

CDSE Copernicus DEM Downloader (Sen2Cor Auxiliary Module)

Installation, Configuration and Operation

by the Sen2cor_Dev_Team



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OPT-MPC



Copernicus Sentinel

Optical Mission Performance Cluster

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INTRODUCTION

- The CDSE (Copernicus DataSpace Ecosystem) Copernicus DEM Downloader is a light external [Sen2Cor](#) module developed by the Sen2cor Dev_Team to assist the users in accessing, searching and downloading the DGED and DTED DEM files (at 30m and 90m resolution) associated to Copernicus Sentinel-2 MGRS Tiles (Tile identifier) or L1C Core Products (SAFE Product filename).
- This Quick Guide illustrates how to retrieve, install and operate the CDSE Copernicus DEM Downloader.
- **Disclaimer:**
 - Please note that the scope of this CDSE Copernicus DEM downloader is not to download the whole archive of CDSE Copernicus DEM tiles.
 - It is intended and specifically designed to support Sen2Cor in downloading the necessary Copernicus DEM files associated to a single or a list of Sentinel-2 tiles or L1C Core Products. The maximum execution time of this script is, thus, limited to 60 minutes, i.e. a single token obtained and refresh with a maximum of 5 times, according to the <https://documentation.dataspace.copernicus.eu/Quotas.html>
- **Important Notes for Sen2Cor Users:**
 - Sen2Cor Toolbox v2.12.03 (as well as previous versions) supports CDSE-DGED DEM types (in GeoTIFF format).
 - Sen2Cor Toolbox v2.12.03 (as well as previous versions) **does not** support CDSE-DTED DEM types (in DT1 & DT2 format).
 - Tested on antimeridian tiles
 - Limited storage on user side (original size 30 m or 90 m)
 - Duplicate download is avoided for adjacent MGRS Tiles and previously downloaded DEM geocells
 - Credentials privacy handling
 - Open source, available on [ESA-Senbox-GitHub](#)

CREDENTIALS

- **Pre-requisites:**

- A valid CDSE user account is required from <https://dataspace.copernicus.eu/>
- Login credentials are:
 - Username (email address)
 - Password

- **Privacy Handling:**

- User will be prompted to insert username and password (once)
- Password is encrypted using RSA encryption and stored in credentials.yaml file
- The credentials.yaml file can be then reused for other runs of the tool by the same user
- Credentials can be deleted with the dedicated command line option (--reset)

- **CDSE Token Generation:**

- Credentials are used to generate CDSE token required for CDSE data download
- CDSE token has a validity time of 10 minutes
- CDSE token can be refreshed 5 times for a maximum overall token validity time of 60 minutes
- After a maximum of 60 minutes of operation, the CDSE Copernicus DEM downloader tool will stop

INSTALLATION & CONFIGURATION

- Python ≥ 3.12 is supported
- Clone repository into your local file system:
 - `git clone https://github.com/senbox-org/CDSE-Copernicus-DEM-downloader`
- External Copernicus Sentinel-2 tiling system KML is required
 - Download the Copernicus Sentinel-2 tiling system KML file from the link: [Copernicus Sentinel-2 KML](#)
 - Place the KML file in the following directory: `.../cdse-copernicus-dem-downloader/auxiliary`
- For the installation of pre-requisite dependencies a dedicated conda environment has been created:
 - Install [conda](#) or [miniconda](#) then run the following command to create the `cdse-copernicus-dem-downloader` conda env
 - `conda env create -f environment.yml`
 - The `cdse-copernicus-dem-downloader` environment is activated with:
 - `conda activate cdse-copernicus-dem-downloader`

