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Software status

from 2024-09-01 to 2024-11-30

Introduction

The software status report includes the software modification and reprocessing plan, which explains how new versions of the Blick Software Suite (BSS) are tested and operationally implemented in the network.

In this report it is also included:

- **Figure 1** that shows some statistics regarding the number modifications requested and solved in the reported period.
- A software version changelist, with all the changes applied to every compiled version of the software.
- A notable events section, which gives a summarized overview of the latest improvements that are being tested in the software.

SW modification and reprocessing plan

Background

The freely distributed BSS consists of 3 separate programs:

- Pandora operation software "BlickO"
- Monitoring and filepush Software "BlickF"
- Pandora processing software "BlickP"

BlickO
BlickO reads the Instrument Operation File, connects to the instrument hardware, changes filterwheel positions, moves the tracker, operates the camera, controls the temperature box, takes spectroscopic measurements, saves the raw data, and provides a graphical user interface (GUI) for the user to display current data and operate Pandora.

BlickF
BlickF checks whether the operation software BlickO is running. If necessary, it stops and restarts BlickO or the entire computer. If BlickO is not able to re-establish connection to the instrument, BlickF sends an automated email to the network operator. BlickF also transmits, in addition to the data files, instrument status reports to one or more servers. The Blick Monitoring Tool (BlickM), which is not part of the Blick Software Suite, receives the status information, analyzes and displays this information on the Pandonia Global Network (PGN) webpage, so that instruments not producing any data or producing faulty data are easily detected.

BlickP
BlickP reads the processing setups file <ProcessingSetups.h5>, the instrument operation file and instrument calibration file, reads the raw level 0 (L0) data and converts them into level 1 (L1) data, which are corrected signals, i.e. all instrumental corrections applied on the L0 data. It also creates different types of Level 2 (L2) data (slant column amounts, vertical column amounts, surface concentrations, etc.).

The predecessor of the Blick Software Suite was the Pandora Software Suite, which evolved from v1.0 in February 2009 to the latest version v1.7 in May 2015. The Blick Software Suite started in July 2014 with v1.0. The operational version at project start of POp-1 (29 June 2018) was v1.5.7. The operational version at project start of POp-2 (1 June 2022) was v1.8.33.

These are the main reasons for modification to BSS:

- Bugs in previous versions are corrected.
- Hardware is changed/added, which requires software changes.
- New software (SW)/hardware (HW) recovery procedures are implemented.
- Operating system updates and changes.
- New measurement techniques are added.
- Formats of data files are changed and new output data are created.
- Numerical improvements are applied.
- New algorithms are added.
- Quality flags are modified.

Note that in this document we do not consider it a BSS modification, if additional stations are added to the locations file.

Naming convention of the software versions

The versioning of the BSS has three levels and is written as **"vX.Y.Z"**:

- **X** refers to the programming language. The current version is X=1, which means Python 2.7 is used. Since Python 2 will be discontinued by the end of 2019, we will have to change to another language in the near future. Therefore LuftBlick plans to switch to Python 3, which would then be X=2.
- **Y** is incremented when data formats are changed, even if it is just an additional line in an L2 output file. Higher Y still can process L0 files from lower Y, but usually an increase of Y requires a reprocessing of the data.
- **Z** is incremented whenever a new version of the BSS is finished and compiled, even if this is just for testing purposes.

If a testing version becomes official after a suitable testing period, the version is then renamed to **"vX.Y.Z_official"**

Operational PGN data products are also submitted to the ESA Validation Data Center (EVDC) as netCDF/H5 files, compliant to the Generic Earth Observation Metadata Standard (GEOMS). Updates in the data products (e.g. due to updates in BlickP) therefore need to be propagated to EVDC as well.

Test plan and transfer to operation plan for integration of new BSS versions

This step by step list shows the path from a request for a SW modification to finishing a new operational BSS version with the modification incorporated.

