SUBJECT:	SPIRE ICC Operations Centre Infrastructure Requirements
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TABLE OF CONTENTS

FIGURES

TABLES

Glossary

1. INTRODUCTION

SPIRE is an instrument forming part of the payload of ESA's Herschel satellite. As provider of the instrument, the SPIRE consortium is required to provide an Instrument Control Centre for the Operations Phase which is responsible for:

(i)   maintaining the health and safety of the instrument and continuously monitoring its operation and performance in order to identify possible future problems;

(ii) optimising the scientific quality of the data produced for the users of SPIRE and Herschel by monitoring the scientific data products and updating the observing modes and data processing software, as necessary;

(iii) supporting the Herschel Science Centre's activities and liaison with Herschel users by providing expert advice and answers to technical queries.

The first of these activities will be carried out under the control of the SPIRE Operations Team based at the SPIRE Operations Centre (SPOC), located at RAL. This centre forms the single formal point of contact between the ICC and the Hercehl Science Centre (HSC), at ESAC, and the Mission Operations Centre (MOC), at ESOC, for deliveries of software, data files and other information identified in the ICC/HSC and ICC/MOC interface documents. Because of this all the daily activities requiring access to real-time data or to software systems in the Herschel Science Centre (HSC), for example for input of calibration or engineering observations, shall be carried out at the SPOC. In addition, the testing and delivery of new software and/or calibration data shall be handled through the SPOC.

The second activity will include monitoring and reviewing the instrument performance and calibration status and the quality of its scientific products, identifying and investigating processing imperfections, anomalies and effects, determining solutions and implementing them in terms of improved observations and data processing software. It will be carried out jointly by the ICC Data Processing and Science Analysis Software (DAPSAS) Centres (located at ICSTM, CEA and Lethbridge), with significant support and participation by other major SPIRE hardware groups - these are: LAM Marseille (FTS hardware behaviour and low-level FTS data processing), IFSI Rome (OBS maintenance), Cardiff University (detector and filter expertise, instrument photometric modelling and simulation, absolute calibration, FTS data processing expertise) and IPAC (Interactive Analysis and scientific data processing software support).

The third activity will be channelled through the SPOC, but will involve participation by the instrument experts in various SPIRE institutes, especially the ones mentioned above.

1.1 Scope

This note defines the requirements on the infrastructure to be located at RAL in order to carry out these activities, during the commissioning, verification and operational phases of the mission and in the pre-launch development phases.

1.2 Structure of Document

Section 2 defines the infrastructure requirements, including the accommodation requirements (office space and meeting rooms), apart from the computer systems to be provided for data storage and data processing, which are defined in Section 3. Section 4 covers the additional (test) facilities required during the mission.

Project Document

SPIRE ICC Operations Centre
Infrastructure Requirements

Ref: SPIRE-DOC-RAL-002889
Issue: Issue 1.0
Date: 10th May 2007
Page: 8 of 13

1.3 Documents

1.3.1 Applicable Documents

1.3.2 Reference Documents

RD01   HSGS Communication RRF Report, HERSCHEL/HSC/REP/0695, Issue 1.0

2. INFRASTRUCTURE REQUIREMENTS

2.1 General Requirements

SPOC-GEN-010	The SPOC shall be operational from the date of the GSRR to the end of the mission post operations phase. *This lasts approximately from Launch – 6 months to end of satellite cryogen + 6 months*
SPOC-GEN-020	The SPOC shall provide a central colour laser printer, scanner and other facilities for documentation handling
SPOC-GEN-030	There shall be a project office to support • Travel requests • Visitor support for accommodation, travel requests • Meeting organisation
SPOC-GEN-040	There shall be a meeting room, available at all times, able to take up to 20 persons in 'boardroom' style
SPOC-GEN-050	The meeting room shall have the following facilities: • Display (projector or large TV screen) for display of PC output • Video conferencing facility • Telephone, with speaker and microphone for teleconferences • Wireless access to RAL and visitors networks (possibly a SPIRE network also) • Mains power supplied at the table (both UK and European sockets)

## 2.2 Accommodation Requirements

SPOC-ACC-010	The SPOC shall support the RAL-based SPOC Operational staff with Office space, a computer workstation, telephone and internet connectivity *This team consists of 6 RAL staff plus up to 4 co-located visitors. Internet access will be through the RAL internal network*
SPOC-ACC-020	The SPOC shall support up to 6 visitors with table space, internet access and telephones *It is assumed that visitors will bring their own computer equipment. Internet access will be through the RAL 'visitors' network*

3. COMPUTING HARDWARE REQUIREMENTS

Computing facilities will be provided for use by the ICC operational teams to carry out their functions during the operational phases of the Herschel mission. The following general system architecture is envisaged for the purpose of defining requirements:

The SPIRE ICC Operational database contains a copy of the SPIRE and S/C associated TM data as received from the satellite, plus other SPIRE related data such as command history and OOL data. The data is transferred from the Herschel Operational Database (HOD) using the propagation mechanism of the Versant database system, which keeps the two databases identical (except that the HOD contains the data from the three instruments).

