

**Demand Access System Interface
Control Document (DASICD)**

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National Aeronautics and
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Greenbelt, Maryland

Demand Access System Interface Control Document (DASICD)

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Preface

This document was produced for the MO&DSD Networks Division, Code 450, and will be controlled by the Demand Access Program Manager.

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1. Introduction

1.1 Background and Scope

Conventional Tracking and Data Relay Satellite System (TDRSS) operations provide the Space Network (SN) user with service based on a schedule generated from user requests. Normally completed days in advance, this schedule is based upon estimates of user needs and mission event timelines. The need to provide timely SN service to smaller missions and at a reduced cost makes a more efficient service allocation more desirable. The Demand Access System (DAS), provides automated service-on-demand. This benefits not only the SN user, but also the SN itself, with low implementation cost and no change in the existing TDRSS-spacecraft. The TDRSS Multiple Access (MA) service was selected for Demand Access (DA) support for the following reasons:

- it supports multiple users simultaneously,
- it is low cost alternative to providing more TDRSS service time, and
- it makes better use of the underused MA service resources.

1.2 Document Description and Scope

The DASICD is an intermediate level (B level) requirements specification that would have been ideally derived from the analysis of high-level (A level) specifications. However, no high-level requirements specifications document has been produced for the DAS. Without having this source of system requirements, it becomes necessary to use existing sources of system description and operations concepts documentation to derive high-level requirements that fill the role of the missing DAS high-level system specification. The Demand Access System Specification and Operations Concept (DASDOC) document contains a summary of all of the technical information produced thus far concerning the DAS. Therefore, the DASDOC has been used as a starting point to identify high-level requirements that are a basis for producing DASICD. As shown in Figure 1-1, the DAS requirements DASDOC extraction yields a high-level list of system specifications that can be divided into the following four categories:

- architecture,
- functions,
- operations, and
- interface requirements.

The first three categories serve as a basis for developing the DASRS. Since a DASICD document is being developed in parallel with the DASRS, the last category of interface requirements has been relegated to this document. Figure 1-1 shows the main structures of both the DASRS and the DASICD. The contents of each requirement section in both documents are summarized in Figure 1-1.

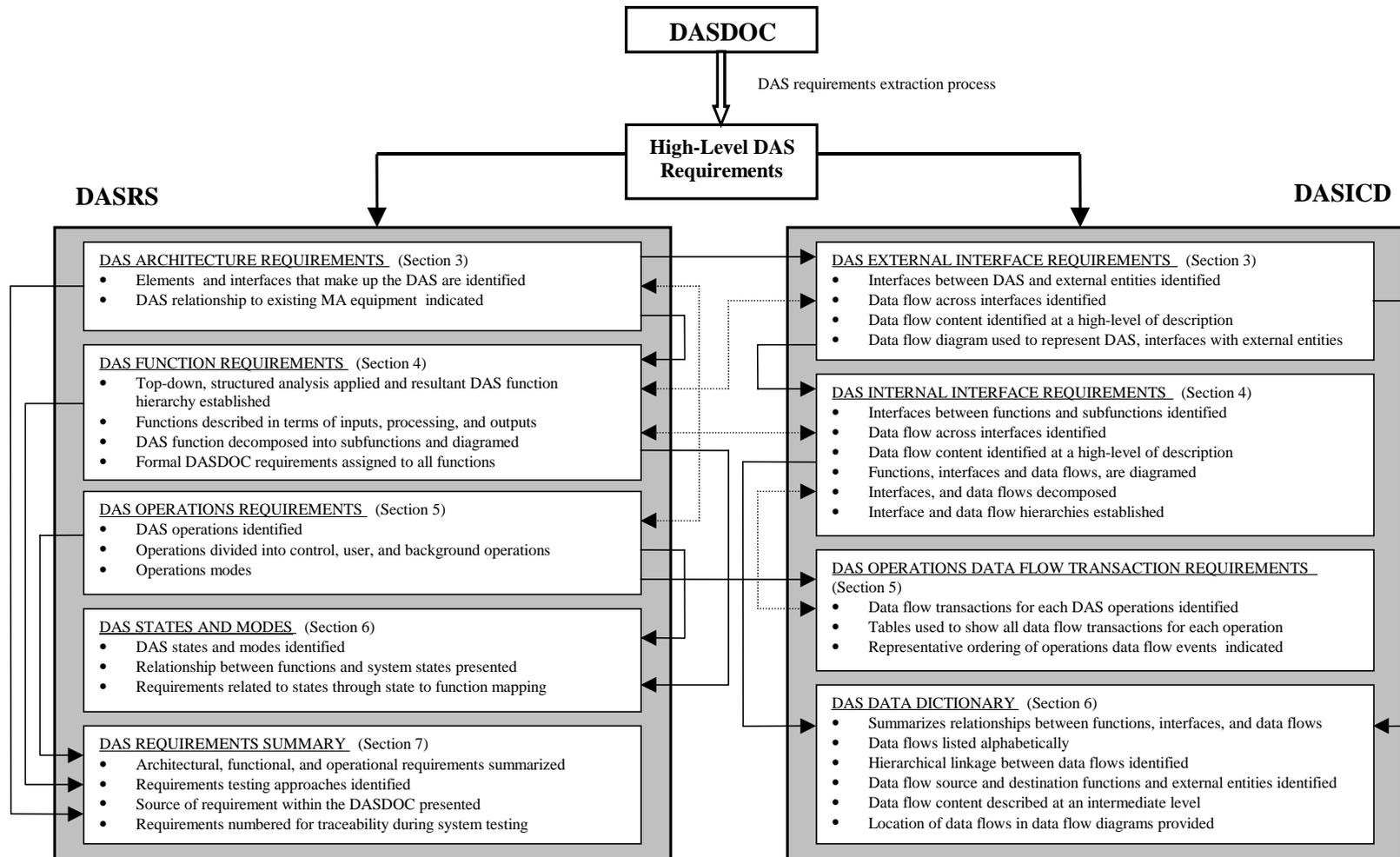


Figure 1-1 DAS Requirements Origins, Analysis Relationships, and Document Presentation Organization

Since the four categories of requirements are all interdependent from a system perspective, the analysis of the high-level specifications cannot be isolated in producing each of the requirements sections in the DASRS and the DASICD. The dependencies between the four requirement categories within each document and between the documents are indicated by the arrows in Figure 1-1. Solid one-way arrows indicate that information presented in a given section strongly governs what appears in the section to which the arrow is pointing. Dotted two-way arrows indicate that the information in both sections to which the arrowheads are pointing is tightly coupled. Tightly coupled sections require mutual, iterative development during the analysis stage in order to meet all of the objectives of the high-level requirements. In particular, Figure 1-1 indicates that tight requirements coupling exist between the functional requirements section of the DASRS and the external and internal interface requirements sections of the DASICD. This reflects the fact that changes in either the function requirements or the interface requirements of a system cannot in general occur without impacting the complement member of the pair.

Tight coupling exists between the architectural and operational requirement sections within the DASRS. This is evident from the fact that the architecture of the system must be tailored to allow the operations requirements to be met. In general, the operational characteristics are constrained by the system architecture.

Lastly, tight coupling exists between the operational requirements and the data flows of the DASICD. In order to implement an operational capability, the data flows must be able to convey the information needed by the functions of the system that support the operations.

In addition to the contents of the requirements presentation Sections 3 through 7 of the DASRS shown in Figure 1-1, this document also contains the following non-requirements sections:

- Introduction: Section 1 describes the scope and organization of this document as well as applicable documents
- DAS Overview: Section 2 of the document briefly describes the architecture, services, high-level scheduling aspects, and functional building blocks associated with the DAS.
- Acronyms and Abbreviations: Section 7 contains a list of all of the acronyms and abbreviations used in this document.

Since the DASICD is an intermediate level requirement specification, functions have not been decomposed to the lowest level (C level). Low-level requirements analysis will proceed by taking the lowest-level functions presented in Section 4 of this document and further decomposing them to a level that is commensurate with the low-level modular aspects of the design implementation of the system. This level of function decomposition will occur in a detailed DAS interface control document that will follow.

1.3 Applicable Documents

The following documents were used as general references in the preparation of this document.

- Demand Access Project Plan, Version 1.1, February 1998.
- Demand Access System Description and Operations Concept (DASDOC), Version 1.3, February 1999.

- Specification for the Third Generation TDRSS MA Beamforming Subsystem Prototype Controller, Version 6.2, February 1999.
- Interface Control Document for the Third-Generation TDRSS MA Beamforming Subsystem, Revision 5.4, December 1998.
- Demand Access System Requirements Specification (DASRS), Version 1.1, February 1999.
- Software Design Document (SDD) for the Demand Access (DA) Planning Tool, Revision 1.3, May 19,1998.

2. DAS Overview

This section contains a brief description of the DAS architecture and the allocation of the architectural elements in establishing and using DAS services. A detailed description of these topics can be found in the DASDOC.

2.1 DAS Architecture

Figure 2-1 shows the functional architecture of the DAS. The existing TDRSS elements that form the foundation for the DAS are also shown in this figure. The systems that augment the existing MA system to form the DAS appear as shaded function blocks and are as follows:

- Third Generation Beam Forming System (TGBFS),
- DA Return Link Data Recovery Subsystem (RLDRS), and
- DA Control/Data Handling Subsystem (DACDHS).

While the TGBFS and RLDRS are integral parts of the DAS, they are hardware entities that exist by themselves and are being developed independent of the DAS. The design of the DAS assumes that these systems will be present for integration with the DACDHS. Requirements assigned to the TGBFS and RLDRS in this document are based on the expectation that the TGBFS and RLDRS will be fielded with these capabilities and be able to perform their role in accomplishing the objectives of the DAS.

Current plans are to have two DASs at the WSC to provide front side TDRSS satellite coverage for DAS User service requests. Backside TDRSS satellite coverage will be realized by a DAS installed in the SGLT located at Guam.

DAS Users, the Network Control Center (NCC), and the Flight Dynamics Facility (FDF) will communicate with the DACDHS through the Closed Input/Output network (IONet). The DACDHS will orchestrate the implementation of requests for

- Demand Access Forward (DAF) services with the NCC, and
- Demand Access Return (DAR) services by configuring the TGBFS and RLDRS according to DAS User service request specifications.

Section 4 of this document analyzes the iterative decomposition of the DACDHS into subordinate functions and describes in detail the processing requirements of each function.

Forward link DAS services will use the existing MA Forward Service Chain in the Space Ground Link Terminal (SGLT). DAS User data and commands will be sent via the Closed IONet to the DACDHS for buffering. The buffered commands and data will be sent to the forward equipment chain from the DACHDS through the Control/Data Interface for uplinking to the User Platform (UP).

Return link DAS services will use the existing MA Return Service Chain for the front-end Radio Frequency (RF) processing. The TGBFS will accept the Intermediate Frequency (IF) signal

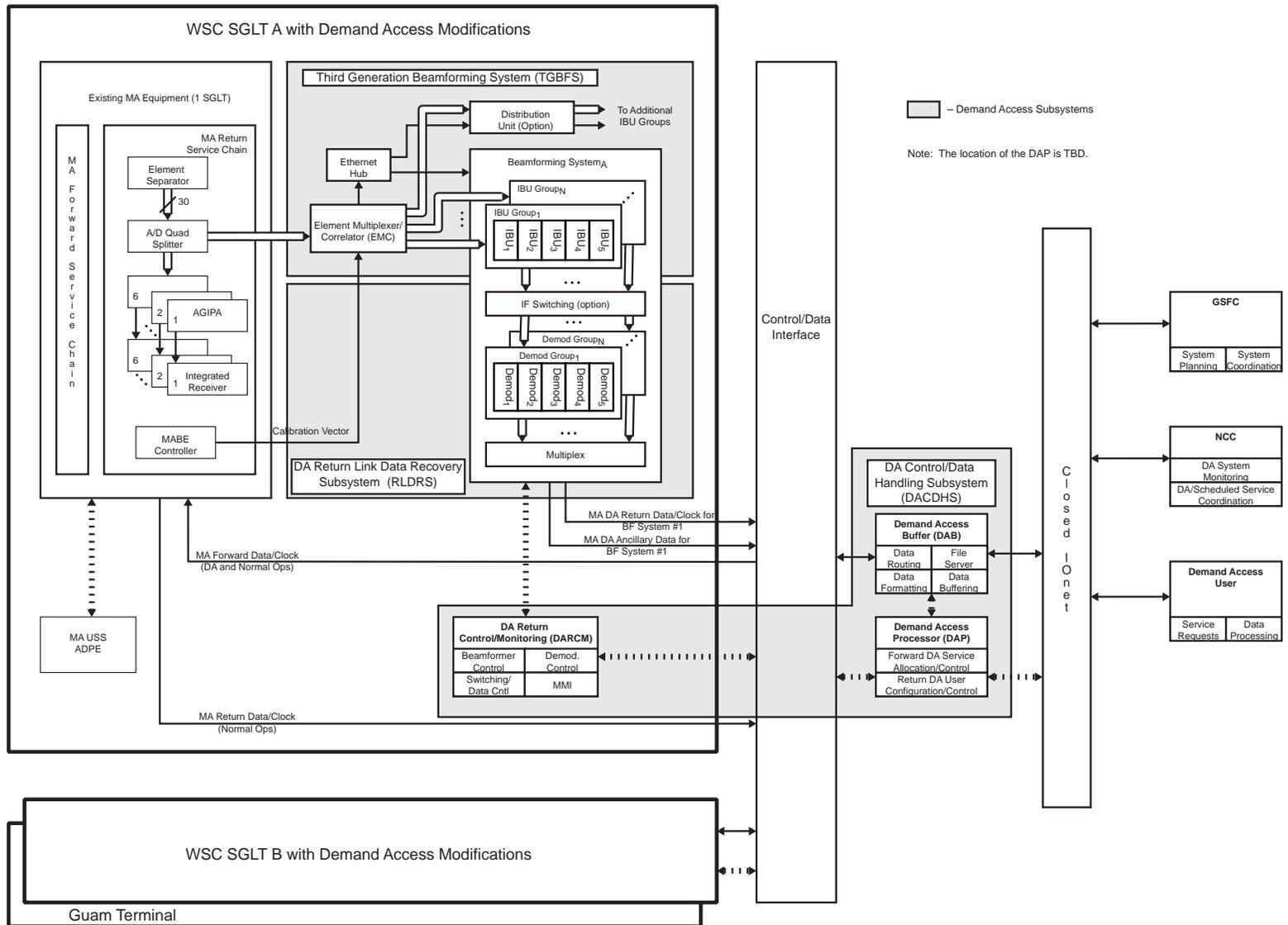


Figure 2-1 DAS Functional Architecture

message data from the signal based on Pseudorandom Noise (PN) code discrimination. The RLDRS will forward the message data to the DACDHS for formatting, buffering via the Control/Data Interface. The DACDHS will route the return data to the DA User via the Closed IOnet.

2.2 Implementing and Using DAS Services

The DAS provides TDRSS users with the capability of obtaining TDRSS services on demand. Two types of DA services are available: DAF and DAR services. The following section describes both of these DA services. Refer to Figure 2-1 for an architectural perspective of the location of the DAS functions described in the following sections.

