
  result true
}
reload-result {
  package core-fp-common
  result true
}
reload-result {
  package custom-template-utils
  result true
}
```

## Uninstall the Local Installation

### 1. Stop Cisco NSO.

```
[root@localhost packages]# cd /home/nso/ncs-run/  
[root@localhost ncs-run]# ncs --stop
```

### 2. Remove the core packages from the NSO packages running directory.

```
[root@localhost packages]# cd /home/nso/ncs-run/packages/  
[root@localhost packages]# rm -rf ncs-6.1-cisco-tm-tc-fp-5.0.0-62.tar.gz  
[root@localhost packages]# rm -rf rm -rf ncs-6.1-tm-tc-multi-vendors-5.0.0-62.tar.gz
```

### 3. Restart Cisco NSO.

```
[root@localhost packages]# cd /home/nso/ncs-run/  
[root@localhost ncs-run]# ncs --with-package-reload-force
```

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