E-PROFILE Programme

E-PROFILE ADDING NEW INSTRUMENTS

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To:	**Meteo-Swiss**
Summary:	**E-PROFILE – ADDING NEW ALC INSTRUMENTS**
Action required:	**For information and comment**
Distribution:	**EUMETNET Members Only**

Reference	Date	Author(s)	Content
Version 1.0	27/01/2017	Myles Turp	First Draft
Version 1.1	30.01.2017	Maxime Hervo	
Version 1.2	31.01.2017	Myles Turp	Update to include additional information provided by Maxime Hervo.
Version 1.3	20.09.2017	Maxime Hervo	Add Wigos identifiers
Version 1.4	05.11.2020	Simone Bircher-Adrot	Update information on WMO nr/ccin_asset_id and Lufft firmware recommendation; delete annexes A1, A2 and A4 and update former annex A3 (now annex A1)

1.0   Site and Instrument Information

The purpose of this document is to describe the information required to add new instruments into the E-PROFILE ALC Hub. This should be treated as a supplement to the E-PROFILE DATA PROCESSING REQUIREMENTS document.

To enable us to process any new instruments we need to record the following information in our database;

Site Information:

a) Site name
b) Location – lat & long and altitude
c) Wigos Identifier
d) Organisation
e) Maintaining Department

Instrument Information:

a) Instrument type
b) Instrument serial number
c) Reporting interval between each message (e.g. 15 minutes, 1 hour)
d) Calibration file(s)

Note: It's possible to have multiple instruments at any given site provided the incoming filenames are unique.

For adding new instruments, please fill the tables 4 and 5 in template provided in Annex A in order to provide all the necessary information

2.0   Data format

2.1   File Name convention

A file naming convention for the incoming data is necessary to minimize the complexity of the file scheduling and to allow a pattern match to link the incoming data to our sites database. The following naming convention should be respected for exchange of data in the E-PROFILE network:

$$NNNNN\_Iyyyymmdd HHMM\_'free\ format'.datatype$$

Where:
NNNNN *= For stations issued prior to July 2016 (WIGOS identifier of type "0-20000-0-XXXXX), the last 5 digits of the WIGOS identifier (corresponding to the WMO Block and Station number) are used. Newer stations do not hold a WMO nr. anymore - a 5 character identifier starting with "99" is allocated by the E-PROFILE hub manager.* ***I*** *= Instrument identifier. Should be A if there is only one instrument on the station. Additional instruments are identified with the letters B, C, D etc.*
yyyymmddHHMM *= The starting date of the observation[1]. Seconds are not included as 5 minutes files are required.*
'free format' *= This could be used for additional information such as site name or instrument number*
datatype *= string indicating whether it is a NetCDF or dat file etc.*

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[1] *The starting time is chosen as a convention as the file is created at the beginning of the observations. This convention is already in used for all Lufft instruments and most CL31 in the E-PROFILE network.*

E.g. The following represents data from a Lufft CHM15k instrument located at Payerne, Switzerland (Wigos identifier 0-20000-0-06610):

<div align="center">06610_A201603110125_CHM15k.nc</div>

For the collocated CL31 the file name is:

<div align="center">06610_B201603110125_CL31.dat</div>

2.2   Test Data

Before a new instrument can be added to our network it's useful to have some test data and will be essential for adding new instrument types. Sample test messages should be provided and tested in our development environment before they can be included as part of our operational network. The process will be co-ordinated by MeteoSwiss (with test data uploaded to Meteoswiss ftp site)

a) The test data should be in format suitable for use in raw2l1 – or suitable data reader should be made available if this is a new instrument type. Any new data readers should be written and made available in the latest release of the raw2l1 software.

Any additional information required for processing the raw instrument data should also be uploaded together with any further comments/considerations which may impact test results. .