INSTALLATION & CONFIGURATION

- Type:
- `python ../cdse_copernicus_dem_downloader.py --help`

- The help menu is visualised:

```
DEM Downloader Version: 1.0 Release Date: 10-October-2024.
```

```
options:
```

```
-h, --help          show this help message and exit
--config [CONFIG]  set the path to the Config file. If blank, read the parameters from the configuration/configuration.xml
--r {30,90}        set the (r)esolution of the DEM: 30 or 90 (m)
--m {DTED,DGED}    set the (m)odel of the DEM: DTED or DGED
--o O              set the (o)utput directory for storing the DEM. If blank, store into the Tool's Output_Dir
--i I              set the path for the (i)npout file containing the tiles list. If blank, read from the Tool's
configuration/input_tiles.txt
--t T              specify a single required MGRS (t)ile. e.g. 32UMA or Product (SAFE)
--reset [RESET]    reset credentials
```

- Credentials. User is prompted to insert username and password (one time):

```
[log-info] Retrieval of public and private keys
```

```
Enter your username: xxxx
```

```
Enter your password:
```

```
Re-enter your password:
```

```
[log-info] Password has been stored in credentials.yaml for username xxxx
```



OPERATION EXAMPLES

There are two ways to operate the `cdse-copernicus-dem-downloader`:

- 1) Using `command lines`
- 2) Indicating all the necessary parameters within the `configuration.xml` file

1. Command lines:

```
- python ../cdse_copernicus_dem_downloader.py --m DGED --r 90 --t 33TXF --o /Users/.../Sen2Cor/dem/CopernicusDEM90_DGED
```

will retrieve (`--m`) DGED type DEM files at (`--r`) 90 m resolution that intersect the (`--t`) MGRS tile 33TFX and store them in the (`--o`) indicated output directory

```
- python ../cdse_copernicus_dem_downloader.py --m DGED --r 90 --i /Users/.../input_tiles.txt --o /Users/.../Sen2Cor/dem/CopernicusDEM90_DGED
```

will retrieve (`--m`) DGED type DEM files at (`--r`) 90 m resolution that intersect the MGRS tiles listed in the (`--i`) indicated file and store them in the (`--o`) indicated output directory

`--t` should be a MGRS `tile_id` (33TXF) or a SAFE product (S2A_MSIL1C_20240816T094031_N0511_R036_T33TXF_20240816T114129.SAFE) file name

`--i` should be a txt file containing the following types of string-lines (MGRS `tile_id` or SAFE product file name):

```
S2A_MSIL1C_20240712T102601_N0510_R108_T32UMA_20240712T154912.SAFE # Frankfurt, Germany, SAFE format
```

```
32UMA # Same as the first one but just the tile_id
```

```
31TCJ # Toulouse, France
```

```
32TNS
```



OPERATION EXAMPLES

2. Configuration file (xml):

```
<?xml version="1.0" encoding="UTF-8"?>
<DEM_DOWNLOADER_CONFIGURATION_FILE xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="configuration.xsd">
  <DEM_Option>
    <!-- Collection, Resolution and Elevation Model will determine the server path for the DEM Retrieval-->
    <!-- Default is COP-DEM-90-DGED-->
    <Collection>COP-DEM</Collection>
    <Resolution>90</Resolution>
    <Elevation_Model>DGED</Elevation_Model>
    <!-- Full path to the list of tiles. Tool's input_tiles.txt is used if DEFAULT-->
    <Tiles_Input_File>DEFAULT</Tiles_Input_File>
    <!-- Full path to the Sen2Cor DEM Directory. Tool's output_dir is used if DEFAULT-->
    <DEM_Output_Directory>DEFAULT</DEM_Output_Directory>
  </DEM_Option>
</DEM_DOWNLOADER_CONFIGURATION_FILE>
```

Once the configuration file is filled with the preferred parameters, specify in the prompt the path of the `configuration.xml`:

```
.../cdse_copernicus_dem_downloader.py --config /user/.../configuration.xml
```