This transfer mechanism is one way only, from the HOD to the SIOD.
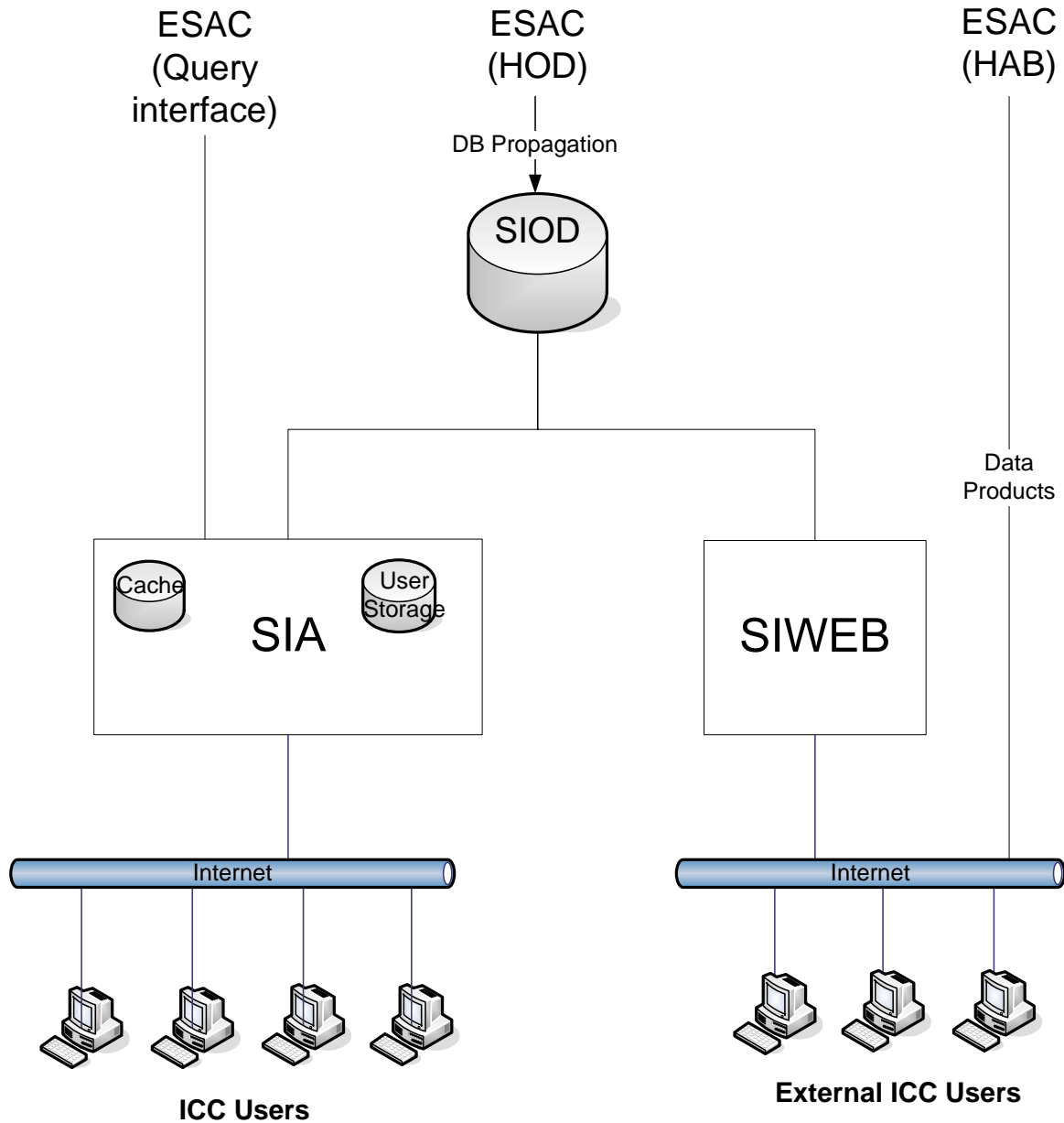
ICC members not located in the SPOC access the data in the SIOD through a web server (SIWEB), which is able to query the SIOD and return the data selected. These users may also access data products directly from ESAC using the Herschel Archive Browser (HAB). All processing of the data is carried out at the users own site and using their computing resources.

Users located at the SPOC may use the same access methods as the external users but also may use the SPIRE Interactive Analysis system to query the SIOD directly or to query the Herschel archive. The SIA provides sufficient computer power to perform batch processing of many observations or long time ranges.