3.0   Instrument Configuration

3.1   CHM15k

a. Instrument Set up

It is recommended to install ALC pointing northward and 3° off zenith. This set-up is not mandatory but it was suggested by the COST action ToPROF to minimize solar background and to avoid specular reflexion from ice clouds.

b. Recommended instrument settings

- Message type: native NetCDF File
- Integration time of 15 or 30 seconds

c. Firmware version

CHM15k Nimbus instruments are recommended. Firmware version ≥ 0.747 are recommended. Older firmware version (e.g. 0.5) introduce may lead to significant differences in the signal (e.g. no overlap correction).
Important Note: In Firmware version 1.050 a new NetCDF data format is introduced. In the default setting it stores the range-corrected internally calibrated signal in the variable "beta_att" instead of "beta_raw" as in previous versions. This setting can be changed with the parameter NetcdfMode (available via web interface or RS485 access): NetcdfMode = 1 → using "beta_att", NetcdfMode = 2 → using "beta_raw". Hence, we kindly ask you to please make sure to set NetcdfMode = 2 if you run a firmware version >=1.05.

d. Data format

Five minutes native NetCDF files are recommended.

e. Data transfer

Data can be directly transferred from the instrument using the AFD module. An example of AFD configuration is given in Table 1. Please make sure the correct user and password are used (in red). The password is provided by E-PROFILE network manager. The *exec* command is used to fulfil the E-PROFILE filename convention. As different AFD configurations can be used simultaneously, data can be sent directly to E-PROFILE and to the operators.

```
[directory]
/tmp/afd/netcdf/afd-src

[files]
*

[destination]

[recipient]
ftp://user:password@151.170.240.50/deposit/lidar/

[options]
priority 9
create target dir
exec mv %s `echo '%s' | awk -F'_' '{print $2"_A"$1$4i"_CHM15k.nc"}'`
time */5 * * * *
lock DOT
```

Table 1: Example of AFD configuration for CHM15k instrument

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3.2 CL31 and CL51

a. Instrument Set up

It is recommended to install ALC pointing northward and 3° off zenith. This set-up is not mandatory but it was suggested by the COST action ToPROF to minimize solar background and to avoid specular reflexion from ice clouds.

b. Recommended instrument settings

The following settings should be applied.

- set message profile noise_h2 on
- set message interval 30 (or less)
- set message type msg2_10x770 (or msg1_10x770 and msg2_10x1540 for CL51)

If these settings are not applied, it may lead to significant differences in the signal (cf ToPROF reports).

c. Firmware version

For old electronic board (CLE311) Vaisala recommends the firmware version ≥1.72 and for recent engine boards (CLE321) ≥2.03. Older firmware version introduces artefacts in the aerosol profiles. For CL51 fimware version ≥1.03 is recommended.

d. Data format

To facilitate data processing, it is recommended to concatenate bulletin in 5 minutes files (10 minutes files are also accepted). Each single profile should be separated by a timestamp with the format[2] –*yyyy-mm-sd HH:MM:SS*. Please note that this timestamp refers to a single profile, it is different from the file timestamp. The profile timestamp corresponds to the end time of measurements.

```
-2015-07-01 00:00:07
CL020321
00 ///// ///// ///// 000000000080
 0 /// 0 /// 0 /// 0 /// 0 ///
00100 10 0770 098 +36 075 01 0004 L0016HN15 005
0017d0005800048000480005100004a00047000420004400[...]
a712

-2015-07-01 00:00:22
CL020321
00 ///// ///// ///// 000000000080
 0 /// 0 /// 0 /// 0 /// 0 ///
00100 10 0770 098 +36 075 01 0003 L0016HN15 005
000f8000510004800048000510004b00047000420004300[...]
ee28
[...]
```

Table 2: Example of a CL31 file. The file name must respect the convention above.

Users of CLview software should try to avoid duplication of data transmission. CLview should be adapted to E-PROFILE needs in the future.

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[2] This time stamp format is required to be consistent with Vaisala software CLView