2.2.1 DAF Service

The TDRSS Unused Time (TUT) for the MA system that is determined daily by the NCC forms the basis for the times when DAF services can be allocated. This information is supplied to the DAP function in the DAS. The FDF supplies the DAP function with updated satellite state vectors for use with the TUT schedules in determining UP visibility constraints. One DAF service per TDRS satellite can be implemented at a time due to the constraints of the existing Multiple Access Forward (MAF) system.

Figure 2-2 shows the DAS functions and operations required to establish a DAF service. The following numbered paragraphs correspond to the sequence of steps shown in Figure 2-2 that outline the activities associated with the allocation and use of the DAF service.

1. DAS Users make requests for DAF services based on information obtained from the DA Planning Tool situated in their Project Operation Control Centers (POCCs). The requests are sent to the Demand Access Processor (DAP) which assesses them to ensure that the requests remain within the constraints of available TUT and satellite visibility. The DAP function notifies the Demand Access Buffer (DAB) function that the DAF service is being requested and supplies it with the specifications for handling the commands and data to be forwarded to the UP. DAS User commands and data are forwarded to the DAB function for buffering.
2. The DAP function forwards the specifications for valid DAF requests to the NCC.
3. The NCC commands the appropriate SGLT to configure the existing MAF equipment chain in accordance with the DAF specifications.
4. During the time interval when the service is operational, the DAB forwards the buffered data to the SGLT MAF equipment chain at the time(s) designated in the DAF service specification for uplinking to the UP. Real-time user commands and data are forwarded directly to the MAF equipment chain for immediate uplinking to the UP during DAF service time interval.
5. DAS User commands and data are uplinked to the TDRSS satellite.

6. The TDRSS satellite forwards the commands and data to the UP.

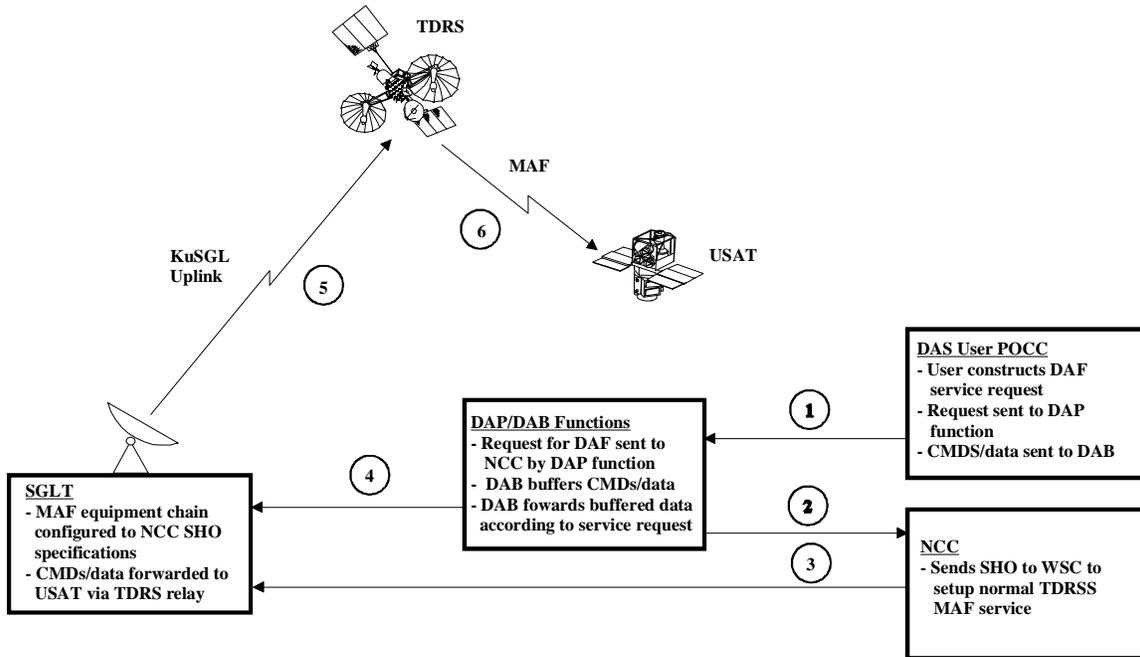


Figure 2-2 Establishing and Using a DAF Service

2.2.2 DAR Services

Multiple DAR services can be established simultaneously. The upper limit on the number of DAR services is determined by the number of beamformer equipment modules installed in the TGBFS function and the number of demodulators present in the RLDRS function. A practical upper limit of 50 simultaneous DAR services exists when the modular expansion of the beamformer and demodulator equipment reaches the limit of current design capacity.

Figure 2-3 shows the DAS functions and operations required to establish a DAR service. The following numbered paragraphs correspond to sequence of steps shown in Figure 2-3 that outline the activities associated with the allocation and use of the DAR service.

1. DAS Users construct DAR requests based on information obtained from DA Planning Tool. The requests are forwarded to the DAP function for validation and implementation. The DAP coordinates the implementation of the service by providing the DAB function with service specifications for return data buffering, formatting, and routing.
2. The DAP function provides the service setup specifications to the beamforming and demodulator controllers as part of the DAR service implementation process.
3. S-band signals from the UP are received by the TDRSS satellite where they are upconverted to Ku-band for transmission to the SGLT.

4. The existing Multiple Access Return (MAR) equipment chain converts the RF signal to IF and forwards the 30 channels of digitized return signal to the DA beamformers along with the calibration vector.
5. The beamformer spatially isolates the return signal based on the information provided by the beamformer controller.
6. The spatially isolated signal is processed by a demodulator which extracts the correct UP data from the IF signal stream by PN code discrimination. The DAB function formats and buffers the data.
7. The DAB function routes the return data to the DAS User.

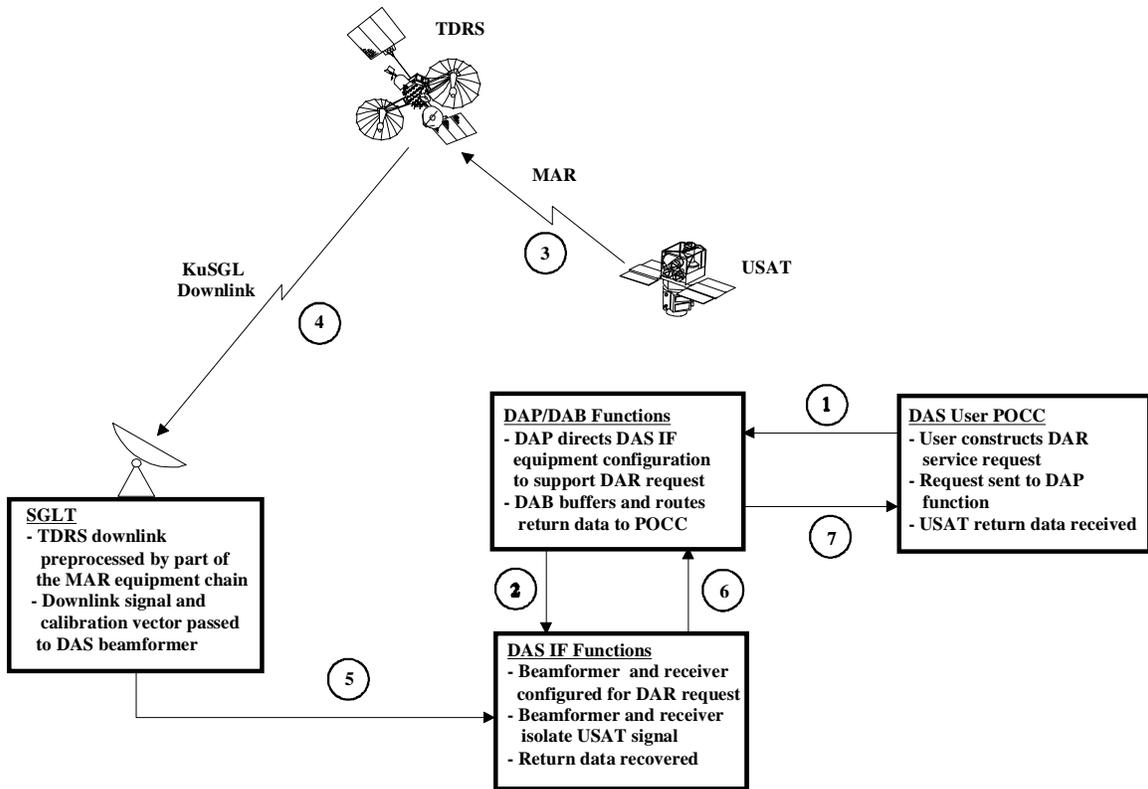


Figure 2-3 Establishing and using a DAR Service

3. DAS Function (1.0) External Interface Requirements

Information is input into the DAS function via interfaces with external entities. The DAS processes the information according to the requirements and the results of the processing appear as outputs from the function. The processing outputs are supplied to the external entities on the basis of each entity's role relative to the DAS. The relationship between the external entities and their interfaces with the DAS function is shown in Figure 3-1. Figure 3-1 has the following features:

- DAS function (represented by a shaded octagon),
- Six external entities that interact with the DAS (represented by squares) are:
 - FDF,
 - NCC,
 - DAS User,
 - MAR Service Chain,
 - MAF Service Chain, and
 - DAS Operator.
- External interfaces between the DAS function and the entities (represented by arrows),
- Data flows across the interfaces (uniquely named via a label in the rounded rectangular structures, (e.g., NCC_TUT),
- A brief, high-level description of the information contained in the data flow accompanies the data flow name (in the rounded rectangular structures), and
- Data flow direction across the interface (indicated by the external interface arrowhead)

The DAS Function is numbered 1.0 in Figure 3-1, indicating that it is the highest level function and the starting point in the data flow analysis of the DAS. This number is an identifier that will be used in Section 4 as a numerical means of organizing and presenting the analysis of the data flows in that section. There is a one-to-one correspondence between the function numbering scheme presented in Sections 3 and 4 of this document and that used in Section 4 of the DASRS. Section 4 of the DASRS provides a functional analysis of the in terms of inputs, outputs, and processing, whereas the DASICD provides an interface analysis in terms of the data flows between functions and external entities. Therefore, the reader interested in details of the functional analysis of the DAS is directed to Section 4 of the DASRS.

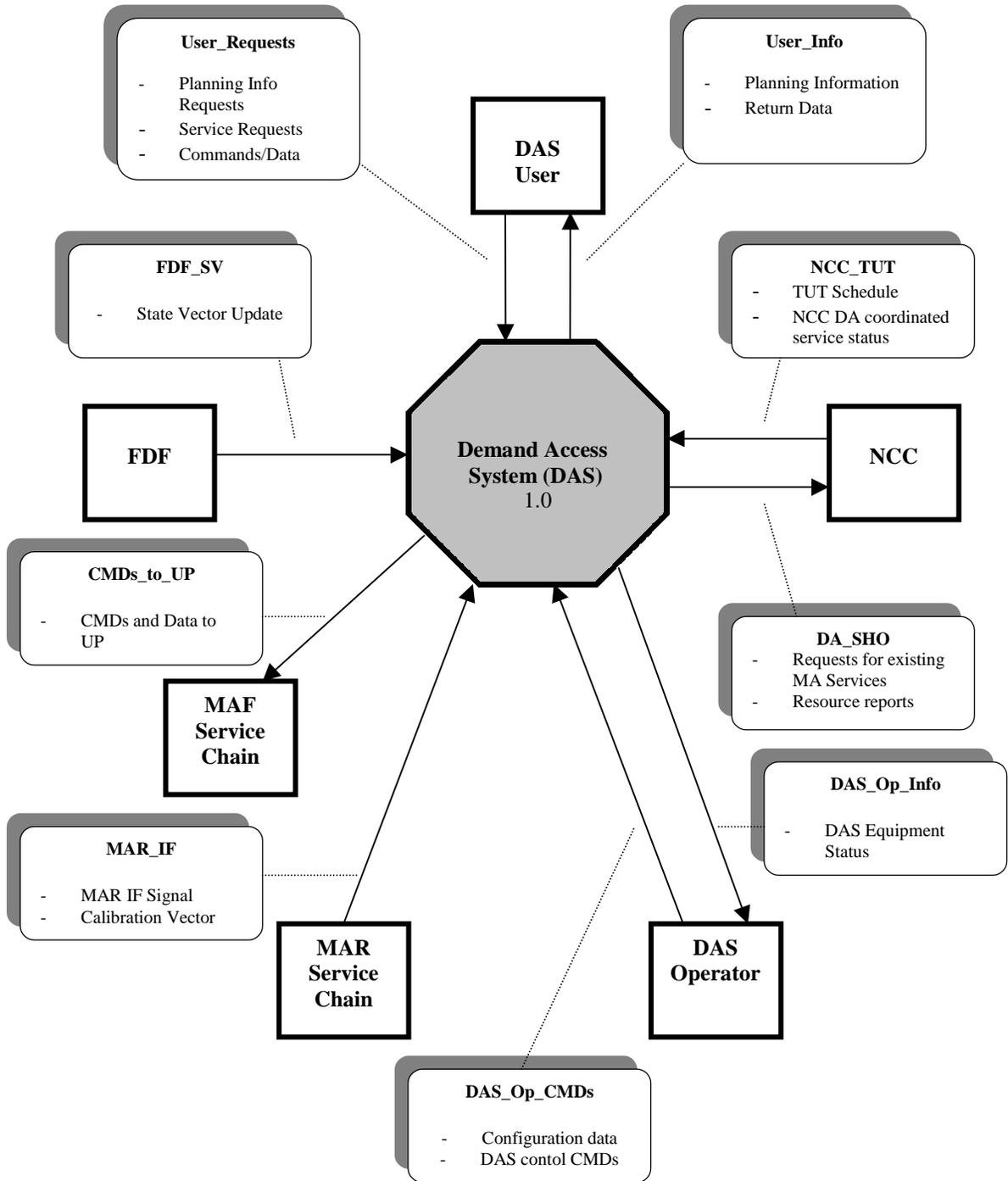


Figure 3-1 DAS Function (1.0) External Interfaces and Data Flows DFD

Table 3-1 contains a listing of the data flows shown in Figure 3-1 with a more detailed description of the information contained in the data.

Table 3-1 DAS Function (1.0) External Data Flow Requirements

DAS Function (1.0) Data Flow (Figure 3-1)	Data Flow Source	Data Flow Destination	Data Flow Contents
CMDs_to_UP	DAS Function (1.0)	MAF Service Chain	<ul style="list-style-type: none"> Buffered or real-time commands and data forwarded to the UP
DA_SHO	DAS Function (1.0)	NCC	<ul style="list-style-type: none"> Requests for normal MAF service within the TUT schedule Requests for existing MAR equipment chain to support DAR services TDRSS resource reports
DAS_Op_CMDs	DAS Operator	DAS Function (1.0)	<ul style="list-style-type: none"> Equipment system control, test, and configuration commands parameters in GUI presentation format
DAS_Op_Info	DAS Function (1.0)	DAS Operator	<ul style="list-style-type: none"> Equipment system control status and test reports in GUI presentation format
FDF_SV	FDF	DAS Function (1.0)	<ul style="list-style-type: none"> TDRS and USAT state vectors
MAR_IF	MAR Service Chain	DAS Function (1.0)	<ul style="list-style-type: none"> IF signal containing UP return data Calibration vector from MABE controller
NCC_TUT	NCC	DAS Function (1.0)	<ul style="list-style-type: none"> TUT schedule update Status of MAF requests Status of existing equipment MAR requests
User_Info	DAS Function (1.0)	DAS User	<ul style="list-style-type: none"> Planning information in GUI presentation format DA service status in GUI format UP return data Tracking measurement data
User_Requests	DAS User	DAS Function (1.0)	<ul style="list-style-type: none"> Planning information and DA service requests in GUI presentation data format Commands and data for buffering and uplinking to UP

The DAS Function (1.0) is decomposed into subfunctions in Section 4. A by-product of the decomposition process is the decomposition of some of the external data flows in Table 3-1 and the introduction of internal data flows between the subfunctions.

