




 <p>Doc. No.: SGD-SSR-RAL-TN-004-1.1-D</p>
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SURVEY OF SOLAR SYSTEM RESEARCH FACILITIES

	<i>Name</i>	<i>Date</i>	<i>Signature</i>
<i>Prepared by :</i>	C. Perry (RAL)	10/05/2002	
<i>Reviewed by :</i>	C. Perry (RAL)	10/05/2002	
<i>Approved by :</i>	S. Beco (DATAMAT)	10/05/2002	
<i>Accepted by:</i>	Gerhard Kreiner (ESA) Pier Giorgio Marchetti (ESA)		

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Document Status Sheet

<i>Issue</i>	<i>Date</i>	<i>Details</i>
1.0-D	05/04/2001	First Draft
1.1-D	10/05/2002	Updated draft after URR

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Document Change Record

<i>Issue</i>	<i>RID No.</i>	<i>Details</i>
1.1	UR-SYS-SB-001	Page 1: "Accepted by:" field added and other fields re-organised to take account of this.
1.1	UR-SYS-SB-002	Page 2: Distribution list updated.







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1. INTRODUCTION

The aim of SpaceGRID in the Solar System Research (SSR) domain is to remove the barriers that currently limit the efficient analysis of distributed data by providing a framework for uniform access to, and manipulation of, local and distributed data sources. The SpaceGRID should not only endeavour to enable research that could not be done before. It should also facilitate analyses that up to now have been very difficult, but not impossible, by reason of data or information inaccessibility, or have only been possible by a chosen few by reason of resource limitations. The SSR part of SpaceGRID is, therefore, not only about handling large amounts of data or providing large scale high performance computing, but is equally about facilitating the handling of small but complex and diverse amounts of data. In the short-term the federation of existing SSR resources will result in improved and faster science return. Longer-term SpaceGRID will encourage the standardisation of design, promoting re-use of analysis systems, long-term security of data and reduced overall cost.

1.1 PURPOSE OF THE DOCUMENT

Task 5 of [SPCGRD-SOW] called on the SpaceGRID consortium to establish the requirements, assess the benefits and evaluate the implementation options for ESA development of a collaborative data analysis system for the Solar System Research community. The purpose of this document is to provide details of the existing and planned SSR facilities identified during the user requirements analysis.

1.2 DEFINITION, ACRONYMS AND ABBREVIATIONS

1.2.1 Acronyms

API	Application Programming Interface
CDF	Common Data Format
CD-ROM	Compact Disc – Read Only Memory
DBMS	Data Base Management System
ESA	European Space Agency
ESTEC	ESA Technology Centre
EU	European Union
FITS	Flexible Image Transport System
FTP	File Transfer Protocol
HPC	High Performance Computing
IDL	Interactive Data Language
ISTP	International Solar Terrestrial Physics
OGSA	Open Grid Service Architecture
OODT	Object Oriented Data Technology
PDS	Planetary Data System
RAID	Redundant Array of Independent Disks
RAL	Rutherford Appleton Laboratory
SCT	Special Conditions of Tender
SCSI	Small Computer Systems Interface
SOW	Statement Of Work
SP	Small Projects
SPCGRD	SpaceGRID

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SSL	Science Systems Limited
SSR	Solar System Research
STP	Solar Terrestrial Physics
STPDF	STP Data Facility
UK	United Kingdom
US/USA	United States
WP	Work Package
WWW	World Wide Web
XDF	eXtensible Data Format
XML	eXtensible Markup Language

1.3 REFERENCES

1.3.1 Applicable Documents

- [SPCGRD-SCT] AO/1-3863/01/I-LG, Invitation To Tender – Study of GRIDS and Collaborative Environments for Space Application – Appendix 3 – Special Conditions of Tender
- [SPCGRD -SOW] AO/1-3863/01/I-LG, Invitation To Tender – Study of GRIDS and Collaborative Environments for Space Application – Appendix 1 - Statement of Work
- [SPCGRD-PROP] P-A876/USA/PT-656-01, Is. 1.1, Proposal for “Study of GRIDS and Collaborative Environments for Space Application (SpaceGRID)”
- [PSS5-SP] BSSC(96)2 Issue 1, Guide to applying the ESA software engineering standards to small software projects

1.3.2 Reference Documents

- [GRID] I. Foster and C. Kesselman, Eds., The GRID Blueprint for a New Computing Infrastructure, Morgan Kaufmann, 1999
- [OGSA] <http://www.globus.org/ogsa>
- [SPCGRD-URSR] Solar System Research User Requirements Document, SGD-SSR-RAL-REQ-001, April 2002.