- A SW modification request is added to the issue list of the "Blick" project, of the GitLab software development environment. Such requests are usually made by LuftBlick, but can in principle be made by any Pandora user via email to LuftBlick.
- LuftBlick will evaluate and rank the new request. If the request is "discarded", it means that LuftBlick does not believe that this is a useful modification. If it is "accepted", then a priority label (Low/Medium/High) will be assigned to the modification.
  The general rule to assign the priority labels is "Operation" goes before "Optimization". This means that modifications needed to improve the operation of a Pandora system (e.g. affecting the up-time) are of higher importance than those improving the data processing, e.g. the inclusion of a new algorithm.
- Minor updates, such as the ones affecting the up-time of instruments, will be directly managed and solved by LuftBlick. Important updates or compromised solutions affecting to the data quality, or file formats, will be discussed with ESA before working on them. Such decisions are done in each quarterly progress meeting (PM), but can also be done in between PMs if there is an urgency to do so (e.g. a very important modification affecting the network operation).
- Requested SW modifications, which have been solved by LuftBlick will be set as closed in the GitLab environment, which can be then queried afterwards to know when every issue was closed, and from which compiled version.
- When LuftBlick decides that it is useful to create a new BSS version including all recent updates, it does the steps listed in the following paragraphs. They depend on which part of the BSS is modified.
- If the transfer to operation of a new SW version is successful, LuftBlick uploads the new operational BSS version on the Pandora Global Network (PGN) webpage and moves the previous version into the "Old versions" section of the webpage.

Steps for transfer to operation affecting BlickO and/or BlickF

O1. LuftBlick tests the changes offline, in the BSS simulation mode.

O2. If the test in O1 is successful, LuftBlick creates and compiles a new BSS version.

O3. The new BSS version is tested on one of the Innsbruck units, typically Pandora 110 or 106. Pandora 110 is the default PGN testing unit. Only in the case this unit is not available, then the Pandora 106 will be used.

O4. If the test in O3 is successful, then the same testing version will be installed in a few other instruments (two or three of the ESA instruments). The selection of the other instruments will depend on the type of modification that was done in the software, so that the proper candidates are those instruments for which the modification could help to improve the up-time, or reduce the amount of daily problems. The duration of the testing period will depend on the nature of the modification. For small modifications, the minimum testing period will be of at least 1 week.

O5. If the test in O4 is successful, LuftBlick communicates again with ESA informing about the improvements, and a decision is made, whether this SW version should become official or not.

O6. Upon ESA approval, the entire PGN is switched to the new SW. This work is done by the network operators at LuftBlick and NASA.

O7. LuftBlick communicates to ESA about the outcome of the SW switch to the entire PGN. If the switch did not succeed (e.g. there are some instruments, where the operation works worse than before) those instruments are switched back to the last version and the next steps are discussed with ESA.

Steps for transfer to operation affecting BlickP

P1. LuftBlick tests the SW changes by doing offline processing of affected data products on one Pandora.

P2. If the test in P1 is successful, LuftBlick creates and compiles a new BSS version.

P3. LuftBlick performs offline processing on several (at least 3) more instruments.

P4. LuftBlick compares the results of the new processing with previous data products, if this is possible. If a new data product is created, LuftBlick also compares the output with external data (usually from satellites or other ground based instrumentation).

P5. LuftBlick communicates to ESA the outcome of the new processing at the selected station. ESA decides whether LuftBlick should proceed with applying the new processing to all the network instruments. Such decisions are done in each quarterly progress meeting, but can also be done in between PMs if there is an urgency to do so.

P6. Upon ESA approval, LuftBlick applies the new processing to the entire PGN on an instrument per instrument base. If an instrument has been deployed at several locations, the new processing is applied in an inverse chronological order (that is latest datasets first).

P7. Once the processing of a dataset with the new processor version has been completed, the dataset is made publicly available, parallel to the previous version. As the major and minor versions of BSS are encoded in the L1, L2Fit and L2 filenames, old and new files will be distinguishable.

P8. The operational and live processing for an instrument at the current location is activated and discontinued for the previous processor version.

Steps for transfer to operation affecting EVDC

E1. LuftBlick compiles a new GEOMS data formatting template if existing templates do not fit the content of the processed dataset. Upon approval by EVDC, the template is registered in the so-called "table attribute values" (TAV) database.