4. DAS Function (1.0) Internal Interface Requirements

This section describes the analysis of the external and internal data flows across the interfaces between the functions and subfunctions that comprise the DAS. Structured analysis^{1,2} is used to successively decompose the DAS Function (1.0) shown in Figure 3-1 into subfunctions and interface data flow components. The decomposition process of top-down, structured analysis can be briefly summarized as follows:

- Represent the system as a single function (Figure 3-1), identify all of the external interfaces to the function, and label the data flows across each interface
- Decompose the system function into subfunctions that interact with each other to produce the same resultant effect as the original function
- Identify the interfaces and data flowing between subfunctions that are internal to the decomposed function
- Decompose any external interfaces to the decomposed function that share information between subfunctions and label the data flow components
- Maintain the fidelity of the decomposition results with the parent function by conserving the function processing, interface, and data flow information between the single function and its representation as a set of subfunctions
- Repeat the above decomposition process for each of the subfunctions to generate yet another lower-level set of subfunctions, interfaces, and data flows while maintaining the fidelity of the relationship between subcomponents and the component from which they are derived
- Proceed with the recursive analysis method from the highest level system function to the lowest level of subfunctions, interfaces, and data flows that satisfies the system resolution required by the goals of the analysis
- Each of the derived functions, interfaces, and data flows become requirements for the system

The Data Flow Diagram (DFD) is used to visualize the relationship between functions, interfaces (internal and external) and data flows. A set of new, lower level DFDs is spawned each time that a function on a higher level DFD is decomposed. As such, a series of DFDs is generated and organized into levels of decomposition during the analysis. The following conventions are used in this document to construct a DFD:

- DAS functions and subfunctions are represented as shaded octagons on the DFD,
- entities external to the DAS are represented by rectangles,
- external and internal interfaces to a function are represented by arrows connecting the function with other entities (other functions or external entities), and
- data flows across the interfaces are identified by the labels attached to the arrows
- data flow direction between functions is indicated by the internal interface arrowhead
- databases are represented by right circular cylinders

¹ E. Yourdon, *Modern Structured Analysis*, Yourdon Press, 1989.

² T. DeMarco, *Structured Analysis and System Specification*, Prentice Hall, 1979.

Since this document focuses on system interfaces and data flows, the functions are identified on the DFDs without further description herein. Section 4 of the DASRS addresses the same functions shown on the diagram from a requirement’s perspective. Therefore, the reader desiring to obtain information about the processing associated with the functions shown in the DFDs that are presented below, should consult Section 4 of the DASRS for this description. The DASRS and the DASICD complement each other in the presentation of different aspects of the same information that appears on the DFDs that are the products of system level structured analysis.

The information presented in Section 4 is organized such that a one-to-one correspondence exists between section number of the DASICD and the number of the function being decomposed. The function identifiers are the same as those used in the DASRS and they form the basis of locating DFDs in this document. For example:

- Section 4.1.1 contains the DFD for the interfaces of function number 1.1,
- Section 4.1.2 contains the DFD for the interfaces of function number 1.2,
- Section 4.1.2.3 contains the DFD for the interfaces of function number 1.2.3, etc.

In general, prefixing the function number’s most significant digit (1) with a 4 converts the function number into a section number that contains the subfunctions and interface data flows (internal and external) for that function. The further that the function decomposition process is pursued, the deeper that the details of the resultant data flow information resides within the section number hierarchy. Figure 4-1 summarizes the hierarchical relationship between the section numbers and data flow decomposition results. The DASICD section location of the DFDs for each decomposed function and data flow is identified in Figure 4-1.

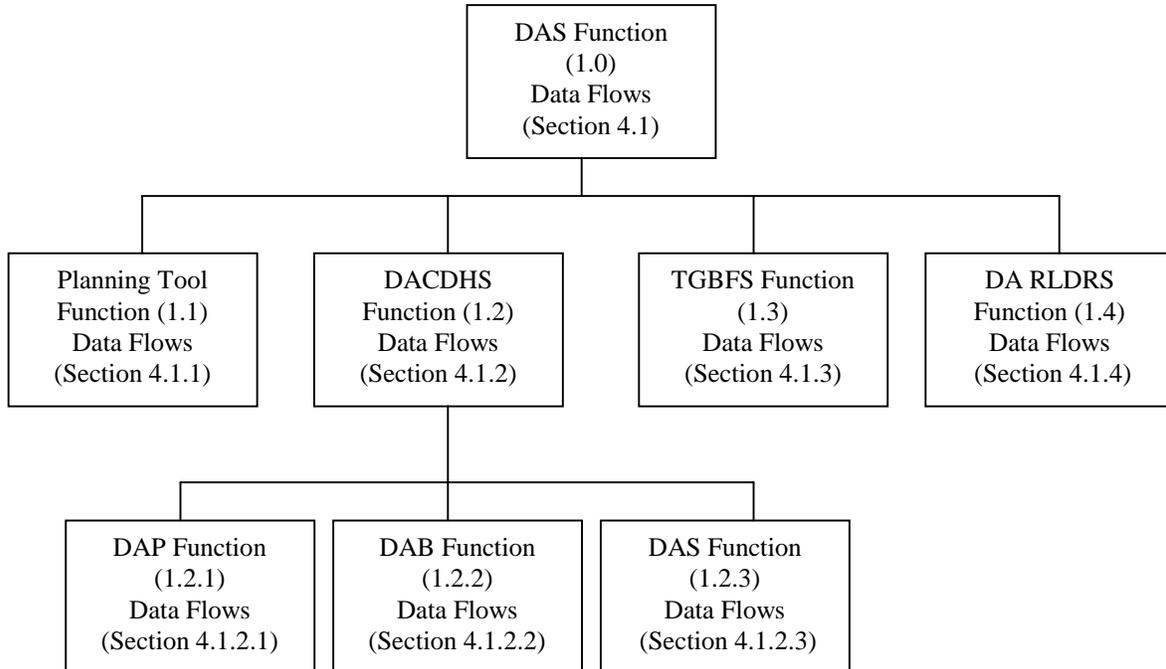


Figure 4-1 Data Flow Decomposition Locations in the DASICD

4.1 DAS Function (1.0) Data Flow Requirements

The decomposition of the DAS Function (1.0) shown in Figure 3-1 is presented in Figure 4-2. The Figure 4-2 DFD shows that the decomposition of the DAS function has resulted in the following components:

- Four subfunctions of the DAS Function (1.0)
 - DA Planning Tool Function (1.1)
 - DACDHS Function (1.2)
 - TGBFS Function (1.3)
 - DA RLDRS (1.4)
- Previously defined DAS Function (1.0) external interfaces and data flows (shown in Figure 3-1)
- New external interfaces and data flows derived from the decomposition of a previously defined DAS Function (1.0) external interface (shown in Figure 3-1)
- Internal interfaces and data flows between the subfunctions (interfaces and data flows starting at one subfunction and terminating on one of the remaining three subfunctions)

Table 4-1 shows the relationship between the DAS Function (1.0) external data flows shown in Figure 3-1 and Figure 4-2. Those external data flows that have undergone decomposition have the names of the subordinate or child data flows listed in the second column of the Table 4-1. External data flows shown in Figure 3-1 that are not decomposed have “Not Applicable” (N/A) inserted in the second column of Table 4-1. Table 4-2 describes the internal data flows associated with the subordinate functions of the DAS Function (1.0) at the first level of function decomposition. The contents of the data flows, as described at this level of analysis, are described for each entry in Tables 4-1 and 4-2.

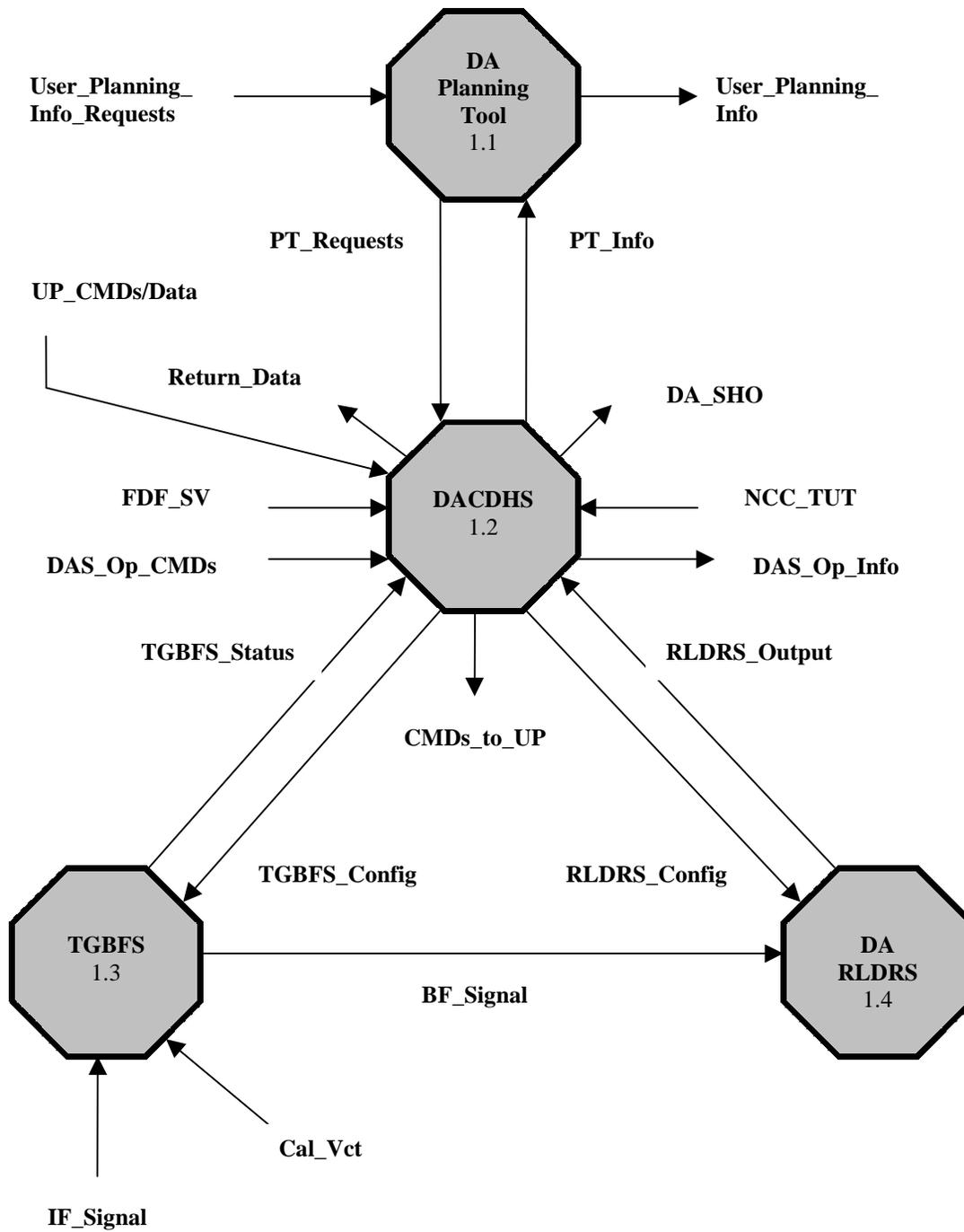


Figure 4-2 Decomposed DAS Function (1.0) External and Internal Interfaces and Data Flows

Table 4-1 DAS Function (1.0) External Data Flow Decomposition

DAS Function (1.0) Parent Data Flow (Figure 3-1)	DAS Function (1.0) Child Data Flows (Figure 4-2)	Data Flow Source	Data Flow Destination	Data Flow Contents
User_Requests	User_Planning_Info_Requests	DAS User	DA Planning Tool Function (1.1)	<ul style="list-style-type: none"> Planning information and DA service requests in GUI format
	UP_COMMANDs/Data	DAS User	DACDHS Function (1.2)	<ul style="list-style-type: none"> Commands and data for buffering and uplinking to UP
User_Info	User_Planning_Info	DA Planning Tool Function (1.1)	DAS User	<ul style="list-style-type: none"> Planning information in GUI format DA service status in GUI format
	Return_Data	DACDHS Function (1.2)	DAS User	<ul style="list-style-type: none"> Formatted UP return data Formatted tracking measurement data
MAR_IF	IF_Signal	MAR Service Chain	TGBFS Function (1.3)	<ul style="list-style-type: none"> IF signal containing UP return data
	Cal_Vct	MAR Service Chain	TGBFS Function (1.3)	<ul style="list-style-type: none"> Calibration vector from MABE controller
FDf_SV	N/A	FDf	DACDHS Function (1.2)	<ul style="list-style-type: none"> TDRS and USAT state vectors
DA_SHO	N/A	DACDHS Function (1.2)	NCC	<ul style="list-style-type: none"> Requests for normal MAF service within the TUT schedule Requests for existing MAR equipment chain to support DAR services TDRSS resource reports
NCC_TUT	N/A	NCC	DACDHS Function (1.2)	<ul style="list-style-type: none"> TUT schedule update Status of MAF requests Status of existing equipment MAR requests
DAS_Op_COMMANDs	N/A	DAS Operator	DACDHS Function (1.2)	<ul style="list-style-type: none"> DAS equipment system control, test, and configuration parameters in GUI presentation format

Table 4-1 DAS Function (1.0) External Data Flow Decomposition (Continued)

DAS Function (1.0) Parent Data Flow (Figure 3-1)	DAS Function (1.0) Child Data Flows (Figure 4-2)	Data Flow Source	Data Flow Destination	Data Flow Contents
DAS_Op_Info	N/A	DACDHS Function (1.2)	DAS Operator	<ul style="list-style-type: none"> DAS equipment performance monitoring and fault isolation reports in GUI presentation format
CMDs_to_UP	N/A	DACDHS Function (1.2)	MAF Service Chain	<ul style="list-style-type: none"> Buffered or real-time commands and data forwarded to the UP

Table 4-2 DAS Function (1.0) Internal Data Flows

Internal Data Flow (Figure 4-2)	Data Flow Source	Data Flow Destination	Data Flow Contents
BF_Signal	TGBFS Function (1.3)	DA RLDRS Function (1.4)	<ul style="list-style-type: none"> Beamformer output IF signals input to a demodulators
PT_Info	DACDHS Function (1.2)	DA Planning Tool Function (1.1)	<ul style="list-style-type: none"> Planning information in DAS internal format DA service status reports in DAS internal format
PT_Requests	DA Planning Tool Function (1.1)	DACDHS Function (1.2)	<ul style="list-style-type: none"> Planning information request in DAS internal format DA service requests in DAS internal format
RLDRS_Config	DACDHS Function (1.2)	DA RLDRS Function (1.4)	<ul style="list-style-type: none"> RLDRS equipment and DA service configuration data RLDRS equipment test requests
RLDRS_Output	DA RLDRS Function (1.4)	DACDHS Function (1.2)	<ul style="list-style-type: none"> Unformatted UP data and tracking measurement data extracted from the IF signal RLDRS equipment performance monitoring and fault isolation reports in internal DAS format
TGBFS_Config	DACDHS Function (1.2)	TGBFS Function (1.3)	<ul style="list-style-type: none"> TGBFS equipment and DA service configuration data TGBFS equipment test requests
TGBFS_Status	TGBFS Function (1.3)	DACDHS Function (1.2)	<ul style="list-style-type: none"> TGBFS equipment performance monitoring and fault isolation reports in internal DAS format

The following section structure is organized according to the levels of successive decomposition from the DAS subfunctions shown in Figure 4-2. Figure 4-2 represents the first level of system decomposition. The decomposition of the four functions and their interfaces shown in Figure 4-2 are the topics of the sections immediately subordinate to this section. In turn, their decomposition results in the second level of subfunctions of the original DAS Function (1.0) shown in Figure 3-1. The resultant subfunctions and interfaces at the second level of

decomposition are the topics addressed in the subordinate sections. This recursive process is repeated until the analysis of the system satisfies the scope of the DASRS.