1.4 OVERVIEW OF THE DOCUMENT

The structure of this document is as follows.

- Section 2 provides details on a set of currently accessible, online, SSR facilities.
- Section 3 provides information on several planned facilities.

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2. CURRENT SSR FACILITIES

This section provides brief details on the 50, online, SSR facilities highlighted in the user requirements analysis document [SPCRGD-URSR]. Most of the facilities listed in the 113 responses to SpaceGRID questionnaire have been included. These include most of the larger archives and a selection of the smaller facilities that only provide data from one or two instruments. The information on each site includes the missions supported, the main data formats that can be accessed, the facilities provided and the types of query that can be used via the online interface. Where known, any existing participation in GRID or related activities has been noted.

Title: ACE Science Data Center
Country: US
Sub-Domain: STP
URL: <http://www.srl.caltech.edu/ACE/ASC/>
Mission(s): ACE/all inst.
Formats: HDF
Facilities: Browse plots & data, Level 2 plots & data, Documentation
Query Type: Time
Access: Public
Comments: Data also passed to NSSDC for long term archive
GRID:

Title: AstroWeb: Solar Telescopes
Country: France
Sub-Domain: Solar
URL: <http://cdsweb.u-strasbg.fr/astroweb/solar.html>
Mission(s): Various
Formats: n/a
Facilities: List of links to about a 100 online solar resources
Query Type: n/a
Access: Public
Comments: Hosted by Centre de Données astronomiques de Strasbourg
GRID: AVO

Title: BASS 2000
Country: France
Sub-Domain: Solar
URL: http://bass2000.bagn.obs-mip.fr/New2001/pagef_ang.html
Mission(s): Various groundbased
Formats: GIFs, FITS
Facilities: Search, survey plots, data download
Query Type: Varies with data set, some or all of time, wavelength, coordinates, objects, instruments
Access: Public
Comments: Access to various French ground based solar observations
GRID: EGSO

Title: Centre de Données de la Physique des Plasmas
Country: France
Sub-Domain: STP
URL: <http://cdpp.cesr.fr/english/index.html>
Mission(s): Various space and groundbased STP
Formats: Quicklook plots, data files etc

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Facilities: Search, quicklook, data download
Query Type: Synoptic table, mission/experiment/dataset, list of datasets, time/keywords
Access: Public & Restricted
Comments: Major European STP archive, international work on query and data interoperability
GRID: SPASE

Title: Cluster Ground Based Data Centre
Country: UK
Sub-Domain: STP
URL: <http://wdcc1.bnsc.rl.ac.uk/cgi-bin/gbdc/summary.pl>
Mission(s): Various STP groundbased
Formats: GIFs
Facilities: Survey plot browser, auroral index
Query Type: Selection of a date
Access: Public
Comments: Displays 24 hour summary plots from other sites, resized to common scale
GRID:

Title: Cluster Science Data System
Country: ESA
Sub-Domain: STP
URL: <http://sci2.estec.esa.nl/cluster/csds/csds.html>
Mission(s): Cluster (survey data)
Formats: CDF, GIFs
Facilities: Search, quicklook, data download
Query Type: Time, instrument
Access: Public & Restricted
Comments: 8 data centres (1 US, 1 China), 1 mirror site at ESTEC/ESA (ESA)
GRID: (CSDS is a data distributed system)

Title: Coordinated Data Analysis Web
Country: US
Sub-Domain: STP
URL: <http://cdaweb.gsfc.nasa.gov/>
Mission(s): Most ISTP
Formats: CDF, GIFs
Facilities: Search, quicklook, data download
Query Type: Time, instrument
Access: Public & Restricted
Comments: (US, plus UK & Germany in Europe)
GRID:

Title: EISCAT data base
Country: UK
Sub-Domain: STP
URL: <http://www.eiscat.rl.ac.uk/>
Mission(s): EISCAT Radar
Formats: NCAR, GUP
Facilities: Data, tools
Query Type: Catalogue of observations
Access: Restricted
Comments: Common programme data should be available to European researchers. CP data also available from CDPP (see above)
GRID:

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Title: STARE data base
Country: Finland
Sub-Domain: STP
URL: <http://www.geo.fmi.fi/PLASMA/RADAR/STARE/>
Mission(s): STARE Radar
Formats: png, HDF
Facilities: Quicklook, download of analysed data (restricted)
Query Type: Date
Access: Public & Restricted
Comments:
GRID:

Title: HAO/MLSO coronagraph
Country: US
Sub-Domain: Solar/STP
URL: <http://www.hao.ucar.edu/>
Mission(s): Various
Formats: CEDAR
Facilities: Query, Catalogues, plots
Query Type:
Access: Restricted
Comments: Coupling, Energetics and Dynamics of Atmospheric Regions
GRID:

Title: HESSI Data Centre
Country: US
Sub-Domain: Solar
URL: <http://hesperia.gsfc.nasa.gov/hessidatcenter/>
Mission(s): HESSI
Formats: FITS
Facilities: Survey plots, download data
Query Type: Navigate directory structure
Access: Public
Comments:
GRID: EGSO

Title: IMAGE data center
Country: US
Sub-Domain: STP
URL: http://150.144.211.77/image/image_main.html
Mission(s): IMAGE
Formats: UDF, CDF, Plot files
Facilities: Quicklook plots, download data
Query Type: Time, Instrument
Access: Public
Comments: Imager for Magnetopause to Auroral Global Exploration
GRID:

Title: IMAGE magnetometers
Country: Finland
Sub-Domain: STP
URL: <http://www.geo.fmi.fi/image/>

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Mission(s): IMAGE magnetometers
Formats: IAGA, GADF, JPEG
Facilities: Survey plots, data request (offline)
Query Type: Date, time
Access: Public & Restricted
Comments: International Monitor for Auroral Geomagnetic Effects
GRID:

Title: Imaging Riometer for Ionospheric Studies
Country: UK
Sub-Domain: STP
URL: <http://www.dcs.lancs.ac.uk/iono/summary/>
Mission(s): IRIS
Formats: PNG
Facilities: Summary plots
Query Type: Date
Access: Public
Comments: Imaging Riometer for Ionospheric Studies
GRID:

Title: Institute of geophysics and Planetary Physics
Country: US
Sub-Domain: Planetary
URL: <http://www.igpp.ucla.edu/data.cfm>
Mission(s): Various
Formats: PDS
Facilities: See PDS
Query Type: Target, Dataset, Map interface
Access: Public
Comments: PDS Planetary Plasma Interaction (PPI) node
GRID: OODT, DITDOS

Title: ISAS Data Archive and Transmission System
Country: Japan
Sub-Domain: Solar
URL: <http://www.darts.isas.ac.jp/>
Mission(s): Yohkoh
Formats: TAR
Facilities: Download data
Query Type: Date, time
Access: Public
Comments:
GRID:

Title: JSOC Cluster Info
Country: UK
Sub-Domain: STP
URL: <http://jsoc1.bnsc.rl.ac.uk/index.html>
Mission(s): Cluster
Formats: ASCII
Facilities: Mission planning data
Query Type: Select/download
Access: Public & Restricted
Comments:

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GRID:

Title: Los Alamos National Lab
Country: US
Sub-Domain: STP
URL: http://leadbelly.lanl.gov/lanl_ep_data/
Mission(s): LANL (also Polar & Cluster)
Formats: PNG
Facilities: Survey plots, data request
Query Type: Date
Access: Public
Comments: Polar & Cluster via CCRweb hosted at LANL
GRID:

Title: MIRACLE
Country: Finland
Sub-Domain: STP
URL: <http://www.geo.fmi.fi/MIRACLE/>
Mission(s): Various groundbased
Formats: GIF
Facilities: Survey plots
Query Type: Date
Access: Public
Comments: Magnetometers - Ionospheric Radars All sky Cameras Large Experiment
GRID:

Title: Mees Solar Observatory
Country: US
Sub-Domain: Solar
URL: <http://www.solar.ifa.hawaii.edu/mees.html>
Mission(s): Various groundbased
Formats: GIF
Facilities: Surevy plots
Query Type: Date
Access: Public
Comments:
GRID:

Title: Multi-Experiment Data Operation Centre for SOHO
Country: France
Sub-Domain: Solar
URL: <http://www.medoc-ias.u-psud.fr/>
Mission(s): SOHO
Formats: FITS
Facilities: Search, request data (offline delivery)
Query Type: Instrument, Date, campaign, object
Access: Public
Comments: Java selection interface, see SOHO archive
GRID:

Title: National Geophysics Data Centre
Country: US
Sub-Domain: STP

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URL: <http://www.ngdc.noaa.gov/ngdc.html>
Mission(s): Various
Formats: Various
Facilities: Data, quicklook, data mining, tools
Query Type: Date, mission, data type
Access: Public & Registered
Comments: SPIDR, Space Physics Interactive Data Resource
GRID:

Title: Nobeyama Radioheliograph
Country: Japan
Sub-Domain: Solar
URL: <http://solar.nro.nao.ac.jp/norh/>
Mission(s): Radio Heliograph
Formats: online plots, FITS
Facilities: Plots, movies
Query Type: Online navigation of directory
Access: Public
Comments:
GRID:

Title: NSO Digital Library
Country: US
Sub-Domain: Solar
URL: <http://www.nso.noao.edu/diglib/>
Mission(s): Various groundbased
Formats: GIF, FITS
Facilities: Query and navigation of FTP directory
Query Type: Data product, date
Access: Public
Comments: Virtual Solar Observatory
GRID: EGSO

Title: NSSDC archive
Country: US
Sub-Domain: All
URL: <http://nssdc.gsfc.nasa.gov/>
Mission(s): Various
Formats: Various
Facilities: Varies with data set
Query Type: Varies with data set
Access: Public
Comments: 20 TB of digital data from about 420 mostly-NASA
GRID: SPASE

Title: Oersted Science Data Center
Country: Denmark
Sub-Domain: STP
URL: <http://web.dmi.dk/projects/oersted/SDC/>
Mission(s): Orsted
Formats: PNG, POSTSCRIPT
Facilities: Survey plot
Query Type: Date
Access: Public

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Comments:
GRID:

Title: Planetary Data System
Country: US
Sub-Domain: Planetary
URL: <http://pds.jpl.nasa.gov/>
Mission(s): Various
Formats: PDS
Facilities: Data, online plots
Query Type: Various mission/data set specific interfaces
Access: Public
Comments: Atomospheric, Geosciences, Imaging, NAIF, PPI, Rings and Small bodies nodes
GRID:

Title: SOHO ARCHIVE
Country: France
Sub-Domain: Solar
URL: <http://www.medoc-ias.u-psud.fr/archive/>
Mission(s):
Formats: FITS
Facilities:
Query Type:
Access: Public
Comments: see MEDOC
GRID: EGSO

Title: SOHO ARCHIVE
Country: UK
Sub-Domain: Solar
URL: <http://trace.solararchive.rl.ac.uk/soho/>
Mission(s): SOHO
Formats: FITS
Facilities: Search, request data (offline delivery)
Query Type: Instrument, date, wavelength, observation type, object, campaign
Access: Public
Comments:
GRID: EGSO

Title: SOHO ARCHIVE
Country: US
Sub-Domain: Solar
URL: <http://sohowww.nascom.nasa.gov/catalog>
Mission(s): SOHO
Formats: FITS
Facilities: Search, request data (offline delivery)
Query Type: Instrument, date, wavelength, observation type, object, campaign
Access: Public
Comments:
GRID: EGSO