E2. The necessary GEOMS metadata for a dataset (e.g. location, affiliations, ...) are cross-checked with EVDC and in case added to the TAV.

E3. The upload of the dataset to EVDC in the defined template with GEOMS metadata is started and communicated to EVDC in advance. The new availability is further forwarded to associated ESA satellite mission performance centers (who perform routine validation).

E4. At EVDC, only one instance of a dataset is publicly available and it is always the dataset with the highest data file version number. This feature is used to overrule datasets on EVDC (e.g. replace a dataset with one from a newer processor version). The mapping between EVDC data file version numbers and PGN processor versions are made available by LuftBlick.

Reprocessing plan

Reprocessing of (parts) of the PGN database is necessary is one of the following reasons:

A. The BSS changes in the X or Y level (version=vX.Y.Z, see section "*Naming convention of the software versions*")

B. An instrument gets a new calibration file, which also affects existing data.

C. A new official retrieval code is added. This is discussed here as well, although it is not a reprocessing in a strict sense.

Reprocessing plan for case A

- This is described in steps P6 to P8 and E3 to E4 of the previous section *"Test plan and transfer to operation plan for integration of new BSS versions"*

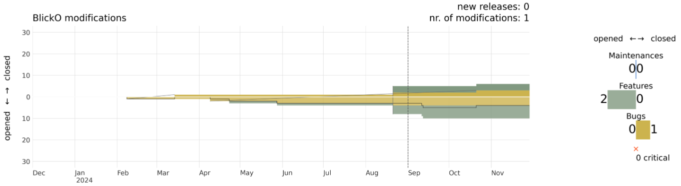
Reprocessing plan for case B

- The existing data for the respective calibration period are moved to a temporary directory.
- The data for the respective calibration period are processed.
- The L2 data of the old and new calibration period are compared.
- If no error in the new processing is detected, the old data are removed from the temporary directory.
- The new data are uploaded to EVDC. By setting a higher file version number, the existing dataset is overwritten.

Reprocessing plan for case C

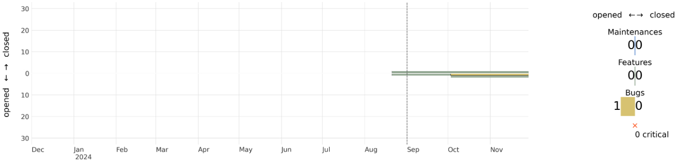
- A request for a new official retrieval code is made. Such requests are usually made by LuftBlick, but can in principle be made by any Pandora user via email to LuftBlick.
- LuftBlick will present the request and the reasons for it to ESA.
- ESA decides whether the request is approved. Such decisions are done in each quarterly progress meeting, but can also be done in between PMs if there is an urgency to do so.
- LuftBlick will process all PGN data with the new retrieval code.
- LuftBlick uploads the new processing setups file on the PGN webpage and removes the previous one.
- LuftBlick informs EVDC and prepares the upload of the new data product to EVDC.
- LuftBlick informs all Pandora users about the availability of a new data product.

Blick modifications



BlickP modifications

nr. of modifications: 0



BlickF modifications

nr. of modifications: 0

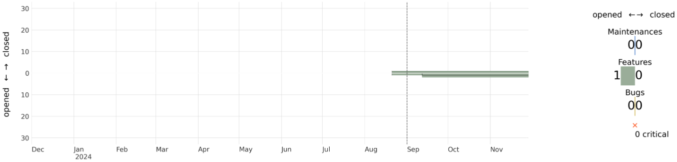


Figure 1

Number of software modifications opened (requested) and closed (solved), for every component of the Blick Software Suite (BlickO/F/P).

The color-coding refers to the software modification type:

- **Maintenance actions**: Used to identify maintenance tasks such as updates in the documentation/manuals, or modifications in the already functional code to make it more readable/efficient/compatible with newer versions of the python modules.
- **Features**: Request of new features (or enhancements)
- **Bugs**: Problems found in the already existing code, that have to be corrected.