4.1.1 DA Planning Tool Function (1.1) Data Flow Requirements

The DA Planning Tool Function is not decomposed in this document since the DA subsystem is being developed as a parallel line of subsystem specification documentation. Therefore, the document entitled Software Design Document (SDD) for the DA Planning Tool should be consulted for further decomposition of the DA Planning Tool Function (1.1) and detailed requirements.

4.1.2 DACDHS Function (1.2) Interfaces Data Flow Requirements

The decomposed DACDHS Function (1.2) shown in Figure 4-2 is presented in Figure 4-3. The Figure 4-3 DFD shows that the decomposition of the DAS function has resulted in the following components:

- Three subfunctions of the DACDHS Function (1.2)
 - DAP Function (1.2.1)
 - DAB Function (1.2.2)
 - DARCM Function (1.2.3)
- Previously defined DAS external interfaces (shown in Figure 3-1)
- New external interfaces derived from the decomposition of a previously defined DACDHS external interfaces (shown in Figure 4-2)
- Internal interfaces and data flows between the subfunctions (interfaces starting at one subfunction and terminating on one of the remaining three subfunctions)

Table 4-3 shows the relationship between the decomposed DACDHS Function (1.2) and the data flows shown in Figure 4-2 and Figure 4-3. Those data flows that have undergone decomposition have the names of the subordinate or child components of the related data flows listed in the second column of the Table 4-3. External interfaces shown in Figure 4-2 that are not decomposed have “Not Applicable” (N/A) inserted in the second column of Table 4-3. Table 4-4 describes the internal interfaces associated with the DACDHS Function (1.2) at this level of function decomposition. The contents of the data flows, as described at this level of analysis, are described for each entry in Tables 4-3 and 4-4.

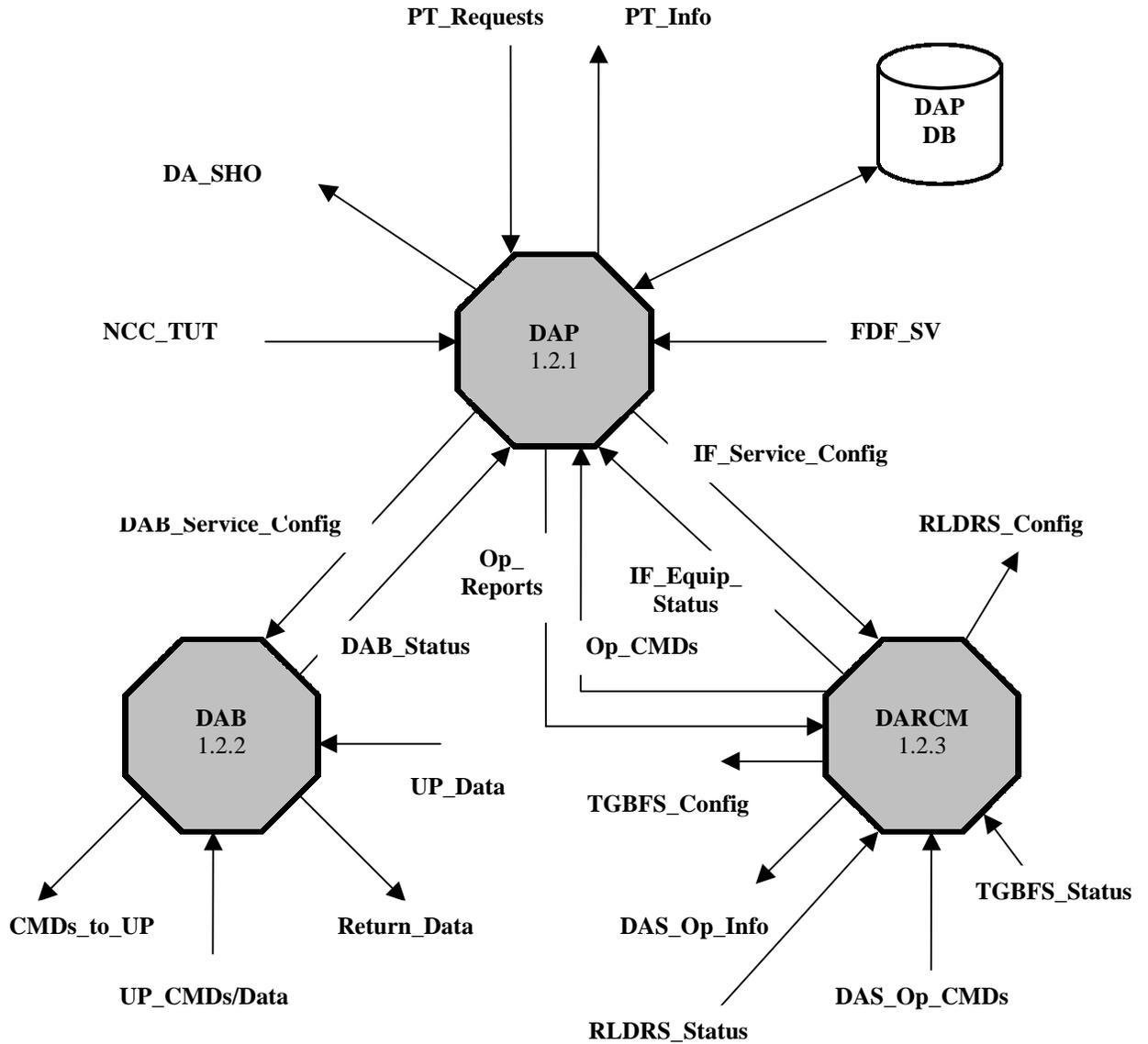


Figure 4-3 DACDHS Function (1.2) Decomposition DFD External and Internal Interfaces and Data Flows

Table 4-3 DACDHS Function (1.2) External Data Flow Decomposition

DACDHS Function (1.2) Parent Data Flow (Figure 4-2)	DACDHS Function (1.2) Child External Data Flows (Figure 4-3)	Data Flow Source	Data Flow Destination	Data Flow Contents
PT_Requests	N/A	DA Planning Tool Function (1.1)	DAP Function (1.2.1)	<ul style="list-style-type: none"> • Planning information request in DAS internal format • DA service requests in DAS internal format
PT_Info	N/A	DAP Function (1.2.1)	DA Planning Tool Function (1.1)	<ul style="list-style-type: none"> • Planning information in DAS internal format • DA service status reports in DAS internal format
TGBFS_Config	N/A	DAP Function (1.2.1)	TGBFS Function (1.3)	<ul style="list-style-type: none"> • TGBFS equipment and DA service configuration data • TGBFS equipment test requests
TGBFS_Status	N/A	TGBFS Function (1.3)	DAP Function (1.2.1)	<ul style="list-style-type: none"> • TGBFS equipment performance monitoring and fault isolation reports in internal DAS format
RLDRS_Config	N/A	DARCM Function (1.2.3)	DA RLDRS Function (1.3)	<ul style="list-style-type: none"> • RLDRS equipment and DA service configuration data • RLDRS equipment test requests
RLDRS_Ouput	UP_Data	DA RLDRS Function (1.3)	DAB Function (1.2.2)	<ul style="list-style-type: none"> • Unformatted UP data and tracking measurement data extracted from the IF signal
	RLDRS_Status	DA RLDRS Function (1.4)	DARCM Function (1.2.3)	<ul style="list-style-type: none"> • RLDRS equipment performance monitoring and fault isolation reports in internal DAS format
Return_Data	N/A	DAB Function (1.2.2)	DAS User	<ul style="list-style-type: none"> • Formatted UP return data • Formatted tracking measurement data

Table 4-3 DACDHS Function (1.2) External Data Flow Decomposition (Continued)

DACDHS Function (1.2) Parent Data Flow (Figure 4-2)	DACDHS Function (1.2) Child External Data Flows (Figure 4-3)	Data Flow Source	Data Flow Destination	Data Flow Contents
NCC_TUT	N/A	NCC	DAP Function (1.2.1)	<ul style="list-style-type: none"> • TUT schedule update • Status of MAF service requests • Status of existing equipment MAR service requests
FDF_SV	N/A	FDF	DAP Function (1.2.1)	<ul style="list-style-type: none"> • TDRS and USAT FDF state vectors
DA_SHO	N/A	DAP Function (1.2.1)	NCC	<ul style="list-style-type: none"> • Requests for normal MAF service within the TUT schedule • Requests for existing MAR equipment chain to support DAR services • TDRSS resource reports
DAS_Op_CMDs	N/A	DAS Operator	DARCM Function (1.2.3)	<ul style="list-style-type: none"> • Equipment system control, test, and configuration parameters in GUI format
DAS_Op_Info	N/A	DARCM Function (1.2.3)	DAS Operator	<ul style="list-style-type: none"> • DAS equipment performance monitoring and fault isolation reports in GUI format
CMDs_to_UP	N/A	DAB Function (1.2.2)	MAF Service Chain	<ul style="list-style-type: none"> • Buffered or real-time commands and data forwarded to the UP

Table 4-4 DACDHS Function (1.2) Internal Data Flows

Internal Data Flow (Figure 4-3)	Data Flow Source	Data Flow Destination	Data Flow Contents
DAB_Service_Config	DAP Function (1.2.1)	DAB Function (1.2.2)	<ul style="list-style-type: none"> • DA service buffering, formatting, and routing specifications • DAB Function system control request specifications • DAB Function test request specifications
DAB_Status	DAB Function (1.2.2)	DAP Function (1.2.1)	<ul style="list-style-type: none"> • DA service buffering, formatting, and routing status reports • DAB Function performance monitoring and fault isolation reports
IF_Equip_Status	DARCM Function (1.2.3)	DAP Function (1.2.1)	<ul style="list-style-type: none"> • DA service beamformer and data recovery status reports • DARCM Function performance monitoring and fault isolation reports
IF_Service_Config	DAP Function (1.2.1)	DARCM Function (1.2.3)	<ul style="list-style-type: none"> • DA service beamformer and data recovery specifications • DARCM Function system control request specifications • DARCM Function test request specifications
Op_COMMANDs	DARCM Function (1.2.3)	DAP Function (1.2.1)	<ul style="list-style-type: none"> • System control specifications in DAS internal format • System test request specifications in DAS internal format
Op_Reports	DAP Function (1.2.1)	DARCM Function (1.2.3)	<ul style="list-style-type: none"> • System control status reports • Performance monitoring and fault isolation reports in DAS internal format

4.1.2.1 DAP Function (1.2.1) Data Flow Requirements

The decomposed DAP Function (1.2.1) shown in Figure 4-3 is presented in Figure 4-4. The Figure 4-4 DFD shows that the decomposition of the DAP function has resulted in the following components:

- Four subfunctions of the DAP Function (1.2.1)
 - Service Request Handler Function (1.2.1.1)
 - DAF Service Manager Function (1.2.1.2)
 - DAR Service Manager Function (1.2.1.3)
 - Service Resource Analyzer Function (1.2.1.4)
- Previously defined DAP external interfaces (shown in Figure 4-3)
- New external interfaces derived from the decomposition of a previously defined DAP Function (1.2.1) external interfaces (shown in Figure 4-3)
- Internal interfaces and data flows between the subfunctions (interfaces starting at one subfunction and terminating on one of the remaining three subfunctions)

Table 4-5 shows the relationship between the DAP Function (1.2.1) external interfaces shown in Figure 4-4 and Figure 4-3. External interfaces shown in Figure 4-3 that are not decomposed have

“Not Applicable” (N/A) inserted in the second column of Table 4-5. Those data flows that have undergone decomposition have the names of the subordinate or child data flows listed in the second column of the Table 4-5. Table 4-6 describes the internal interfaces associated with the DAP Function (1.2.1) at this level of function decomposition. The contents of the data flows, as described at this level of analysis, are described for each entry in Tables 4-5 and 4-6.

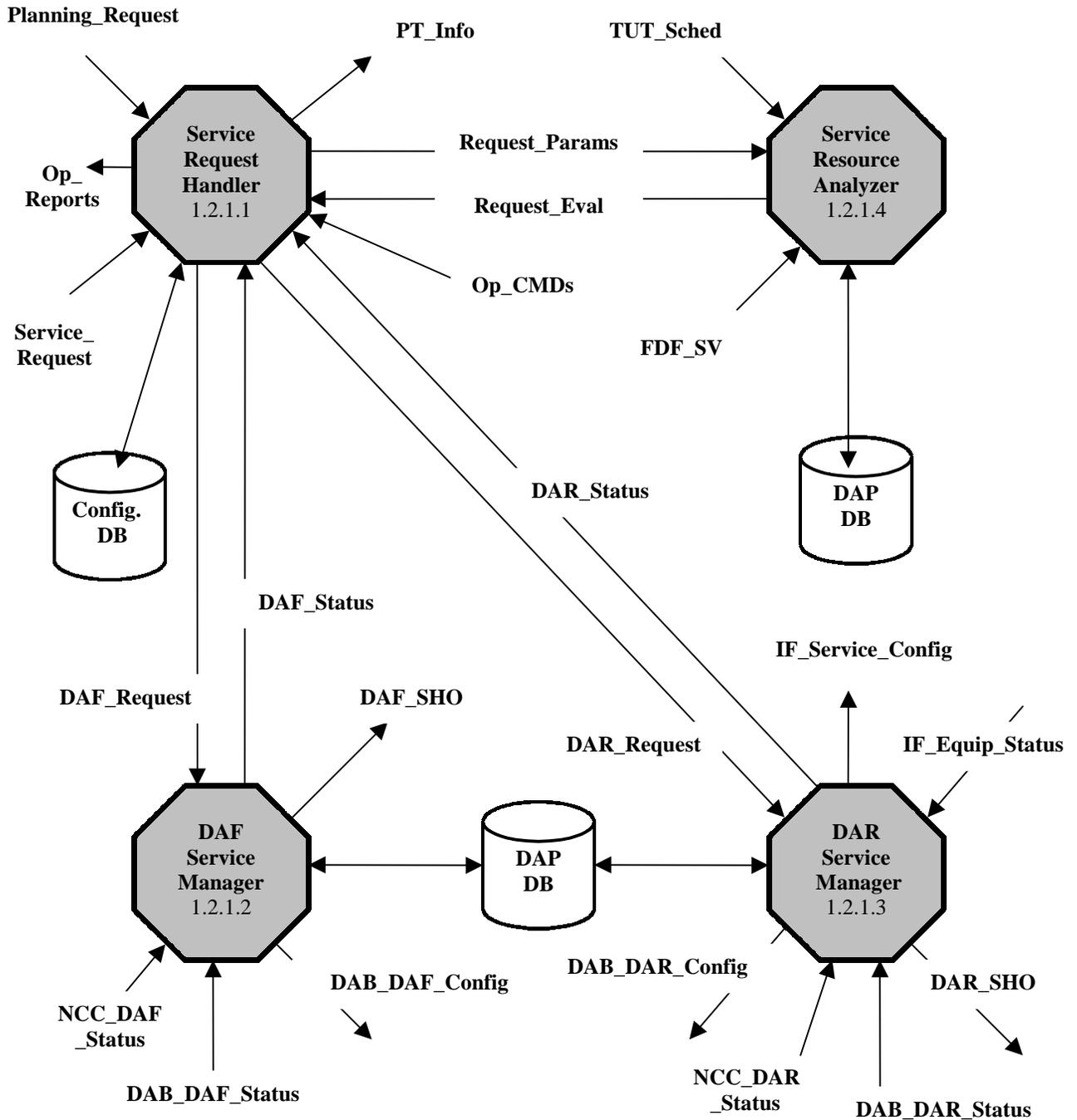


Figure 4-4 Decomposed DAP Function (1.2.1) External and Internal Interfaces and Data Flows