Title: SOHO ARCHIVE SOI/MDI
Country: US

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Sub-Domain: Solar
URL: <http://soi.stanford.edu/>
Mission(s): SOHO/MDI
Formats: GIF, FITS
Facilities: Search, download data
Query Type: Date, time
Access: Public
Comments:
GRID:

Title: SOHO ARCHIVE SUMER
Country: Germany
Sub-Domain: Solar
URL: <http://www.linmpi.mpg.de/english/projekte/sumer/FILE/SumerEntryPage.html>
Mission(s): SOHO/SUMER
Formats: PNG, FITS
Facilities: Browse survey plots, download data
Query Type: Date or study name
Access: Public & Registered
Comments:
GRID:

Title: SOHO CATALOG CDS
Country: UK
Sub-Domain: Solar
URL: <http://solg2.bnsc.rl.ac.uk/atlas/search.shtml>
Mission(s): SOHO/CDS
Formats: JPG
Facilities: Search catalog, select survey plot
Query Type: Date range then select plot
Access: Public
Comments:
GRID:

Title: SOHO CATALOG EIT
Country: US
Sub-Domain: Solar
URL: <http://umbra.nascom.nasa.gov/eit/eit-catalog.html>
Mission(s): SOHO/EIT
Formats: FITS
Facilities: Search catalog, download data via FTP
Query Type: Date range, wavelength
Access: Public
Comments:
GRID:

Title: SOHO CATALOG LASCO
Country: US
Sub-Domain: Solar
URL: <http://lasco-www.nrl.navy.mil/database.html>
Mission(s): SOHO/LASCO
Formats: JPG, FITS
Facilities: Search catalog, preview JPG, download FITS
Query Type: Date range, wavelength, instrument settings

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Access: Public
Comments:
GRID:

Title: SOHO CDS Database
Country: UK
Sub-Domain: Solar
URL: <http://solg2.bnsc.rl.ac.uk/>
Mission(s): SOHO/CDS
Formats: GIF
Facilities: Near realtime images
Query Type: None
Access: Public
Comments:
GRID:

Title: Solar Data Analysis Center, SDAC
Country: US
Sub-Domain: Solar
URL: <http://umbra.gsfc.nasa.gov/sdac.html>
Mission(s):
Formats:
Facilities:
Query Type:
Access:
Comments:
GRID:

Title: Solar UK Research Facility, SURF
Country: UK
Sub-Domain: Solar
URL: <http://surfwww.mssl.ucl.ac.uk/surf/>
Mission(s): Yohkoh, SOHO, TRACE
Formats: FITS and mission specific
Facilities: Submit data request (offline delivery)
Query Type: Date and time, instrument
Access: Public
Comments: SolarSoft mirror site.
GRID: EGSO

Title: Space Environment Centre, NOAA
Country: US
Sub-Domain: STP
URL: <http://www.sec.noaa.gov/>
Mission(s): ACE RT, GOES, IMAGE
Formats: GIF, ASCII
Facilities: Near real time displays, web and ftp access plots and data
Query Type: Online navigation of directory
Access: Public
Comments:
GRID:

Title: SPENVIS, Space Environment Information System

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<p>Project:</p> 	    

Country: Belgium
Sub-Domain: STP
URL: <http://www.spennis.oma.be/spennis/>
Mission(s): Models
Formats: Various
Facilities: Information/models on space environment
Query Type: Define project
Access: Restricted
Comments:
GRID:

Title: SPIDR
Country: US
Sub-Domain: STP
URL: <http://spidr.ngdc.noaa.gov/> (<http://clust1.wdcb.ru/spidr/>)
Mission(s): Various
Formats: Various
Facilities: Data, quicklook, data mining, tools
Query Type: Date, mission, data type
Access: Public & Registered
Comments: SPIDR, Space Physics Interactive Data Resource
GRID:

Title: SSC Satellite Situation Centre
Country: US
Sub-Domain: STP
URL: <http://sscweb.gsfc.nasa.gov/>
Mission(s): Various
Formats: GIF or ASCII
Facilities: Orbit plotting, field line tracing
Query Type: Mission (s), time range, configuration, region
Access: Public
Comments: Can be used to predict spacecraft conjunctions
GRID:

Title: TRACE Data Archive
Country: Germany
Sub-Domain: Solar
URL: <http://trace.kis.uni-freiburg.de/>
Mission(s): TRACE
Formats: Mission specific
Facilities: Search catalog, data request
Query Type:
Access: Registered
Comments:
GRID: EGSO

Title: TRACE Data Archive
Country: UK
Sub-Domain: Solar
URL: <http://trace.solararchive.rl.ac.uk/soho/>
Mission(s): TRACE
Formats: Mission specific
Facilities: Search catalog, data request

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Query Type:
Access: Registered
Comments:
GRID: EGSO

Title: UK CDHF for STP/CDC
Country: UK
Sub-Domain: STP
URL: http://cdhf.bnsc.rl.ac.uk:8080/STP_CDHF/home.htm
Mission(s): Various
Formats: ASCII, GIF, CDF
Facilities: Search, quicklook, data download
Query Type: Time range, mission and instrument
Access: Public & Restricted
Comments: Quicklook uses NASA/CDAWlib
GRID: AstroGRID

Title: Ulysses Data System
Country: ESA
Sub-Domain: Solar
URL: <http://helio.estec.esa.nl/ulysses/archive/>
Mission(s): Ulysses
Formats: GIF, instrument specific
Facilities: Browse survey plots, browse directory & download data
Query Type: Date, time range, instrument
Access: Public
Comments:
GRID:

Title: US Geological Survey
Country: US
Sub-Domain: STP
URL: <http://www.usgs.gov/>
Mission(s): Geophysical data
Formats:
Facilities:
Query Type:
Access: Public
Comments:
GRID:

Title: WDC-C1
Country: UK
Sub-Domain: STP
URL: <http://www.wdc.rl.ac.uk/>
Mission(s): Geophysical indices
Formats: ASCII
Facilities: Request and download data
Query Type: Date range and parameter
Access: Registered
Comments:
GRID: AstroGRID

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Title: World Data Center for Geomagnetism
Country: Japan
Sub-Domain: STP
URL: <http://swdcd.db.kugi.kyoto-u.ac.jp/>
Mission(s): Dst, Kp, Ae, etc
Formats: GIF and ASCII
Facilities: Browse online plots and data
Query Type: Navigate web pages
Access: Public
Comments:
GRID:

Title: YOHKOH Data Archive
Country: UK
Sub-Domain: Solar
URL: <http://surfwww.mssl.ucl.ac.uk/surf/>
Mission(s):
Formats:
Facilities:
Query Type:
Access: Public
Comments: see SURF
GRID: EGSO



3. PLANNED SSR FACILITIES

The future facilities planned in support of the ESA missions are the Planetary Data Archive, the Double Star Data System and the Cluster archive.

A Planetary Data Archive is in the process of being set-up at ESTEC in support of ESA major planetary programme over the next few years. The archive will be based on the standards defined by the US Planetary Data System. This means that the data from all ESA planetary missions will be reviewed and include comprehensive documentation to support their long-term archive and use. The specification of the archive is currently underway with the definition of the PDS data files for Rosetta, Mars-Express and SMART-1. It is planned for the archive to have a web-based interface to the data held within the archive. This is currently at the requirements definition phase and is expected to be an adaptation of the ISO web interface. The first data to be made available through this system is likely to be the Giotto archive that is currently available as part of the set of International Halley Watch archive distributed on CD-ROM.

The Double Star Data System will be set up in support of the joint China/ESA Double Star magnetospheric mission. A number of the instruments to be flown on the Double Star spacecraft are flight spares from the current ESA/Cluster mission. It is expected that where possible the Double Star programme will re-use the infrastructure that has already been set up, and continues to be used, for the Cluster mission and Cluster extension. The data is expected to be similar in format to that currently provided by Cluster, consisting of the survey level products stored in NASA/CDF format.

The Cluster Science Data System mentioned above is intended to support the Cluster groups for the duration of the mission and for the early exploitation phase. Discussions are underway to define a long-term archive for all Cluster data that will include both the current survey level parameters, and higher resolution and publication quality products. A data archiving task force has been set-up to help guide the definition of this archive. These activities are still at an early stage and no clear plans are in place.