Apart from this classification, the software modifications can be marked as "**Critical**", which means that the issue (or the lack of the feature) could potentially interrupt the instrument operation, or generate invalid data (creating exceptions, hangs, stop of operation, or corrupted data) so, it is a problem that has to be solved as soon as possible.

Thin gray lines are drawn from the opened-date to the closing-date for each modification.

The official releases are also marked in the x axis of every plot (with a ⭐), indicating the release date of every official BSS version.

Change list

Here are listed all the software versions that have been compiled and their respective changes since the last two official releases.

Note that only the versions named as 'x.y.z_official' are the ones that have been spread officially in all the network. The rest are trial versions that have only been tested on a few instruments.

v1.8.67:

Release date: 2024-11-27

-BlickO: Added compatibility with TETech1090 (USB) -BlickP: solved bug that prevented GPS lat, long etc. to be propagated into higher level data > L0

v1.8.66:

Release date: 2024-11-08

- BlickO: Corrected bug splash screen not allowing to quit eventually.
- BlickO: Corrected minor wx python bug, created by commit cf252bc5 (only affecting to v1.8.65).
- BlickO: Corrected wrong background color when debug mode is enabled (it must be orange, not red).
- BlickO: Do not delete the last part file of the day at the change-of-day event.

v1.8.65:

Release date: 2024-07-15

- BlickAll: Added a Dockerfile to facilitate the Dockerization/Installation of the BSS in linux (including wx python)
- BlickO: Correction of Horiba signal jump problem after pixel 1045
- BlickO: Updated horiba dll and test script
- BlickP: Removed the wx-python dependency for programs without UI

v1.8.64:

Release date: 2024-06-09

- BlickO: Allow to specify seconds in schedule sequences start&end times.
- BlickO: Do not skip routine sequence when nreps=1 and start time of the last routine of the sequence is less than 1 second passed.
- BlickP: Added missing codes in blick_genprocsetfile, nvt0 and qw10

v1.8.63:

Release date: 2024-05-28

- BlickO: Don't write "Started routine X" commentary into L0 files because it messes up routine count & rep index.
- BlickO: Extra logging lines to show the averaging mode in Horiba spectrometers.

v1.8.61:

Release date: 2024-05-20

- BlickAll: Created README.md for repository.
- BlickAll: blick_figure: expand ToggleYLimits to ToggleAxLimits: switching Y and X-axes between given and optimized values
- BlickO: Added the calibration_library and lab_equipment.h5 to the repository, at /lib/cslib
- BlickO: Added warning to see faulty Horiba temperature readings
- BlickO: Allow right-side blind pixels only in IOF, i.e: "2052 0 4"

v1.8.60:

Release date: 2024-03-14

- BlickO: Corrected L5 routine, in order to have into account the current cycle delay time.
- BlickO: Ensure spec config parameters are set after a spec power lost.
- BlickP: New processing codes added for O2O2 calibration
- BlickP: blick_atmos.py corrected eventual bug while calculating the effective height and temperature for high-latitude instruments
- BlickP: blick_psio.py LPNIR bypass in SLC

v1.8.59:

Release date: 2023-11-23

- BlickAll: Write the software version in the metadata of the setup file
- BlickO: Added option to read left and right blind pixels (Horiba related)
- BlickO: Added some extra LuftBlick TR1 tracker motor alarm codes
- BlickO: Added support to control Horiba spectrometers (CT330 model)
- BlickO: Reorganized oslib folder and deleted old unnecessary files
- BlickO: Select proper leveling in a 2S system depending on which spec is connected

v1.8.58_official:

Release date: 2023-07-28

- BlickF: Updated file push server from lb3 to lb5 (upload.pandonia-global-network.org)
- BlickF: Updated icon, with higher resolution (Avoid dark icons in taskbar).
- BlickF: Updated pass for new lb5 upload server, upload.pandonia-global-network.org
- BlickO: Do not report the instrument external IP in the status lines (not needed anymore).
- BlickO: Updated avantes spectrometer dll v9.8.2 -> v9.14
- BlickO: Updated icon, with higher resolution (Avoid dark icons in taskbar).

v1.8.57:

Release date: 2023-06-26

- BlickP: Changed fus6 noff to from 1 to 0

v1.8.56:

Release date: 2023-06-15

- BlickO: Add a small delay after AVS_StopMeasure() to give time to the spec to be ready for the next measurement.
- BlickO: Added 'MCS' Make Spec Commands debug mode. Corrected wrong calculation ncy (too low s2 ncy in 2S instruments)
- BlickO: Corrected bug in KC routine (newalignline variable does not exist).
- BlickO: Store the spec data arrival events into individual spec queues, and process them in a dedicated thread. (allows parallel cycle-processing now).
- BlickO: avoid calculating the effective cy_delay in each call to calc_measdur.
- BlickO: modified save_events function, to analyze the spec data arrival events.
- BlickO: removed blocking call function from XWndProc. Store the spec data arrival events into a queue, and process it in a side Thread.
- BlickP: Added first official H2O code wvt1 to ProcessingSetups

v1.8.55:

Release date: 2023-05-10

- BlickO: Added new 'CI' debug mode (Check Intensity, for MakeCheckIntensityCommands function).
- BlickO: Changes in MakeCheckIntensityCommands to avoid PanNIR stuck in MO routine.
- BlickO: Do never write detector temp in L2,L3,L6,L7 lab routines (news from develop_19).
- BlickP: Added HCHO retrieval code using OPEN reference fus6.

v1.8.54:

Release date: 2023-04-04

- BlickO: Allow IOF Dual read out electronics -> -1 option, for PanNIR
- BlickO: Do not allow L4,L7 and LA routines to take so long (merged from v1.9 to v1.8)
- BlickO: Order to abort rest of cycles after saturation is now sent once all specs have finished

v1.8.53:

Release date: 2023-03-08

- BlickO: Added 'LPNIR' as an accepted functional filter

v1.8.52:

Release date: 2023-02-21

- BlickO: Corrected minor bug related to the modifications to solve the meas. sync problems in 2S
- BlickO: Deleted unused avantes dll 9.11

v1.8.51:

Release date: 2023-02-20

- BlickO: Added option to plot a specific pixel in the DiagnoseScript()
- BlickO: Added option to saturate dark measurements, in simulation mode.
- BlickO: Solved the out of sync repetitions problem for 2S instruments, while doing SQ. (PanNIR and EVO)
- BlickO: Warn when saturation happens while doing a dark measurement.
- BlickP: Corrected bug in dimension of (empty) tau
- BlickP: Rearranged function wdiffw, so that the linear interpolation (xfus.linint) is only called twice in a "matrix way" instead of many more times applied on a vector. This speeds things up.

v1.8.50_official:

Release date: 2022-12-22

- BlickO: Added TD and FW to the align schedule
- BlickO: Multiple corrections for GlobalSat GPS functionality
- BlickO: Removed exec's from blick_camerecha.py
- BlickO: Removed warning related to 'too many cycles' (PaNIR)
- BlickO: added FW to all std schedules (in the mid-morning/afternoon tests)
- BlickO: corrected avaspec.dll error message description
- BlickO: use true pza's instead of refraction corr pza's to calculate the schedules
- BlickP: H2O added to ProcessingSetups and adjusted product status
- BlickP: Removed exec's from io.combine_data(), and atmos.za_refrcorr(), and blick_genprocsetfile.py
- BlickP: Replace os.rename with shutil.move

Notable events

Notable software modification events, that have happened in the reported period:

v1.8.67:

Release date: 2024-11-27 -BlickO: Added preliminary compatibility with TETech1090 Temperature Controller (USB) -BlickP: solved bug that prevented GPS lat, long etc. to be propagated into higher level data > L0

v1.8.66:

Release date: 2024-11-08

- BlickO: Do not delete the last part file of the day at the change-of-day event.

Summary of compiled software releases in the reported period:

- Number of testing releases: 1
- Number of official releases: 0

About this section

This section of the reporting web tool serves as deliverable D7, D8, D9 and D10 of the ESA project Pandonia Operations 2 (POp-2).

POp-2 is contracted to LuftBlick

LUFTBLICK