Table 4-5 DAP Function (1.2.1) External Data Flow Decomposition

DAP Function (1.2.1) Parent Data Flow (Figure 4-3)	DAP Function (1.2.1) Child Data Flows (Figure 4-4)	Data Flow Source	Data Flow Destination	Data Flow Contents
PT_Requests	Planning_Request	DA Planning Tool Function (1.1)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> • Planning information request in DAS internal format
	Service_Request	DA Planning Tool Function (1.1)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> • DA service requests in DAS internal format
PT_Info	N/A	Service Request Handler Function (1.2.1.1)	DA Planning Tool Function (1.1)	<ul style="list-style-type: none"> • Planning data in GUI format • Service status reports
DAB_Service_Config	DAB_DAF_Config	DAF Service Manager Function (1.2.1.2)	DAB Function (1.2.2)	<ul style="list-style-type: none"> • DAF service buffering, formatting, and routing specifications • DAB Function DAF system control request specifications • DAB Function DAF test request specifications
	DAB_DAR_Config	DAR Service Manager Function (1.2.1.3)	DAB Function (1.2.2)	<ul style="list-style-type: none"> • DAR service buffering, formatting, and routing specifications • DAB Function DAR system control request specifications • DAB Function DAR test request specifications

Table 4-5 DAP Function (1.2.1) External Data Flow Decomposition (Continued)

DAP Function (1.2.1) Parent Data Flow (Figure 4-3)	DAP Function (1.2.1) Child Data Flows (Figure 4-4)	Data Flow Source	Data Flow Destination	Data Flow Contents
DAB_Status	DAB_DAF_Status	DAB Function (1.2.2)	DAF Service Manager Function (1.2.1.2)	<ul style="list-style-type: none"> • DAF service buffering, formatting, and routing status reports • DAB Function DAF performance monitoring and fault isolation reports
	DAB_DAR_Status	DAB Function (1.2.2)	DAR Service Manager Function (1.2.1.3)	<ul style="list-style-type: none"> • DAR service buffering, formatting, and routing status reports • DAB Function DAR performance monitoring and fault isolation reports
IF_Equip_Status	N/A	DACRM Function (1.2.3)	DAR Service Manager Function (1.2.1.3)	<ul style="list-style-type: none"> • DA service beamformer and data recovery status reports • DACRM Function performance monitoring and fault isolation reports
IF_Service_Config	N/A	DAR Service Manager Function (1.2.1.3)	DACRM Function (1.2.3)	<ul style="list-style-type: none"> • DA service beamformer and data recovery specifications • DACRM Function system control request specifications • DACRM Function test request specifications • Direction cosines for each DAR user

Table 4-5 DAP Function (1.2.1) External Data Flow Decomposition (Continued)

DAP Function (1.2.1) Parent Data Flows (Figure 4-3)	DAP Function (1.2.1) Child Data Flows (Figure 4-4)	Data Flow Source	Data Flow Destination	Data Flow Contents
NCC_TUT	TUT_Sched	NCC	Service Resource Analyzer Function (1.2.1.4)	<ul style="list-style-type: none"> TUT schedule update
	NCC_DAF_Status	NCC	DAF Service Manager Function (1.2.1.2)	<ul style="list-style-type: none"> Status of MAF service requests
	NCC_DAR_Status	NCC	DAR Service Manager Function (1.2.1.3)	<ul style="list-style-type: none"> Status of existing equipment MAR service requests
FDF_SV	N/A	FDF	Service Resource Analyzer Function (1.2.1.4)	<ul style="list-style-type: none"> TDRS and USAT FDF state vectors
DA_SHO	DAF_SHO	DAF Service Manager Function (1.2.1.2)	NCC	<ul style="list-style-type: none"> Requests for normal MAF service within the TUT schedule TDRSS and DAF resource reports
	DAR_SHO	DAR Service Manager Function (1.2.1.3)	NCC	<ul style="list-style-type: none"> NCC request for existing MAR equipment chain to support DAR service request TDRSS and DAR resource reports
Op_CMDs	N/A	DACRM Function (1.2.3)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> DAS equipment system control, test, and configuration parameters in DAS internal format
Op_Reports	N/A	Service Request Handler Function (1.2.1.1)	DACRM Function (1.2.3)	<ul style="list-style-type: none"> DAS equipment performance monitoring and fault isolation reports in DAS internal format

Table 4-6 DAP Function (1.2.1) Internal Data Flows

Internal Data Flow (Figure 4-4)	Data Flow Source	Data Flow Destination	Data Flow Contents
DAF_Request	Service Request Handler Function (1.2.1.1)	DAF Service Manager Function (1.2.1.2)	<ul style="list-style-type: none"> • DAF service configuration specifications • DAF subsystem control specifications • DAF Service Manager Function test request specifications
DAF_Status	DAF Service Manager Function (1.2.1.2)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> • DAF service configuration status • DAF Service Manager Function control status reports • DAF Service Manager Function test request reports
DAR_Request	Service Request Handler Function (1.2.1.1)	DAR Service Manager Function (1.2.1.3)	<ul style="list-style-type: none"> • DAR service configuration specifications • DAR Service Manager Function control specifications • DAR Service Manager Function test request specifications
DAR_Status	DAR Service Manager Function (1.2.1.3)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> • DAR service configuration status • DAR Service Manager Function control status reports • DAR Service Manager Function test request reports
Request_Eval	Service Resource Analyzer Function (1.2.1.4)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> • Planning information reports • Service request resource availability verification report • Service Resource Analyzer Function status and test request reports
Request_Params	Service Request Handler Function (1.2.1.1)	Service Resource Analyzer Function (1.2.1.4)	<ul style="list-style-type: none"> • Planning information request specifications • DA service validation request specifications • Service Resource Analyzer Function test request specifications

4.1.2.2 DAB Function (1.2.2) Data Flow Requirements

The decomposed DAB Function (1.2.2) shown in Figure 4-3 is presented in Figure 4-5. The Figure 4-5 DFD shows that the decomposition of the DAP function has resulted in the following components:

- Four subfunctions of the DAB Function (1.2.2)
 - DAB Service Manager Function (1.2.2.1)
 - Data Buffering Function (1.2.2.2)
 - Data Formatting Function (1.2.2.3)
 - Data Routing Function (1.2.2.4)
- Previously defined DAB external interfaces (shown in Figure 4-3)

- New external interfaces derived from the decomposition of a previously defined DAP external interfaces (shown in Figure 4-3)
- Internal interfaces and data flows between the subfunctions (interfaces and data flows starting on one subfunction and terminating on one of the remaining three subfunctions)

Table 4-7 shows the relationship between the DAP external interfaces shown in Figure 4-5 and Figure 4-3. External interfaces shown in Figure 4-3 that are not decomposed have “not applicable” (N/A) inserted in the second column of Table 4-7. Those data flows that have undergone decomposition have the names of the subordinate or child data flows of the related data flows listed in the second column of the table. Table 4-8 describes the internal interfaces associated with the DAB function at this level of function decomposition.

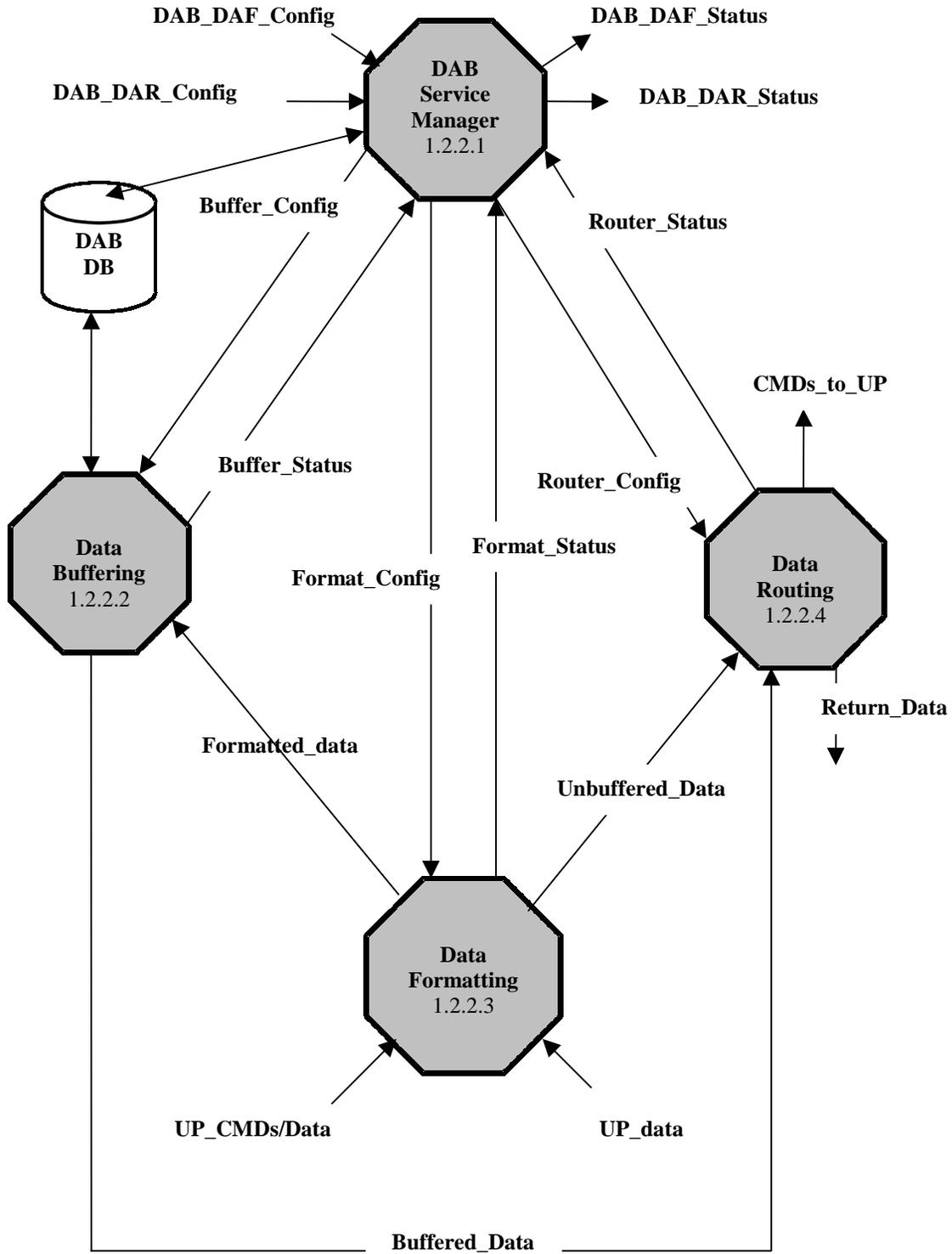


Figure 4-5 Decomposed DAB Function (1.2.2) External and Internal Interfaces and Data Flows

Table 4-7 DAB Function (1.2.2) External Data Flow Decomposition

DAB Function (1.2.2) Parent Data Flow (Figure 4-3)	DAB Function (1.2.2) Child Data Flows (Figure 4-5)	Data Flow Source	Data Flow Destination	Data Flow Contents
DAB_Service_Config	DAB_DAF_Config	DAF Service Manager Function (1.2.1.2)	DAB Service Manager Function (1.2.2.1)	<ul style="list-style-type: none"> • DAF service buffering, formatting, and routing specifications • DAB Function DAF system control request specifications • DAB Function DAF test request specifications
	DAB_DAR_Config	DAR Service Manager Function (1.2.1.3)	DAB Service Manager Function (1.2.2.1)	<ul style="list-style-type: none"> • DAR service buffering, formatting, and routing specifications • DAB Function DAR system control request specifications • DAB Function DAR test request specifications
DAB_Status	DAB_DAF_Status	DAB Service Manager Function (1.2.2.1)	DAF Service Manager Function (1.2.1.2)	<ul style="list-style-type: none"> • DAF service buffering, formatting, and routing status reports • DAB Function DAF performance monitoring and fault isolation reports
	DAB_DAR_Status	DAB Service Manager Function (1.2.2.1)	DAR Service Manager Function (1.2.1.3)	<ul style="list-style-type: none"> • DAR service buffering, formatting, and routing status reports • DAB Function DAR performance monitoring and fault isolation reports
UP_CMDs/Data	N/A	DA Planning Tool Function (1.1)	Data Formatting Function (1.2.2.3)	<ul style="list-style-type: none"> • Unformatted DAS User commands and data for uplinking to the UP
UP_data	N/A	DA RLDRS Function (1.4)	Data Formatting Function (1.2.2.3)	<ul style="list-style-type: none"> • Unformatted UP data and tracking measurement extracted from the DA return IF signal

Table 4-7 DAB Function (1.2.2) External Data Flow Decomposition (Continued)

DAB Function (1.2.2) Parent Data Flow (Figure 4-3)	DAB Function (1.2.2) Child Data Flows (Figure 4-5)	Data Flow Source	Data Flow Destination	Data Flow Contents
Return_Data	N/A	Data Routing Function (1.2.2.4)	DAS User	<ul style="list-style-type: none"> Formatted UP return data and tracking measurement data
CMDs_to_UP	N/A	Data Routing Function (1.2.2.4)	MAF Service Chain	<ul style="list-style-type: none"> Formatted UP commands and data

Table 4-8 DAB Function (1.2.2) Internal Data Flows

Internal Data Flow (Figure 4-5)	Data Flow Source	Data Flow Destination	Data Flow Contents
Buffer_Config	DAB Service Manager Function (1.2.2.1)	Data Buffering Function (1.2.2.2)	<ul style="list-style-type: none"> DA service buffer specifications Data Buffering Function DA system control request specifications Data Buffering Function test request specifications
Buffer_Status	Data Buffering Function (1.2.2.2)	DAB Service Manager Function (1.2.2.1)	<ul style="list-style-type: none"> DA service buffer status reports Data Buffering Function performance monitoring and fault isolation reports
Buffered_data	Data Buffering Function (1.2.2.2)	Data Routing Function (1.2.2.4)	<ul style="list-style-type: none"> Buffered DAF and DAR commands and data released for distribution at the time specified in the service specifications
Format_Config	DAB Service Manager Function (1.2.2.1)	Data Formatting Function (1.2.2.3)	<ul style="list-style-type: none"> DA service formatting specifications Data Formatting Function DA system control request specifications Data Formatting Function test request specifications
Format_Status	Data Formatting Function (1.2.2.3)	DAB Service Manager Function (1.2.2.1)	<ul style="list-style-type: none"> DA service formatting status reports Data Formatting Function performance monitoring and fault isolation reports
Formatted_data	Data Formatting Function (1.2.2.3)	Data Buffering Function (1.2.2.2)	<ul style="list-style-type: none"> Formatted DAF and DAR commands and data to be buffered until the time designated by the service specifications when it is forwarded
Router_Config	DAB Service Manager Function (1.2.2.1)	Data Routing Function (1.2.2.4)	<ul style="list-style-type: none"> DA service routing specifications Data Routing Function DA system control request specifications Data Routing Function test request specifications

