Herschel Legacy SW
HCSS - The user's perspective

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Scope

- The Herschel Common Science System (HCSS) is the SW specifically designed to process, visualise and analyse Herschel data
- Over the years, there has been a general effort from both HSC and ICCs to implement and improve the HCSS code in order to facilitate the user's experience, for example:
  - General
    - Generic Cube Spectrum Analysis Toolbox
    - Versatile tasks and scripts allowing reprocessing of products or to correct specific issues
    - Continuous improvements in HCSS GUI (HIPE) usage and appearance
    - Ability to read in data from other missions (e.g. ALMA cubes)

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- HIFI:
  - Correction for fringes in HIFI spectra (heritage from ISO)
  - HifiTool interface to display HIFI spectra with commonly used axes
- SPIRE:
  - Correction of flux calibration for spectra taken on semi-extended emission or suffering from pointing offsets
  - Scripts to reconstruct the beam model and all color correction parameters
- PACS:
  - Correction of flux calibration for spectra taken on semi-extended emission
  - Improvements in several interactive scripts to make them more intuitive and to accept more parameters so increasing the output

The taskforce

- In addition, a taskforce was constituted in February 2016 (lead J. Bakker, coordination D. Coia) to identify and prioritize possible work packages intended to improve the HIPE user's experience in the remaining POPs taking into account constraints such as time and resources
- Idea:
  - Not to lose >15 years of continuous efforts, development, testing
  - Ensuring user-friendliness for interactive use of HIPE
  - Ensuring availability of high quality SW documentation
  - Removing as much as possible Herschel-specific features from HIPE to facilitate its use in other missions as well as overseeing ICCs efforts in the same direction

Starting

- Early March 2016: Call for ideas issued
- March 21st, 2016: Brainstorming meeting including Data Processing team, Instrument Calibration Scientists, some ICC representation, former Herschel developers now working for other missions (Rosetta, ESASky, GAIA)
- Meeting resulted in 28 proposals
- Also:
  - independent efforts have started within the SPIRE ICC to convert some HIPE user scripts into python
  - voluntary activities being carried out in (former) HIFI ICC on HIFI specific tools/scripts

Examples of proposals

- Creating standalone tools for spectral analysis (Spectrum Explorer, Spectrum Fitter) that could be used by e.g. VO, JWST, ALMA
- Developing a tool to restructure Herschel FITS headers to align them with current standards
- Exporting the SPIRE SECT (Semi-Extended source Correction) task
- Exporting SPIRE useful scripts into Python (e.g. FTS footprint plot script, pointing offset correction script)
- Developing a reader for VO table files
- Making HIPE able to read GAIA data files

Current status

- A checkpoint meeting was held on May 18th to assess and prioritize all proposals once the requirements had been put in place
- Three levels of priorities were set during that meeting:
  - The highest priority is given to HIPE related proposals that are considered essentials from a legacy point of view
  - Medium priority is given to proposals that are considered useful from a legacy point of view
  - Low priority is given to all others
- Many of the proposals included also the suggestion to create standalone tools for their respective HIPE counterparts. However, this part of the proposal was seen as having low priority given the resources at hand. Highest importance is given to HIPE improvements
- **Furthermore:** need to discuss asap about the adequate strategy to populate the existing github repository within the department's infrastructure with legacy SW

The proposals

- High priority proposals: these were considered to have a very high impact for the HIPE user either for their uniqueness and/or usefulness and therefore fundamental from a legacy point of view
  - Improvements in the Spectrum Explorer, which is widely recognized as a unique tool for the spectral analysis inside and outside of Herschel
  - Developing a tool to restructure the FITS headers of Herschel products to align them with standard headers
  - Developing a script to improve the astrometry for warm Beta angle problems

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- Medium priority proposals: these were considered as nice to have and should be implemented, but of somewhat slightly lower importance w.r.t the high priority proposals
  - Improvements in pacsExtendedtoPointCorrection and point source correction tasks to make them more user friendly
  - Improvements in specInterpolate task to make it more user friendly
  - Creating a writer for VO table XML files

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- Low priority proposals: low priority is given to proposals not necessarily strictly related to HIPE users (so no further efforts to reach out to other missions) or that are considered nice to have but do not have a very big impact e.g.:
  - Footprint PACS spectrometer viewer
  - Converting SPIRE useful scripts into Python (being carried on mostly in SPIRE ICC)
  - Exporting the SPIRE SECT (Semi-Extended source Correction) task into python
  - De-Herschelise the documentation
  - Developing editors for XML and HTML
  - Enable plugins to incorporate their own documentation
  - Developing a reader for VO table files
- **Note:** low priority proposals are unlikely to be implemented with the current resources.

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- Proposals rejected: two proposals were rejected as either not feasible or not strictly useful for HIPE users
  - Select and modularize utilities from the HCSS code that could be reused in other Java projects
  - Enabling HIPE to read GAIA data files

Organization of work

- Workflow:
  - For HIPE related improvements:
    - Proposals are being progressively included in Data Processing scrum meetings of 2-3 weeks duration for integration in HIPE 15 when applicable (i.e. modules in the hand of DP developers)
  - All others (e.g. exporting HIPE scripts into python)
    - Progress will be followed with the help of Instrument Calibration Scientists

But…

- ISSUES:
  - Time:
    - HIPE 15 is the last version, scheduled to be released to the community in December, so all HIPE related changes need to be integrated and tested before then
  - Manpower:
    - HSC: DP developers only available until December and only partly as they are already being absorbed by other missions
    - ICCs: development work already phasing out or terminated

      -> residual work is being done on a voluntary basis

- Some of the proposals (e.g. spectral toolboxes) could be of interest to ESASky

  -> possible collaboration with that team to develop the tool?