The BepiColombo Archive Core System (BACS)

A. Macfarlane*, P. Osuna*, F. Pérez-López, J. C. Vallejo**, S. Martinez**, C. Arviset*, M. Casale****

** ESA Science Archives and Virtual Observatory Team (SAT),*
***BepiColombo MPO Science Ground Segment (SGS),*
European Space Astronomy Centre (ESAC), Madrid, Spain

Abstract

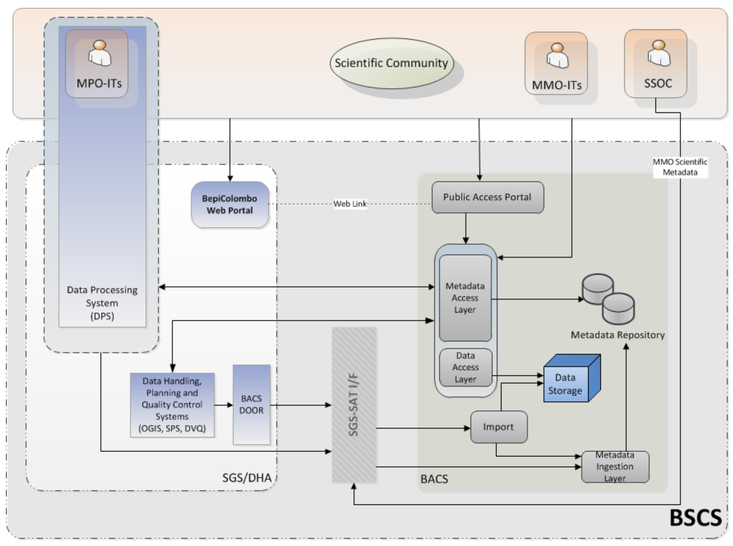
*The BepiColombo Archive Core System (**BACS**) will act as the central archive for the BepiColombo MPO science operations, storing both operational and science data, in addition to acting as the long-term archive. The BACS will be a key component within the BepiColombo Science Operations Control System (**BSCS**) through which all operational data would be exchanged between the different BSCS subsystems and the MPO Instrument Teams. BACS will also be one of the first of ESA's science archives to provide PDS4 data. This paper provides an overview of the concept and design of the BACS and how it integrates into the science ground segment workflow.*

Introduction

BepiColombo is an interdisciplinary ESA & JAXA mission to explore the planet Mercury. The mission consists of two separate Mercury orbiters: ESA's Mercury Planetary Orbiter (MPO) and JAXA's Mercury Magnetospheric Orbiter (MMO), which are dedicated to the detailed study of the planet and its magnetosphere. The MPO scientific payload comprises 11 instruments covering different scientific disciplines developed by several European teams.

Operational Archive

The MPO science operations and the BSCS are being prepared by the Science Ground Segment (SGS), based at ESAC. The BSCS consists of a number of core subsystems designed to cover the needs of the SGS and the MPO Instrument Teams in terms of operations planning, data handling and archiving.



The role of the BACS as a subsystem of the BSCS is to act as a central distribution system and to facilitate the information exchange of data and metadata between the core subsystems of the BSCS as well as with the MPO Instrument Teams.

The development of the BACS is driven by the requirements of the users and the needs of the BSCS interface. As a key component of the BSCS, development has already started in the early phases of the mission and will proceed in-line with the development of the BSCS such that it will be fully operational at Launch (2016).

The design of the BACS allows for an incremental implementation of the requirments over time as some functionality will not be needed until arrival at Mercury (2024).

A well defined interface is in place between the BACS and the BSCS which allows the BACS to operate as a separate module. To facilitate this interface, a common data model is shared between the two systems based on a concept of data item types. The modular nature provided by the data model allows for additional data item types to be added easily to the existing structure.

Long Term Archive

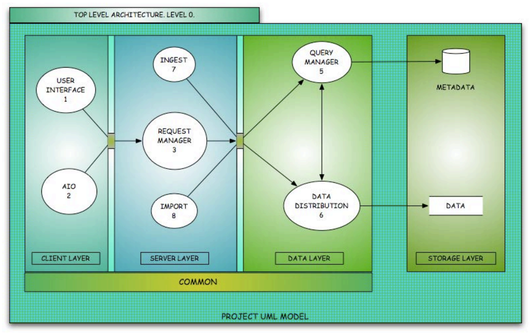
In the long term, the other key role of the BACS is to act as the legacy archive for the science data and to provide access to this data to the public scientific community.

The BACS will be one of the first of the ESA science archives to provide PDS4 data. Ultimately interoperability will be provided between the BACS and the Planetary Science Archive (PSA) also developed by the ESA SAT to enable the retrieval and visualisation of the BepiColombo science data from the PSA.

Within the larger context the BACS will form one part of a global BepiColombo Archive, which is an international collaboration between ESA and JAXA.

Architectural Design

The design of the BACS follows the latest generation of archives being developed by the Science Archives and VO Team (SAT) based at ESAC, taking full advantage of the existing knowledge, expertise and code.