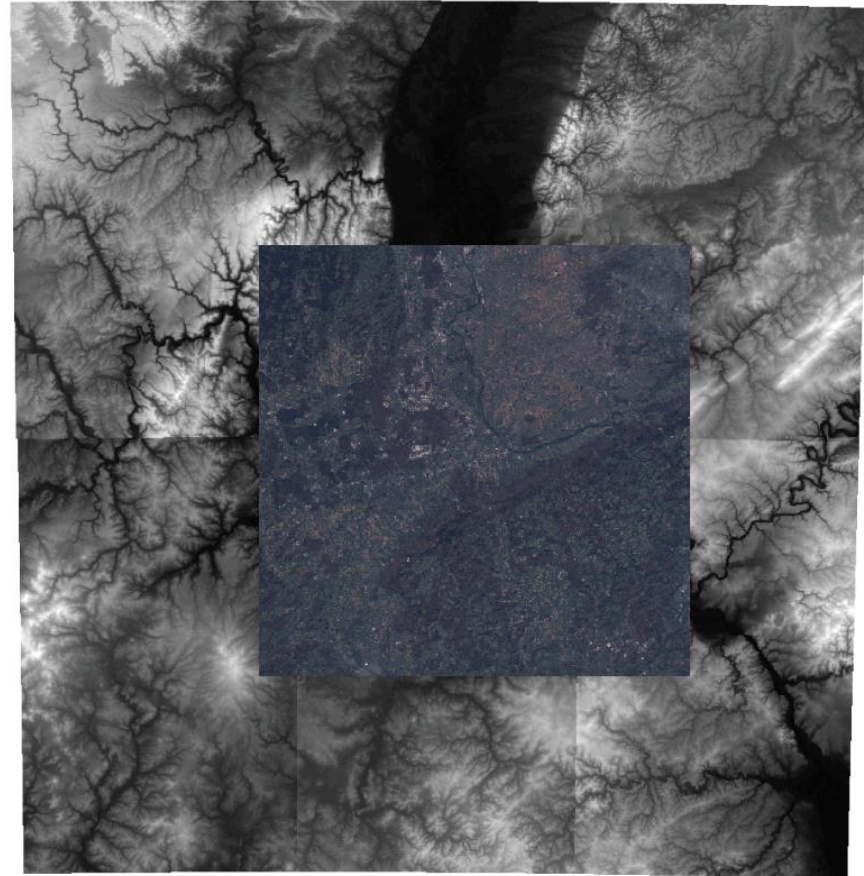

OPERATION EXAMPLES

- PRIORITIES within the command lines:
 - --config has the priority to the other options. If --config is specified within the command line, the other parameters are skipped.
 - If --config is not followed by the path of a configuration.xml file, the default configuration.xml file located in the /configuration directory is used.
 - --t has priority on --i.
 - In case neither --t or --i are specified, the default input_tile.txt located in the /configuration directory is used.

OUTPUT

```
.../cdse_copernicus_dem_downloader.py --m DGED --r 90 --t 32UMA --o /Users/.../Sen2Cor/dem/CopernicusDEM90_DGED
```