Table 4-8 DAB Function (1.2.2) Internal Data Flows (Continued)

Internal Data Flows (Figure 4-5)	Data Flow Source	Data Flow Destination	Data Flow Contents
Router_Status	Data Routing Function (1.2.2.4)	DAB Service Manager Function (1.2.2.1)	<ul style="list-style-type: none"> • DA service routing status reports • Data Routing Function performance monitoring and fault isolation reports
Unbuffered_data	Data Formatting Function (1.2.2.3)	Data Routing Function (1.2.2.4)	<ul style="list-style-type: none"> • Formatted DAF and DAR commands and data to be forwarded immediately without buffering having occurred

4.1.2.3 DARCM Function (1.2.3) Data Flow Requirements

The decomposed DARCM Function (1.2.3) shown in Figure 4-3 is presented in Figure 4-4. The Figure 4-5 DFD shows that the decomposition of the DAP function has resulted in the following components:

- Three DARCM subfunctions
 - DAS Operator MMI Function (1.2.3.1)
 - TGBFS Controller Function (1.2.3.2)
 - RLDRS Controller Function (1.2.3.3)
- Previously defined DARCM external interfaces (shown in Figure 4-3)
- New external interfaces derived from the decomposition of a previously defined DAP external interfaces (shown in Figure 4-3)
- Internal interfaces and data flows between the subfunctions (interfaces and data flows starting on one subfunction and terminating on one of the remaining two subfunctions)

Table 4-9 shows the relationship between the DARCM external interfaces shown in Figure 4-6 and Figure 4-3. External interfaces shown in Figure 4-3 that are not decomposed have “not applicable” (N/A) inserted in the second column of Table 4-9. Those interfaces that have undergone decomposition have the names of the subordinate or child components of the related data flows listed in the second column of the table. There are no internal interfaces among the three subfunctions of the DARCM function.

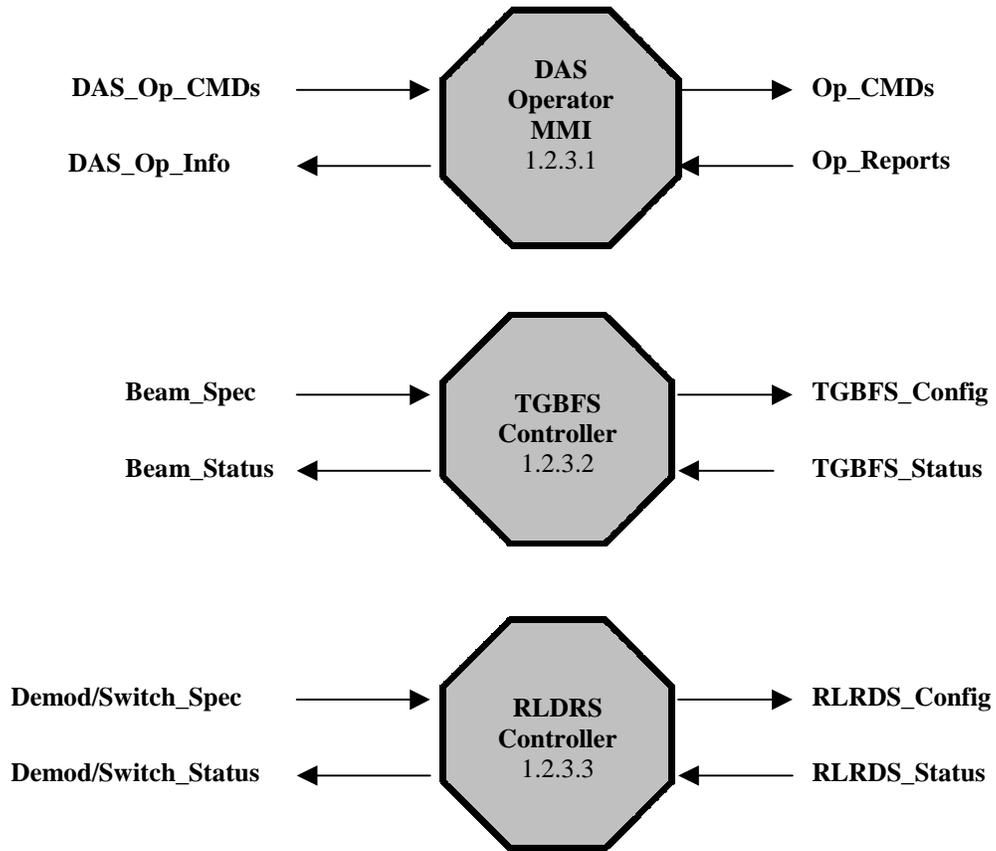


Figure 4-6 Decomposed DARCM Function (1.2.3) External Interfaces and Data Flows

Table 9 DARCM Function (1.2.2) External Data Flow Decomposition

DARCM Function (1.2.3) External Interface Parent Data Flow (Figure 4-3)	DARCM Function (1.2.3) Decomposition Child Data Flows (Figure 4-6)	Data Flow Source	Data Flow Destination	Data Flow Contents
DAS_Op_COMMANDs	N/A	DAS Operator	DAS Operator MMI Function (1.2.3.1)	<ul style="list-style-type: none"> Equipment system control, test, and configuration parameters in GUI presentation format
DAS_Op_Info	N/A	DAS Operator MMI Function (1.2.3.1)	DAS Operator	<ul style="list-style-type: none"> Equipment system control status and test reports in GUI presentation format
Ops_COMMANDs	N/A	DAS Operator MMI Function (1.2.3.1)	DAP Function (1.2.1)	<ul style="list-style-type: none"> System control specifications in DAS internal format System test request specifications in DAS internal format
Op_Reports	N/A	DAP Function (1.2.1)	DAS Operator MMI Function (1.2.3.1)	<ul style="list-style-type: none"> System control status reports Performance monitoring and fault isolation reports in DAS internal format
IF_Service_Config	Beam_Spec	DAP Function (1.2.1)	TGBFS Controller (1.2.3.2)	<ul style="list-style-type: none"> Service request beamformer specifications Test request parameters
	Demod/Switch_Spec	DAP Function (1.2.1)	RLDRS Controller Function (1.2.3.3)	<ul style="list-style-type: none"> Service request demodulator ID, PN code, IF switch, and data multiplexing specifications Test request parameters User specified demodulator ID and PN code
IF_Equip_Status	Beam_Status	TGBFS Controller (1.2.3.2)	DAP Function (1.2.1)	<ul style="list-style-type: none"> Service request beamformer status Test results
	Demod/Switch_Status	RLDRS Controller Function (1.2.3.3)	DAP Function (1.2.1)	<ul style="list-style-type: none"> Service request demodulator, IF switch, and data multiplexing status Test results

Table 9 DARCM Function (1.2.2) External Data Flow Decomposition (Continued)

DARCM Function (1.2.3) External Interface Parent Data Flows (Figure 4-3)	DARCM Function (1.2.3) Decomposition Child Data Flows (Figure 4-6)	Data Flow Source	Data Flow Destination	Data Flow Contents
TGBFS_Config	N/A	TGBFS Controller Function (1.2.3.2)	TGBFS Function (1.3)	<ul style="list-style-type: none"> • TGBFS equipment and DA service configuration data • TGBFS equipment test requests • Direction cosines at a 2 sec update rate for each DAR user
TGBFS_Status	N/A	TGBFS Function (1.3)	TGBFS Controller Function (1.2.3.2)	<ul style="list-style-type: none"> • TGBFS equipment performance monitoring and fault isolation reports in internal DAS format
RLDRS_Config	N/A	RLDRS Controller Function (1.2.3.3)	DA RLDRS Function (1.4)	<ul style="list-style-type: none"> • RLDRS equipment and DA service configuration data • RLDRS equipment test requests
RLDRS_Status	N/A	DA RLDRS Function (1.4)	RLDRS Controller Function (1.2.3.3)	<ul style="list-style-type: none"> • RLDRS equipment performance monitoring and fault isolation reports in internal DAS format

4.1.3 TGBFS Function (1.3) Interfaces Data Flow Requirements

The TGBFS Function is not decomposed in this document since the system is being developed independently prior to the development of the DAS. Therefore, the document entitled Specification for the Third-Generation TDRSS MA Beamforming Subsystem Prototype Controller should be consulted for a decomposition of the TGBFS Function (1.3).

4.1.4 DA RLDRS Function (1.4) Interfaces Data Flow Requirements

The DA RLDRS Function is not decomposed in this document since the system is being developed independently prior to the development of the DAS. Therefore, the document entitled TBD should be consulted for a decomposition of the DA RLDRS Function (1.4).

5. DAS Operations Data Flow Transaction Requirements

This section contains the data flow transactions associated with each of the operational capabilities of the DAS that are presented in Section 4 of the DASDOC. The data flow transaction tables in this section are more detailed than those found in the DASDOC due to the existence of the detailed requirements analysis products (functions and data flows) contained in this document and the DASRS. The tables presented in this section serve to associate groups of data flows described in Section 4 with each DAS operation. In contrast to the static presentation of data flow identification in the DFDs of Section 4, the information presented in this section gives a dynamic perspective of DAS operations in terms an execution profile of subsets of DAS data flows. The data flows presented in the tables below provide a time-ordered sequences of required information exchange that will take place among the internal functions and the external DAS entities from the beginning to the end of each DAS operation.

Table 5-1 contains a cross-reference between the DAS operations names, DASDOC section number, and the section number in this document where each operation is presented in terms of the data flows described in Sections 3 and 4 above. Section 4 of the DASDOC should be consulted if a detailed description of each operation is desired.

Tale 5-1 DASDOC Operation Requirements Cross-Reference

DASDOC Operations Names	DASDOC Section Number	DASICD Section Number
Planning Operations	4.1.1	5.1
Forward Operations	4.1.2	5.2
DAR Unlimited Operations	4.1.3.1	5.3
DAR Limited Operations	4.1.3.2	5.4
Polling DAR Operations	4.1.3.3	5.5
DAR Tracking Operations	4.1.4	5.6
Service Reconfiguration Operations	4.1.5	5.7
TUT Update Operations	4.2.1	5.8
State Vector Updates Operations	4.2.2	5.9
Equipment Status Operations ³	4.2.3	5.2 through 5.13
Start-up Operations	4.3.1	5.10
Configuration Operations	4.3.2	5.11
Test Operations	4.3.3	5.12
Termination Operations	4.3.4	5.13

The data flow transactions presented below serve to identify the subset of DAS data flows required to realize each DAS operation. The ordering of the data flow transactions shown for an operation presented in this section contain some flexibility as far as requirement implementation in the DAS is concerned. Some transactions must occur before others can take place. For example, a request for status data flow must precede a response data flow to the request. However, in many situations, the ordering of several resultant transactions can have several

³ Equipment Status Operations are incorporated in most of the operational data flow transactions shown in Section 5 of the DASICD and are not treated as a separate operations case.

sequential combinations of occurrence without impacting the performance of an operation. In fact, the order may vary in a real-time sense when the DAS is operational since a lot of the transactions are associated with asynchronous events that have varied timing constraints based on specific system loading profiles. In addition, some data flows may occur repetitively over the course of an operation but are only shown once in the table. In reality, a DAS operation may require hundreds of data flow invocations under real-time running conditions. (For example, an implementation of DAR Unlimited Operations might encounter hundreds of Return_Data data flow transactions over long operational periods.) In this sense, the tables identify the minimum size subset of data flow transactions required to realize a given DAS operation. Therefore, each transaction table represents only one of many combinations of time ordered data flow sequences that could produce the same operations results from the perspectives of the DAS Users and DAS Operators. Freedom is given to the system designers as to the actual order and number of times that the some portion of the minimum size subset of required data flows presented herein are executed as long as the objectives and requirements of each operation are met under all DAS loading conditions.

Contingency data flows associated with unusual situations that might arise (e.g., error messages or low-level data transfer acknowledgements) are not presented in the operations transactions described below. This level of requirement detail is left to the C level requirement specification. To present such details here, would only serve to confuse the large scale (B level) perspective of system requirements covered in this document.

The columns of each transaction table shown in this section are grouped into the following four categories and are labeled as follows:

- Data Flow Transaction,
- DAS External Entities,
- DAS Functions, and
- Data Flow Name.

The numbers listed in the Data Flow Transaction column of each table represent the sequential order of the data flow transactions. The External Entities category encompasses all of the external systems with which the DAS interacts. Each of the external entities shown Figure 3-1 occupies a single column under the External Entities category. The grouping entitled DAS Functions identifies the lowest level functions obtained from the function decomposition process contained in Section 4 of this document and the DASRS. Each of the lowest level DAS functions occupies a column under the DAS Functions category. The Data Flow Name column contains the name of the DAS data flow that transfers data across an interface between entities and functions or two functions as depicted on the DFDs of Sections 3 and 4. An “S” in a column indicates that the entity or function is the source of the data flow. A “D” indicates that the entity or function is the destination of the data flow. The Data Dictionary presented in Section 6 contains an alphabetical listing of the data flow names with their contents and cross-references between related information presented elsewhere in the DASICD and the DASRS. The Data Dictionary should be consulted if more detail is desired concerning the contents a data flow or the relationship of a data flow to other DAS requirements in the analysis decomposition process.

5.1 Planning Operations Data Flow Transactions

Table 5-2 shows the sequence of data flows associated with Planning Operations. Planning operations that can precede requests for services. The DA Planning Tool provides the DAS User with a GUI input mechanism for registering user planning information requests with the DAS. During planning operations, the DAS User submits requests form service information that will enable the user to make decisions to be used in formulating DA service requests. The DAP processor analyzes the information requests within the context of available TDRSS resources and visibility constraints. The DAS User is supplied with the results of the analysis that indicate the available times and resources that meet the specifications of the information request. Users that make the same type service requests on a repetitive basis may forgo planning operations prior to each service request. These users may be willing to accept DAS determined service allocations if their requirements are somewhat flexible. The unshaded and shaded rows in Table 5-2 are associated with the following DAS two stages:

- Planning Request and Analysis Stage (Data flow transactions 1 through 3)
- Planning Report Stage (Data flow transactions 4 through 6)

Table 5-2 Planning Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS														DATA FLOW NAME					
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)						
1	S						D																			User_Requests
2							S	D																		Planning_Requests
3								S			D															Request_Params
4								D			S															Request_Eval
5							D	S																		PT_Info
6	D						S																			User_Info

5.2 Forward Operations Data Flow Transactions

Forward Operations provide the DAS User with the capability of forwarding commands and data to a UP. Table 5-3 shows the data flows associated with the implementation of the DAF service and the use of the service to forward DAS User commands and data to the UP. The shaded and unshaded subgroupings of data flows shown in Table 5-3 represent the following four stages of the DAF Service Operations:

- Service Request Stage (Data flow transactions 1 through 6)
- Service Implementation Stage (Data flow transactions 7 through 22)
- UP Command and Data Input stage (Data flows 23 through 27)
- Service Termination Stage (Data flows 28 and 34)

The DA User can invoke the Service Reconfiguration Operations (Section 5.7) to stop the service if it is desired to terminate this service prior to the requested termination time.