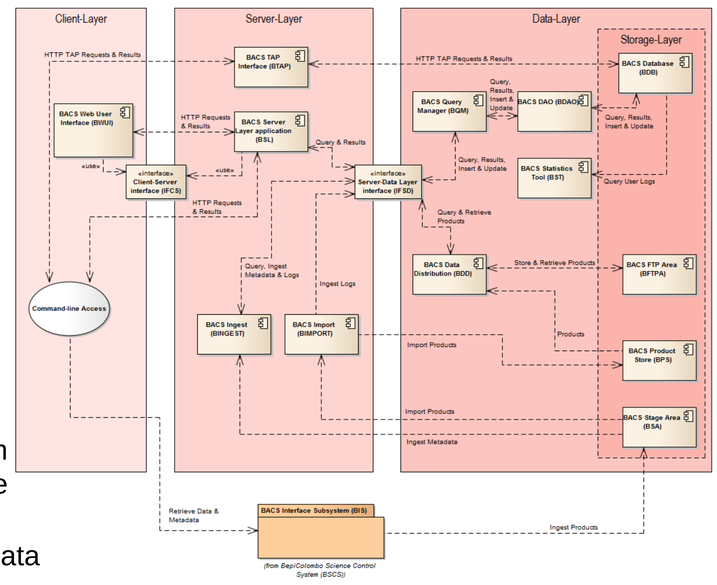


The BACS builds on top of the SAT's common Archives Building System Infrastructure (ABSI), which defines the components common to all the current ESA Science Archives within a three-tier modular architecture.

Each layer is built up of several components with specific tasks to do which communicate through given interfaces. This modular approach allows the internal technologies to be upgraded without affecting the need to overhaul other parts of the archive.

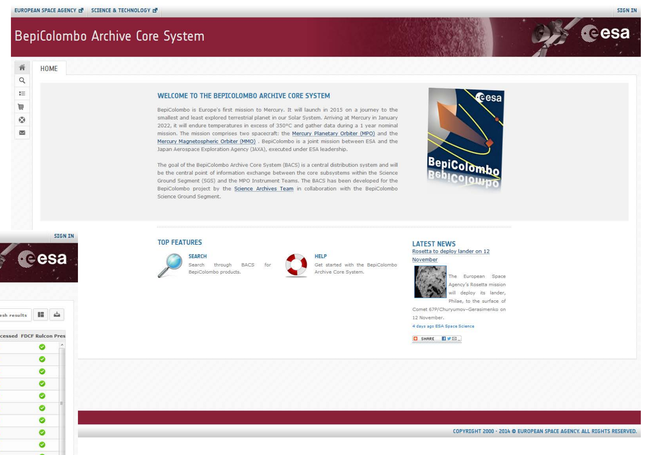
Data (+ Storage) Layer

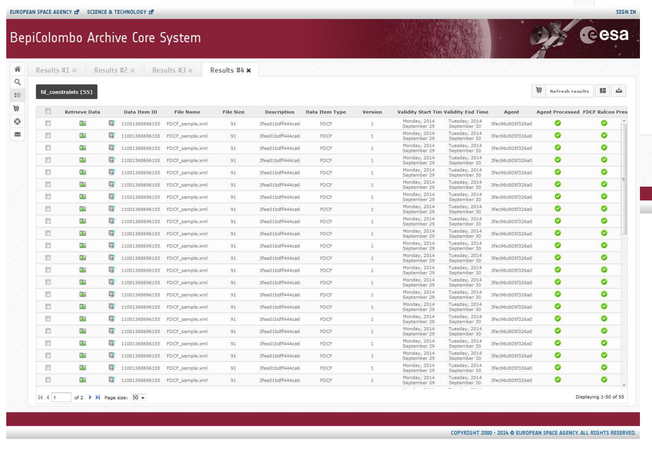
- Handles the physical storage of data and metadata
- Provides secure FTP access to the data
- Processes incoming queries from the sever layer for retrieving data and metadata.
- Handles access to proprietary data



Server Layer

- Handles HTTP requests from clients to query and retrieve data
- Handles the ingestion of data delivered by the BSCS
- Provides an interface based on the VO standard Table Access Protocol (TAP)
- Provides a Planetary Data Access Protocol (PDAP) interface





Client Layer

- Provides a Thin-Layer web-based application to facilitate queries to the archive

References

1. Arviset, C. et al, "Long-term Strategy for ESA Science Archives" , ADASS 2013
2. Pérez-López, F. et al, "*Framework for the integration of multi-instrument pipelines in the BepiColombo Science Operations Control System*", P2.5, ADASS 2014
3. Vallejo, J. C. et al, "*Flexible and Modular Design for the BepiColombo Science Operations Control System*", P2.10, ADASS 2014
4. Gill, R., at al, "*BepiColombo Science Ground Segment Requirements Management and more with native JIRA*", P8.7, ADASS 2014

Conclusions

- The BACS will provide the central repository through which operational data can be exchanged between the BSCS subsystems and the MPO Instrument Teams.
- The modular approach of the data model and the architecture allow for the archive functionality to be incremented throughout the lifetime of the BepiColombo mission.
- In the long term the BACS shall host the archive for MPO science and provide interoperability with the Planetary Science Archive and the science data from JAXA's BepiColombo Archive.

Contact Info

Alan J. Macfarlane
Phone: +34 91 8131 472
Alan.Macfarlane@esa.int

serco for esa

European Space Astronomy Center (ESAC),
P.O. Box 78, 28691
Villanueva de la Cañada, Madrid, Spain