e. Data transfer

If you use a data logger to transfer cloud base height, you might experience troubles to transfer the profile (the profile is a 4000 characters string). The recommended solution is to install an industrial computer between the ceilometer and the logger (for example a Moxa box http://www.moxa.com/product/uc-8100.htm). The industrial computer transfer the cloud base height information to the data logger (msg2_base) and send the full message (msg2_10x770) to the E-PROFILE FTP server.
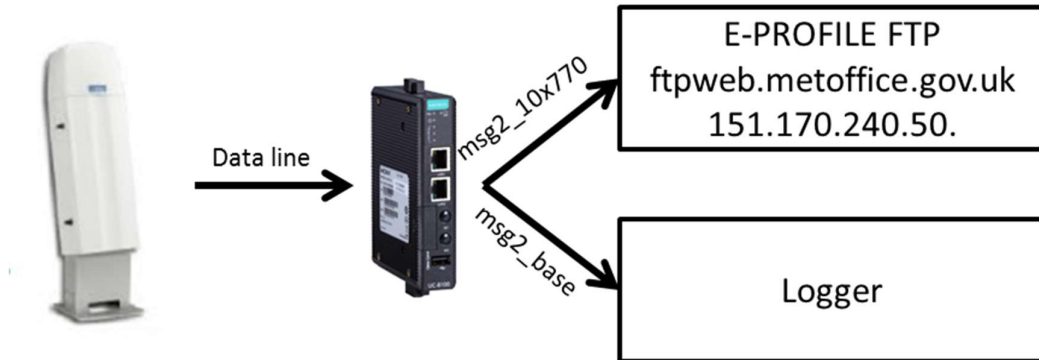

Figure 1: Diagram of data transfer recommende for CL31 and CL51

The main advantages of this configuration are:

- An already existing set-up is not modified.
- The hardware costs for this installation should be below 500€.

More information can be provided on request by the E-PROFILE Network Manager.

3.3 Other instruments

Other commercial or research Lidars shall be integrated in E-PROFILE as well:

- CS135
- Sigma MPL and Mini-MPL
- Sigma
- CIMEL CE-370
- Léosphère RMAN-510
- Raymetrics (LR111-D300)
- …

Recommendations for those instruments are not yet mature and will be included in this document at a later stage.

ANNEX A – TEMPLATE FOR ADDING NEW INSTRUMENTS

Please add the following instrument to E-PROFILE Hub.

All Completed forms should be sent to E-PROFILE Network Manager.

Action: E-PROFILE Hub – Ensure the following instrument is associated with the following network

Network	Schema	Table
hermes_eprofile_alc	*hermes_core_config*	*hecc_networks.ccnw_name*

1) Organisation/Met Service Details

Are you currently sending ALC data to the E-PROFILE Hub?

a) No

    i)   Action E-PROFILE Hub: Request an ftp account for the new organisation.

    ii)   Operators will be supplied with account login details and the new organisation will be entered into Hermes database table below;

Organisation Name
ccor_name

Table 3: organisation name

E.g. Met Office (please provide shorted names or abbreviations for your organisation where appropriate)

*Action E-PROFILE Hub: Add new organisation to schema/table **hermes_core_config.hecc_organisations***

b) **Yes**

    i)   proceed to step 2

2) **New Site Details**

If the site already exists then proceed to step 3.

If your site(s) is **not already holding an instrument contributing data to E-PROFILE** then please add the site details to table below;

SITE DETAILS

Site name	Fixed/mobile*	Latitude (decimal)	Longitude (decimal)	Station Height (m)	Wigos Identifier **	Country	Full site name***
ccsi_name	*ccsi_fixed_location*	*ccsi_lon*	*ccsi_lat*	*ccsi_alt*	*ccsi_attributes*	*ccsi_attributes*	*ccsi_attributes*

Table 4: New site details

Notes:

*Enter 'true' for fixed location – for mobile site enter 'false' and where possible provide additional information on site deployment.
*** *If YOU DO NOT HAVE A WIGOS identifier for your site then this can be co-ordinated through your national WMO*
representative - a list of responsible members can be found here:

https://cpdb.wmo.int/workgroups/view/crm_FP%20OSCAR-surface
https://community.wmo.int/governance/commission-membership/wmo-secretariat/secretariat/national-focal-point-wdqms

***If you have a more detailed site name then this should be entered here, if not leave blank and we will use the name provided in col 1.