- 08/22/2024 08:30:30 AM | INFO CDSE Copernicus DEM Downloader: Copernicus DEM retrieval for Sen2Cor
- 08/22/2024 08:30:30 AM | INFO Version: 1.0 Date: 01-September-2024
- 08/22/2024 08:30:30 AM | INFO <----->
- 08/22/2024 08:30:30 AM | INFO Reading Request from Command Line
- 08/22/2024 08:30:30 AM | INFO Processing 1 Tile(s)
- 08/22/2024 08:30:30 AM | INFO Getting access token
- 08/22/2024 08:30:30 AM | INFO Retrieval of public and private keys
- 08/22/2024 08:30:30 AM | INFO User is known and id and password are retrieved
- 08/22/2024 08:30:30 AM | INFO Start time: 2024-08-22 08:30:30.965152
- 08/22/2024 08:30:30 AM | INFO <----->
- 08/22/2024 08:30:32 AM | INFO Tile_ID: 32UMA
- 08/22/2024 08:30:32 AM | INFO Tile Found
- 08/22/2024 08:30:32 AM | INFO URL for Request created
- 08/22/2024 08:30:32 AM | INFO DEM_LIST from url retrieved
- 08/22/2024 08:30:32 AM | INFO There are 6 DEM files expected
- 08/22/2024 08:30:32 AM | INFO Processing file n 1
- 08/22/2024 08:30:32 AM | INFO Token is still valid, within its 10 minutes period
- 08/22/2024 08:30:34 AM | INFO File 2d5696bc-0c5e-5be4-911a-a033ee0bb32a downloaded
- 08/22/2024 08:30:34 AM | INFO DEM Copernicus_DSM_30_N50_00_E007_00_DEM.tif extracted and stored
- 08/22/2024 08:30:34 AM | INFO Processing file n 2
- 08/22/2024 08:30:34 AM | INFO Token is still valid, within its 10 minutes period
- 08/22/2024 08:30:35 AM | INFO File 656d7355-62d4-51ae-8951-49c5a536f913 downloaded
- 08/22/2024 08:30:35 AM | INFO DEM Copernicus_DSM_30_N50_00_E009_00_DEM.tif extracted and stored
- 08/22/2024 08:30:35 AM | INFO Processing file n 3
- 08/22/2024 08:30:35 AM | INFO Token is still valid, within its 10 minutes period
- 08/22/2024 08:30:37 AM | INFO File f21e8d13-928b-5d18-b0cd-4b2bdfa9051 downloaded
- 08/22/2024 08:30:37 AM | INFO DEM Copernicus_DSM_30_N49_00_E008_00_DEM.tif extracted and stored
- 08/22/2024 08:30:37 AM | INFO Processing file n 4
- 08/22/2024 08:30:37 AM | INFO Token is still valid, within its 10 minutes period
- 08/22/2024 08:30:41 AM | INFO File bd872bbf-0bac-563d-bbea-b520c9e3ab54 downloaded
- 08/22/2024 08:30:41 AM | INFO DEM Copernicus_DSM_30_N50_00_E008_00_DEM.tif extracted and stored
- 08/22/2024 08:30:41 AM | INFO Processing file n 5
- 08/22/2024 08:30:41 AM | INFO Token is still valid, within its 10 minutes period
- 08/22/2024 08:30:43 AM | INFO File f7925d3b-ec53-5b6c-82ae-24577b1d302c downloaded
- 08/22/2024 08:30:43 AM | INFO DEM Copernicus_DSM_30_N49_00_E007_00_DEM.tif extracted and stored
- 08/22/2024 08:30:43 AM | INFO Processing file n 6
- 08/22/2024 08:30:43 AM | INFO Token is still valid, within its 10 minutes period
- 08/22/2024 08:30:48 AM | INFO File 0882fa18-0267-519e-958d-d669dba19787 downloaded
- 08/22/2024 08:30:48 AM | INFO DEM Copernicus_DSM_30_N49_00_E009_00_DEM.tif extracted and stored
- 08/22/2024 08:30:48 AM | INFO Dictionary name:id saved to JSON file
- 08/22/2024 08:30:48 AM | INFO Process is finished



USEFUL LINKS

Useful links for additional information

- Information on the Copernicus Digital Elevation Model:
 - <https://spacedata.copernicus.eu/collections/copernicus-digital-elevation-model>
- Information on the Copernicus DataSpace Ecosystem (CDSE):
 - <https://documentation.dataspace.copernicus.eu/Home.html>
- Information on the APIs services provided by CDSE:
 - <https://documentation.dataspace.copernicus.eu/APIs.html>
- To report bugs, or for further questions, please visit the ESA STEP Forum page dedicated to Sen2Cor:
 - <https://forum.step.esa.int/c/optical-toolbox/sen2cor/>

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