Table 5-3 Forward Operations Data Flow Transactions (Continued)

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS													DATA FLOW NAME					
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)		DA RLDRS (1.4)				
23	S													D											UP_CMDS/Data
24													D	S											Formatted_Data
25														S	D										Unbuffered_Data
26													S	D											Buffered_Data
27					D										S										CMDS_to_UP
28											D				S										Router_Status
29											D		S												Format_Status
30											D	S													Buffer_Status
31								D			S														DAB_DAF_Status
32							D	S																	DAF_Status
33						D	S																		PT_Info
34	D					S																			User_Info

5.3 DAR Unlimited Operations Data Flow Transactions

DAR Unlimited Operations provide the DAS User with the capability of receiving data from a UP on a continuous basis until the user decides to terminate the service. This type of operation assumes that the DAS User has dedicated beamformer and demodulator equipment to support the continuous service. Table 5-4 shows the data flows associated with the implementation of the DAR service and the use of the service to receive data from the UP. The shaded and unshaded subgroupings of data flows shown in Table 5-4 represent the following three stages of the DAR Unlimited Operations:

- Service Request Stage (Data flow transactions 1 through 6)
- DAR Service Implementation Stage (Data flow transactions 7 through 26)
- Return Data Recovery Stage (Data flow transactions 27 through 33)

The DA User can invoke the Service Reconfiguration Operations (Section 5.7) to stop the service if it is desired to terminate this service prior to the requested termination time.

Table 5-4 DAR Unlimited Operations Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS													DATA FLOW NAME			
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)		DA RLDRS (1.4)		
1	S						D																User_Requests
2			Ø																				Service_Requests
3			Ø																				Request_Params
4			Ø																				Request_Eval
5			Ø																				PT_Info
6	D						S																User_Info
7								S		D													DAR_Request
8									S		D												DAB_DAR_Config
9											S	D											Buffer_Config
10											S		D										Format_Config
11											S			D									Router_Config
12											D			S									Router_Status
13											D		S										Format_Status
14											D	S											Buffer_Status
15									D		S												DAB_DAR_Status
16									S								D						Beamformer_Spec
17																	S		D				TGBFS_Config
18																	D		S				TGBFS_Status
19									D								S						Beamformer_Status
20									S									D					Demod/Switch_Spec

Table 5-4 DAR Unlimited Operations Data Flow Transactions (Continued)

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS														DATA FLOW NAME
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
21																		S		D	RLDRS_Config
22									D									D		S	RLDRS_Status
23									D									S			Demod/Switch_Status
24							D	S													DAR_Status
25						D	S														PT_Info
26	D					S															User_Info
27					S														D		MAR_IF
28																		S	D		BF_Signal
29													D							S	UP_data
30												D	S								Formatted_Data
31													S	D							Unbuffered_Data
32												S		D							Buffered_Data
33	D													S							Return_Data

5.4 DAR Limited Operations Data Flow Transactions

DAR Limited Operations provide the DAS User with the capability of receiving data from a UP for a specified interval of time. Table 5-5 shows the data flows associated with the implementation of the DAR service and the use of the service to receive data from the UP. DAR Limited Operations assumes that the DAS User Request Operations have been performed by the user sometime in advance to specify the service implementation in terms of resources and time windows. The shaded and unshaded subgroupings of data flows shown in Table 5-5 represent the following four stages of the DAR Limited Operations:

- Service Request Stage (Data flow transactions 1 through 7)
- Existing MAR Data Recovery Stage (Data flow transactions 8 through 12), realized only if the existing MAR equipment is requested
- DAR Service Implementation Stage (Data flow transactions 13 through 31), realized only if the DAS return link equipment is requested
- Return Data Recovery Stage (Data flow transactions 32 through 38), realized only if the DAS return link equipment is requested

The DA User may invoke the Service Reconfiguration Operations (Section 5.7) to stop the service if it is desired to terminate this service prior to the requested termination time.

Table 5-5 DAR Limited Operations Data Flow Transactions (Continued)

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS													DATA FLOW NAME	
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)		DA RLDRS (1.4)
21									S							D					Beamformer_Spec
22																S		D			TGBFS_Config
23																D		S			TGBFS_Status
24									D							S					Beamformer_Status
25									S									D			Demod/Switch_Spec
26																		S		D	RLDRS_Config
27									D									D		S	RLDRS_Status
28									D									S			Demod/Switch_Status
29							D		S												DAR_Status
30						D	S														PT_Info
31	D					S															User_Info
32					S													D			MAR_IF
33																		S	D		BF_Signal
34													D							S	UP_data
35												D	S								Formatted_Data
36													S	D							Unbuffered_Data
37												S		D							Buffered_Data
38	D													S							Return_Data

5.5 Polling Operations Data Flow Transactions

Polling Operations provide the DAS User with the capability of scanning data from multiple USATs controlled by the user and locking onto USAT MAR signals that are encountered in the polling scenario. Table 5-6 shows the data flows associated with the implementation of this DAR service and the use of the service to receive data from the USATs. The shaded and unshaded subgroupings of data flows shown in Table 5-6 represent the following four stages of the Polling Service Operations:

- Service Request Stage (Data flow transactions 1 through 6)
- Return Data Configuration Stage (Data flow transactions 7 through 16)
- Polling Stage (Data flow transactions 17 through 27)
- Return Data Recovery Stage (Data flow transactions 28 through 34)

The Return Data Configuration Stage implements the return data processing requirements in order to prepare for the acquisition of return data from one or more USATs during the polling operations. The polling stage provides the real-time return beam control and demodulator monitoring in an iterative feedback mode such that as each USAT is polled, demodulator lock can be detected and the DAS User can be notified that return data from a specific satellite is being retrieved. The Return Data Recovery Stage provides the DAS User with the return data obtained from the signal of the intercepted USAT.

The DA User can invoke the Service Reconfiguration Operations (Section 5.7) to stop the service if it is desired to terminate this service prior to the requested termination time.

Table 5-6 Polling Operations Data Flow Transactions (Continued)

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS													DATA FLOW NAME	
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)		DA RLDRS (1.4)
21																	D			S	RLDRS_Status
22																	D		S		TGBFS_Status
23									D									S			Demod/Switch_Status
24									D								S				Beam_Status
25							D		S												DAR_Status
26						D	S														PT_Info
27	D					S															User_Info
28					S														D		MAR_IF
29																			S	D	BF_Signal
30														D						S	UP_data
31													D	S							Formatted_Data
32													S	S	D						Unbuffered_Data
33													S		D						Buffered_Data
34	D														S						Return_Data

5.6 DAR Tracking Data Operations Data Flow Transactions

DAR Tracking Data Operations provide the DAS User with the capability of making one-way Doppler tracking measurements for a USAT equipped with a USO and obtaining TDMs from the RLDRS. Table 5-7 shows the data flows associated with the implementation of the DAR tracking service and the use of the service to receive data from the UP. The shaded and unshaded subgroupings of data flows shown in Table 5-7 represent the following four stages of the DAR Tracking Service Operations:

- Service Request Stage (Data flow transactions 1 through 6)
- DAR Tracking Service Implementation Stage (Data flow transactions 7 through 27)
- Tracking Data Recovery Stage (Data flow transactions 28 through 33)

The DA User can invoke the Service Reconfiguration Operations (Section 5.7) to stop the service if it is desired to terminate this service prior to the requested termination time.

Table 5-6 DAR Tracking Operations Data Flow Transactions (Continued0

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS														DATA FLOW NAME
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
21																		S		D	RLDRS_Config
22									D									D		S	RLDRS_Status
23									D									S			Demod/Switch_Status
24							D	S													DAR_Status
25						D	S														PT_Info
26	D					S															User_Info
27					S														D		MAR_IF
28																		S	D		BF_Signal
29													D							S	UP_data
30													S	D							Unbuffered_Data
31													D	S							Formatted_Data
32													S		D						Unbuffered_Data
33	D													S							Return_Data

5.7 Service Reconfiguration Operations Data Flow Transactions

Service Reconfiguration Operations provide the DAS User with the capability of reconfiguring an existing service established by that user. Typical reconfiguration operations include:

- Cancellation of a previously accepted service request
- Lengthening or shortening the duration of a request
- Termination of an operations scenario currently being executed
- Request for alternate equipment chains
- Change in the beamformer mode

Table 5-8 shows the data flows associated with the implementation of the DA Service Reconfiguration Operations. The shaded and unshaded subgroupings of data flows shown in Table 5-8 represent the following four stages of the DAR Limited Service Operations:

- Service Reconfiguration Request Stage (Data flow transactions 1 through 6)
- Existing MAR Service Reconfiguration Stage (Data flow transactions 7 through 10), realized only if the existing MAR service requires reconfiguration
- DAR Service Reconfiguration Stage (Data flow transactions 11 through 23), realized only if the DAR service reconfiguration is requested
- MAF Service Reconfiguration Stage (Data flow transactions 24 through 36), realized only if the DAF service reconfiguration is requested

Table 5-8 Service Reconfiguration Operations Data Flow Transactions (Continued)

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS														DATA FLOW NAME
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
21																	D		S		TGBFS_Status
22										D							S				Beamformer_Status
23										S								D			Demod/Switch_Spec
18																		S		D	RLDRS_Config
19																		D		S	RLDRS_Status
20											D							S			Demod/Switch_Status
21										D		S									DAR_Status
22							D			S											PT_Info
23	D						S														User_Info
24								S	D												DAF_Request
25									S			D									DAB_DAF_Config
26											S	D									Buffer_Config
27												S		D							Format_Config
28												S			D						Router_Config
29												D			S						Router_Status
30												D		S							Format_Status
31												D	S								Buffer_Status
32												S									DAB_DAF_Status
33								D	S												DAF_Status
34							D	S													PT_Info
35		D							S												DAF_SHO

Table 5-8 Service Reconfiguration Operations Data Flow Transactions (Continued)

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS												DATA FLOW NAME			
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)		TGBFS (1.3)	DA RLDRS (1.4)	
36		S						D														NCC_DAF_Status
36							D	S														DAF_Status
37						D	S															PT_Info
38	D					S																User_Info

5.8 TUT Update Operations Data Flow Transactions

TUT Update Operations are transparent to the DAS User. The NCC issues TUT schedules on a daily basis. The DAP receives the schedules and uses the information for DAF service allocation planning information support and service request assessments. Table 5-9 shows the data flow associated with TUT Update Operations.

5.9 State Vector Update Operations Data Flow Transactions

State Vector Update Operations are transparent to the DAS User. The FDF issues TDRSS satellite and USAT state vector updates on varied schedules. The DAP receives the state vectors and uses the information for DA service allocation planning information support and service request assessments. Table 5-10 shows the data flow associated with State Vector Update Operations.

Table 5-9 TUT Update Operations Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES					DAS FUNCTIONS												DATA FLOW NAME				
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)		RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
1		S								D												TUT_Sched

Table 5-10 State Vector Update Operations Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES					DAS FUNCTIONS												DATA FLOW NAME				
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)		RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
1			S							D												FDF_SV

5.10 Start-Up Operations Data Flow Transactions

Start-Up Operations provide the Master DAS Operator located at one of the WSC SLGTs with the capability of cold-starting or warm-starting the DAS. During this operation the data in the designated system configuration files are installed in the system. The components of the DAS are initialized and at the end of the start up operations, the system is placed in a state that allows DAS Users to perform all of the user operations activities. Table 5-11 shows the data flows associated with the Start-Up Operations. The shaded and unshaded subgroupings of data flows shown in Table 5-11 represent the following three stages of the Start-Up Operations:

- Start-Up Request Stage (Data flow transactions 1 through 4)
- Start-Up Implementation Stage (Data flow transactions 5 through 15)
- Start-Up Report Stage (Data flow transactions 16 through 28)

Table 5-11 Start-Up Operations Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS														DATA FLOW NAME
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
1				S												D					DAS_Op_CMDs
2							D									S					Op_CMDs
3							S									D					Op_Reports
4				D												S					DAS_Op_Info
5							S	D													DAF_Request
6							S		D												DAR_Request
7									S	D											Request_Params
8								S			D										DAB_DAF_Config
9											S	D									Buffer_Config
10											S		D								Format_Config
11											S			D							Router_Config
12							S										D				Beamformer_Spec
13																	S		D		TGBFS_Config
14							S											D			Demod/Switch_Spec
15																		S	D		RLDRS_Config
16																		D	S		RLDRS_Status
17							D											S			RLDRS_Ouput
18																	D		S		TGBFS_Status
19							D										S				Beamformer_Status
20											D			S							Router_Status

5.11 Configuration Operations Data Flow Transactions

Configuration Operations provide the Master DAS Operator located at one WSC SLGT with the capability of specifying parameters that define the hardware and software constraints within which the system must function after start up. During Configuration Operations, the Master DAS Operator enters the values of the system parameters into the MMI. These values are stored in a Configuration Database and are accessed when the system is cold-started or warm-started. During system start up, the configuration parameters are distributed throughout the DAS for installation in the appropriate processor memory locations. Table 5-12 shows the data flows associated with the System Configuration Operations. The shaded and unshaded subgroupings of data flows shown in Table 5-12 represent the following two stages of the Configuration Operations:

- Configuration Parameter Installation Stage (Data flow transactions 1 and 2)
- Configuration Report Stage (Data flow transactions 3 and 4)

Table 5-12 Configuration Operations Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS													DATA FLOW NAME				
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)		DA RLDRS (1.4)			
1				S												D								DAS_Op_CMDs
2								D								S								Op_CMDs
3								S								D								Op_Reports
4				D												S								DAS_Op_Info

5.12 Test Operations Data Flow Transactions

Test Operations provide the Master DAS Operator located at one WSC SLGT with the capability of invoking tests on part or the whole of the DAS. During Test Operations, the Master DAS Operator enters test specifications into the MMI. The tests are executed and reports are presented to the Master DAS Operator MMI. Table 5-13 shows the data flows associated with the Test Operations. The shaded and unshaded subgroupings of data flows shown in Table 5-12 represent the following two stages of the Test Operations:

- Test implementation and Execution Stage (Data flow transactions 1 through 13)
- Test Report Stage (Data flow transactions 14 through 26)

Table 5-13 Test Operations Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES					DAS FUNCTIONS														DATA FLOW NAME
	DAS User	NCC	FDF	DAS Operator	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
1				S											D					DAS_Op_CMDS
2							D								S					Op_CMDS
3							S	D												DAF_Request
4							S		D											DAR_Request
5									S	D										Request_Params
6								S			D									DAB_DAF_Config
7											S	D								Buffer_Config
8											S		D							Format_Config
9											S			D						Router_Config
10							S									D				Beamformer_Spec
11															S		D			TGBFS_Config
12							S										D			Demod/Switch_Spec
13																S		D		RLRDS_Config
14																D		S		RLDRS_Status
15							D									S				RLDRS_Ouput
16															D		S			TGBFS_Status
17							D								S					Beamformer_Status
18										D			S							Router_Status
19										D		S								Format_Status
20										D	S									Buffer_Status