*Action E-PROFILE Hub: Add any new sites to schema/table **hermes_core_config.hecc_sites***

3) New Instruments Details

A list of the instrument types currently available can be found in **Annex A1** below;

If your **instrument type is not** in this list then you will need to contact E-PROFILE Network Manager

Please enter the following details for each new instrument;

Site	Instrument ID	Instrument Type	Message Frequency	Organisation	Maintaining Dept.
ccsi_name	ccin_asset_id	ccit_name	ccin_expected_reception_interval	ccor_name	ccin_metadata

Table 5: Instrument details

Notes:

a) **Instrument ID:** This should relate to the first characters of the incoming filename and should be unique for each new instrument.
   i.e. *NNNNN_I*
   Where:
   NNNNN = For stations issued prior to July 2016 (WIGOS identifier of type "0-20000-0-XXXXX), the last 5 digits of the WIGOS identifier (corresponding to the WMO Block and Station number) are used. Newer stations do not hold a WMO nr. anymore - a 5 character identifier starting with "99" is allocated by the E-PROFILE hub manager. I = Instrument identifier (this could be used if multiple instruments exist at one site)
   See 2.2 Filename Convention for full details. – see Site notes for obtaining a suitable Wigos Identifier.

b) **Message Frequency:** This is the time interval expected between each message transmitted to the hub (E-PROFILE recommend 5 minutes)
c) **Instrument_type:** This should be one of the types listed in **Annex A1**.
d) Details of any new organisation site(s) should have already been provided in step 1 and 2.

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e) **Maintaining Department:** We are unable to store names of responsible individuals, instead we ask for the department responsible for the ALC instrument within that organisation.

ADDITIONAL NOTES FOR CHM15k Instruments

In most cases the overlap file calculations will be applied to the incoming raw data as part of the instrument processing. Where this calculation is not supplied or the operator wishes the overlap calculations to be performed by the E-PROFILE Hub will require the following information;

Instrument Device Name: 'CHMnnnnnn' instrument number provided by the manufacturer.
Serial Number of LOM: 'TUBnnnnnn' instrument number provided by the manufacturer.

*The instrument device name and serial number of LOM are only required for some CHM15k instruments (where further overlap corrections need to be applied by the hub). We have introduced a new feature which can extract the overlap from a .cfg file so where applicable The configuration file `.cfg` should also be provided (the information contained in this file will be updated into our database and used to determine the overlap file corrections for that particular instrument).

This can be found in the raw NetCDF output e.g. for Payerne CHM15k instrument:
:device_name = "CHM120106";
:serlom = "TUB140016";

Where such instrument exists in the E-PROFILE ALC Network we will need to be informed of any changes to the LOM so we can continue to ensure that the correct overlap is applied.

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4) Instrument configuration check-list

These following points are not mandatory but are recommended to ensure optimal performances of the instruments.

a. CHM15k

	Name	Description
☐	Recommended settings	• Default settings • 15 or 30 seconds time resolution
☐	Firmware version	≥V0.747
☐	Data format	Native Netcdf file 5 minutes files
☐	Instrument installation	Pointing northward and 3° off zenith

b. CL51 / CL31

	Name	Description
☐	Recommended settings	• profile noise_h2 on • interval 30 (or less) • set message type
☐	Firmware version	≥1.03 / ≥V2.03 (or >=1.72 for CLE311 old engine board)
☐	Data format	Compliant with CL view software
☐	Instrument installation	Pointing northward and 3° off zenith

ANNEX A1: LIST OF VALID INSTRUMENT TYPES

Instrument type	Instrument Description	Comments
ccit_name	ccit_description	
chm15k or chm15kx (note for Hermes network management the term nimbus is used).	Lufft Jenoptik nimbus lidar (see comments on LHS)	All chm15k instruments are given the instrument type 'nimbus' . E-PROFILE strongly recommends firmware version 0.747 or later.
cl31	Vaisala cl31	E-PROFILE strongly recommends ToPROF firmware version (V2.03 or later or >=172 for CLE311 old engine board).
cl51	Vaisala cl51	E-PROFILE strongly recommends ToPROF firmware version (V1.03 or later).
Mini-MPL	SigmaSpace Mini-MPL LIDAR	
chm8k	Lufft	Reader being developed
cs135	Campbell Scientic CS135	Reader existing, data can also be output in CL31 format.
LR111-D300	Raymetrics LR111-D300 LIDAR	Reader has to be developed

Instrument types in 'grey' are not yet part of the E-PROFILE network, but they are planned to be added