Project Document

SPIRE ICC Operations Centre
Infrastructure Requirements

Ref: **SPIRE-DOC-RAL-002889**
Issue: **Issue 1.0**
Date: **10th May 2007**
Page: 11 of 13

The input data may be cached so that repeated requests for the same data do not make require repeated data transfers from ESAC to the ICC. The size of the cache is TBD, but it may contain the complete set of SPIRE products produced by the HSC

3.1 SPIRE ICC Operational Database (SIOD)

SPOC-COM-110	There shall be a SPIRE ICC Operational Database (SIOD) holding all of the SPIRE telemetry for the mission *This system runs a (Versant) database which will receive, through the propagation mechanism of Versant a copy of all of the SPIRE data received from the instrument, selected data from spacecraft and other instruments, and uplink information*
SPOC-COM-110	The SIOD shall interface to the HSC through an ADSL link provided by ESA *This works through a direct link into the HSC and is, in effect, part of the HSC network (a set of IP addresses has been provided)*
SPOC-COM-120	The SIOD shall be protected (by a firewall) from the general RAL network
SPOC-COM-130	The SIOD shall run the Versant Object Oriented Database software.
SPOC-COM-140	The SIOD shall be capable of holding the entire SPIRE database and selected data from other instruments and the Herschel satellite, with margin. *The size of this database is estimated to be 2.3TBytes (RD01)*
SPOC-COM-150	The SOID database shall be capable of being backed up to a remote store, regularly *This shall be daily, TBC*

3.2 SPIRE ICC Web Server (SIWEB)

SPOC-COM-200	The SIWEB shall provide a web interface to the SIOD for simple database queries for clients internal or external to the SPOC
SPOC-COM-210	The SIWEB shall be able to handle up to 50 simultaneous connections

3.3 SPIRE ICC Analysis (SIA)

SPOC-COM-300	There shall be a (SIA) facility provided for the SPIRE ICC personnel to process instrument data as part of their daily tasks
SPOC-COM-310	The SIA shall allow simultaneous data analysis and processing for at least 12 users *It should be expandable at a later stage up, if necessary, to 20 users*
SPOC-COM-320	The SIA shall provide resources to each user to execute the SPIRE Pipeline interactively and perform data analysis. *This requires running a copy of the Herschel Common Science System (HCSS). As a minimum this will require per user:* • *5Gbyte RAM* • *100 GByte disk space*

Project Document

SPIRE ICC Operations Centre
Infrastructure Requirements

Ref: **SPIRE-DOC-RAL-002889**
Issue: **Issue 1.0**
Date: **10th May 2007**
Page: 12 of 13

SPOC-COM-330	The SIA shall be easily upgradeable post-implementation to provide at least double the resources given above
SPOC-COM-340	The SIA shall provide the following software for each user • Herschel HCSS • Java • IDL • Office Productivity Tools (word processor, spreadsheet) • Fortran/C/C++ compilers, TBC • Web browser
SPOC-COM-350	It shall be possible from the SIA for RAL employees to store and access data on the SPIRE project disk
SPOC-COM-360	The SIA shall provide for querying the Herschel archive for products
SPOC-COM-370	The SIA shall provide a caching mechanism such that products requested from the Herschel archive shall be provided from the cache in the first place. *Cache size is TBD, but ~1TByte would probably be adequate (RD01)* *In the event that all the products are required to be stored at the SPOC, the size o fthis storage area would increase to ~10TByte (RD01)*

3.4 Maintenance

Being operational machines, they shall be maintained throughout the Operational Phase of the ICC. For the purposes of this section the Operational Phase can be split into the following parts (dates TBC):
- Ready Phase starts following implementation of the system and continues until Ground Segment Readiness
- Training Phase starts with Ground Segment Readiness (Q1, 2008)and continues until Launch
- Verification Phase starts following launch (Q3, 2008) and continues until routine operations starts
- Routine Phase starts (L + 1year) and continues to He loss + 3 months (~L + 4years)

SPOC-COM-400	The maximum time of unavailability of systems shall be

System	Ready Phase	Training Phase	Verification Phase	Routine Phase
SIOD	3 days	24 hours	<5 hours	24 hours
SIWEB	3 days	3 days	3 days	3 days
SIA	3 days	24 hours	< 5 hours	24 hours

SPOC-COM-410	The disk(s) of the SIOD shall be backed up to remote storage daily
SPOC-COM-420	The disk(s) of the SIA shall be backed up to remote storage daily

4. TEST FACILITIES

SPOC-FAC-010	There shall be a facility to operate the Flight Spare instrument at regular intervals *This is required to support test of OBS change, verification of new operational modes, validation of new AOTs, investigation of instrument anomalies*
SPOC-FAC-020	There shall be a facility to operate an AVM model of the instrument at regular intervals *This is required to support test of OBS change, verification of new operational modes, validation of new AOTs etc*

Project Document

SPIRE ICC Operations Centre
Infrastructure Requirements

Ref:	SPIRE-DOC-RAL-002889
Issue:	Issue 1.0
Date:	10th May 2007
Page:	13 of 13