Table 5-13 Test Operations Data Flow Transactions (Continued)

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS														DATA FLOW NAME
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
21								D			S										DAB_DAF_Status
22									D	S											DAB_DAR_Status
23							D		S												DAR_Status
24							D	S													DAF_Status
25							S								D						Op_Reports
26				D											S						DAS_Op_Info

5.13 Termination Operations Data Flow Transactions

Termination Operations provide the Master DAS Operator located at one WSC SLGT with the capability of invoking tests on part or the whole of the DAS. During Termination Operations, the Master DAS Operator enters the request into the MMI. System termination proceeds by bring all processes to a halt in an orderly manner and closing all open files. Upon completion, a termination report is issued to the Master DAS Operator via the MMI. Table 5-14 shows the data flows associated with the Termination Operations. The shaded and unshaded subgroupings of data flows shown in Table 5-14 represent the following two stages of the Termination Operations:

- Termination Request and Execution Stage (Data flow transactions 1 through 13)
- Termination Report Stage (Data flow transactions 14 through 26)

Table 5-14 Termination Operations Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES					DAS FUNCTIONS														DATA FLOW NAME					
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)		DA RLDRS (1.4)				
1				S												D									DAS_Op_CMDS
2							D									S									Op_CMDS
3							S	D																	DAF_Request
4							S		D																DAR_Request
5									S	D															Request_Params
6								S			D														DAB_DAF_Config
7											S	D													Buffer_Config
8											S		D												Format_Config
9											S			D											Router_Config
10							S										D								Beamformer_Spec
11																S		D							TGBFS_Config
12							S											D							Demod/Switch_Spec
13																	S			D					RLRDS_Config
14																	D				S				RLDRS_Status
15							D											S							RLDRS_Ouput
16																	D		S						TGBFS_Status
17							D										S								Beamformer_Status
18											D			S											Router_Status
19											D		S												Format_Status
20											D	S													Buffer_Status

Table 5-14 Termination Operations Data Flow Transactions

DATA FLOW TRANSACTION	DAS EXTERNAL ENTITIES						DAS FUNCTIONS														DATA FLOW NAME
	DAS User	NCC	FDF	DAS Operator	MAF Service Chain	MAR Service Chain	DA Planning Tool (1.1)	Service Request Handler (1.2.1.1)	DAF Service Manager (1.2.1.2)	DAR Service Manager (1.2.1.3)	Service Resource Analyzer (1.2.1.4)	DAB Service Manager (1.2.2.1)	Data Buffering (1.2.2.2)	Data Formatting (1.2.2.3)	Data Routing (1.2.2.4)	DAS Operator MMI (1.2.3.1)	TGBFS Controller (1.2.3.2)	RLDRS Controller (1.2.3.3)	TGBFS (1.3)	DA RLDRS (1.4)	
21								D			S										DAB_DAF_Status
22									D	S											DAB_DAR_Status
23							D		S												DAR_Status
24							D	S													DAF_Status
25							S								D						Op_Reports
26				D											S						DAS_Op_Info

6. DAS Data Dictionary

Table 6-1 contains the data flow dictionary for the DAS. The data dictionary acts as a cross-reference that links the data flows to functions and external entities presented in this document and the DASRS. The functions listed are the lowest level DAS functions. The lowest level functions provide the most detailed perspective of system requirements. Higher level functions and data flows associated with the data flows listed in Table 6-1 can be identified through the function numbering and data flows parent and child information contained therein. With the parent to child links in the function and data flow decomposition hierarchies, it is possible to quickly locate the predecessor DFDs and function descriptions associated with a specific data flow in both the DASICD and the DASRS, respectively. If the contents of Table 6-1 is chosen as a starting point to look-up information about the DAS, Section 4 of both the DASICD and the DASRS should be logically consulted to expand an overall DAS requirements understanding. The contents of the columns in Table 6-1 are as follows:

- The first column (column at the left) contains the alphabetical listing of all data flow names that appear in the DFDs of Section 4 and the DAS operations data flow transaction tables of Section 5.
- The second column from the left contains the name of the parent data flow that spawned the flow in the left-hand column during the function decomposition process. “N/A” entries in this column indicates that the flow is not the result of the decomposition of a higher-level data flow. An entry of “N/A” indicates that the data flow is a primary data flow with respect to the child data flows that may be spawned.
- The third column from the left contains child data flows that are spawned by the data flow listed in the left-most column. “N/A” entries in the column indicates that there are no child data forms spawned by the data flow in the left most column. An entry of “N/A” indicates that the data flow is at the lowest-level of decomposition for the requirements analysis. In some instance, a “N/A” appears in both the second and third columns. This reflects the existence of internal DAS data flows that are not decomposed during the system analysis process.
- The fourth column from the left contains the function numbers or DAS external entity name that is the source of the data flow listed in the left-most column. If more than one function is identified, it implies that data flow in the left-most column appears on the DFD of each function listed. More than one function entry in this column reflects the subset of the total DAS function hierarchy associated with the data flow listed in the left-most column. In some instances, the data flow does not explicitly interface with a listed function. Instead, its parent interfaces, and the data flow appears on the next lower level of decomposition as the by-product of the analysis process. These limited exceptions must be dealt with on an individual basis in following the trail of system decomposition.
- The fifth column from the left contains the function numbers or DAS external entity name that is the destination of the data flow listed in the left-most column. If more than one function is identified, it implies that data flow in the left-most column appears on the DFD of each function listed. More than one function entry in this column reflects the subset of the total DAS function hierarchy associated with the data flow listed in the left-most column. In some instances, the data flow does not explicitly interface with a listed function. Instead, its parent interfaces, and the data flow appears on the next lower level of decomposition as the

by-product of the analysis process. These limited exceptions must be dealt with on an individual basis in following the trail of system decomposition.

- The sixth column from the left contains a summary description of the contents of the data flow listed in the left most column.

Table 6-1 DAS Data Flow Dictionary

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
Beam_Spec	IF_Service_Config	N/A	DAP Function (1.2.1)	TGBFS Controller Function (1.2.3.2)	<ul style="list-style-type: none"> Service request beamformer specifications Test request parameters
Beam_Status	IF_Service_Status	N/A	TGBFS Controller Function (1.2.3.2)	DAP Function (1.2.1)	<ul style="list-style-type: none"> Service request beamformer status Test results
BF_Signal	N/A	N/A	TGBFS Function (1.3)	DA RLDRS Function (1.4)	<ul style="list-style-type: none"> Beamformer output IF signals input to DA RLDRS IF switch and demodulators
Buffer_Config	N/A	N/A	DAB Service Manager Function (1.2.2.1)	Data Buffering Function (1.2.2.2)	<ul style="list-style-type: none"> DA service buffer specifications Data Buffering Function DA system control request specifications Data Buffering Function test request specifications
Buffer_Status	N/A	N/A	Data Buffering Function (1.2.2.2)	DAB Service Manager Function (1.2.2.1)	<ul style="list-style-type: none"> DA service buffer status reports Data Buffering Function performance monitoring and fault isolation reports
Buffered_Data	N/A	N/A	Data Buffering Function (1.2.2.2)	Data Routing Function (1.2.2.4)	<ul style="list-style-type: none"> Formatted DAF and DAR commands and data to be forwarded immediately without buffering having occurred
Cal_Vct	MAR_IF	N/A	MAR Service Chain	<ul style="list-style-type: none"> DAS Function (1.0) TGBFS Function (1.3) 	<ul style="list-style-type: none"> Calibration vector from MABE controller
CMDS_to_UP	N/A	N/A	<ul style="list-style-type: none"> DAS Function (1.0) DACDHS Function (1.2) 	MAF Service Chain	<ul style="list-style-type: none"> Buffered or real-time commands and data forwarded to the UP

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
DA_SHO	N/A	<ul style="list-style-type: none"> DAF_SHO DAR_SHO 	<ul style="list-style-type: none"> DAS Function (1.0) DACDHS Function (1.2) 	NCC	<ul style="list-style-type: none"> Requests for normal MAF service within the TUT schedule Requests for existing MAR equipment chain to support DAR services TDRSS resource reports
DAB_DAF_Config	DAB_Service_Config	N/A	DAF Service Manager Function (1.2.1.2)	DAB Function (1.2.2)	<ul style="list-style-type: none"> DAF service buffering, formatting, and routing specifications DAB Function DAF system control request specifications DAB Function DAF test request specifications
DAB_DAF_Status	DAB_Status	N/A	DAB Function (1.2.2)	DAF Service Manager Function (1.2.1.2)	<ul style="list-style-type: none"> DAF service buffering, formatting, and routing status reports DAB Function DAF performance monitoring and fault isolation reports
DAB_DAR_Config	DAB_Service_Config	N/A	DAR Service Manager Function (1.2.1.3)	DAB Function (1.2.2)	<ul style="list-style-type: none"> DAR service buffering, formatting, and routing specifications DAB Function DAR system control request specifications DAB Function DAR test request specifications
DAB_DAR_Status	DAB_Status	N/A	DAB Function (1.2.2)	DAR Service Manager Function (1.2.1.3)	<ul style="list-style-type: none"> DAR service buffering, formatting, and routing status reports DAB Function DAR performance monitoring and fault isolation reports
DAB_Service_Config	N/A	<ul style="list-style-type: none"> DAB_DAF_Config DAB_DAR_Config 	DAP Function (1.2.1)	DAB Function (1.2.2)	<ul style="list-style-type: none"> DA service buffering, formatting, and routing specifications DAB Function system control request specifications DAB Function test request specifications

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
DAB_Status	N/A	<ul style="list-style-type: none"> • DAB_DAF_Status • DAB_DAR_Status 	DAB Function (1.2.2)	DAF Service Manager Function (1.2.1.2)	<ul style="list-style-type: none"> • DA service buffering, formatting, and routing status reports • DAB Function performance monitoring and fault isolation reports
DAF_Request	N/A	N/A	Service Request Handler Function (1.2.1.1)	DAF Service Manager Function (1.2.1.2)	<ul style="list-style-type: none"> • DAF service configuration specifications • DAF subsystem control specifications • DAF Service Manager Function test request specifications
DAF_SHO	DA_SHO	N/A	DAF Service Manager Function (1.2.1.2)	NCC	<ul style="list-style-type: none"> • Requests for normal MAF service within the TUT schedule • TDRSS and DAF resource reports
DAF_Status	N/A	N/A	DAF Service Manager Function (1.2.1.2)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> • DAF service buffering, formatting, and routing status reports • DAB Function DAF performance monitoring and fault isolation reports
DAR_Request	N/A	N/A	Service Request Handler Function (1.2.1.1)	DAR Service Manager Function (1.2.1.3)	<ul style="list-style-type: none"> • DAR service configuration specifications • DAR Service Manager Function control specifications • DAR Service Manager Function test request specifications
DAR_SHO	DA_SHO	N/A	DAR Service Manager Function (1.2.1.3)	NCC	<ul style="list-style-type: none"> • NCC request for existing MAR equipment chain to support DAR service request • TDRSS and DAR resource reports
DAR_Status	N/A	N/A	DAR Service Manager Function (1.2.1.3)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> • DAR service configuration status • DAR Service Manager Function control status reports • DAR Service Manager Function test request reports

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
DAS_Op_CMDs	N/A	N/A	DAS Operator	<ul style="list-style-type: none"> DAS Function (1.0) DACDHS Function (1.2) DARCM Function (1.2.3) DAS Operator MMI Function (1.2.3.1) 	<ul style="list-style-type: none"> DAS equipment system control, test, and configuration parameters in GUI presentation format
DAS_Op_Info	N/A	N/A	<ul style="list-style-type: none"> DAS Function (1.0) DACDHS Function (1.2) DARCM Function (1.2.3) DAS Operator MMI Function (1.2.3.1) 	DAS Operator	<ul style="list-style-type: none"> DAS equipment performance monitoring and fault isolation reports in GUI presentation format
Demod/Switch_Spec	IF_Service_Config	N/A	DAP Function (1.2.1)	RLDRS Controller Function (1.2.3.3)	<ul style="list-style-type: none"> Service request demodulator ID, PN code, IF switch, and data multiplexing specifications Test request parameters User specified demodulator ID and PN code
Demod/Switch_Status	IF_Service_Status	N/A	RLDRS Controller Function (1.2.3.3)	DAP Function (1.2.1)	<ul style="list-style-type: none"> Service request demodulator, IF switch, and data multiplexing status Test results

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
FDF_SV	N/A	N/A	FDF	<ul style="list-style-type: none"> • DAS Function (1.0) • DACDHS Function (1.2) • DAP Function (1.2.1) • Service Resource Analyzer Function (1.2.1.4) 	<ul style="list-style-type: none"> • TDRS and USAT state vectors
Format_Config	N/A	N/A	DAB Service Manager Function (1.2.2.1)	Data Formatting Function (1.2.2.3)	<ul style="list-style-type: none"> • DA service formatting specifications • Data Formatting Function DA system control request specifications • Data Formatting Function test request specifications
Format_Status	N/A	N/A	Data Formatting Function (1.2.2.3)	DAB Service Manager Function (1.2.2.1)	<ul style="list-style-type: none"> • DA service formatting status reports • Data Formatting Function performance monitoring and fault isolation reports
Formatted_data	N/A	N/A	Data Formatting Function (1.2.2.3)	Data Buffering Function (1.2.2.2)	<ul style="list-style-type: none"> • Formatted DAF and DAR commands and data to be buffered until the time designated by the service specifications when it is forward
IF_Equip_Status	N/A	<ul style="list-style-type: none"> • Beam_Status • Demod/Switch_Status 	DARCM Function (1.2.3)	DAP Function (1.2.1)	<ul style="list-style-type: none"> • DA service beamformer and data recovery status reports • DARCM Function performance monitoring and fault isolation reports
IF_Service_Config	N/A	<ul style="list-style-type: none"> • Beam_Spec • Demod/Switch_Spec 	DAP Function (1.2.1)	DARCM Function (1.2.3)	<ul style="list-style-type: none"> • DA service beamformer and data recovery specifications • DARCM Function system control request specifications • DARCM Function test request specifications • Direction cosines for each DAR user

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
IF_Signal	MAR_IF	N/A	MAR Service Chain	TGBFS Function (1.3)	<ul style="list-style-type: none"> IF signal containing UP return data
MAR_IF	N/A	<ul style="list-style-type: none"> IF_Signal Cal_Vct 	MAR Service Chain	DAS Function (1.0)	<ul style="list-style-type: none"> IF signal containing UP return data Calibration vector from MABE controller
NCC_DAF_Status	NCC_TUT	N/A	NCC	DAF Service Manager Function (1.2.1.2)	<ul style="list-style-type: none"> Status of MAF service requests
NCC_DAR_Status	NCC_TUT	N/A	NCC	DAR Service Manager Function (1.2.1.3)	<ul style="list-style-type: none"> Status of existing equipment MAR service requests
NCC_TUT	N/A	<ul style="list-style-type: none"> NCC_DAF_Status NCC_DAR_Status 	NCC	<ul style="list-style-type: none"> DAS Function (1.0) DACDHS Function (1.2) DAP Function (1.2.1) 	<ul style="list-style-type: none"> Daily NCC TUT schedules for DAF allocation use Status of DAF service requests Status of existing MAR equipment DAR service requests
Op_COMMANDs	N/A	N/A	<ul style="list-style-type: none"> DARCM Function (1.2.3) DAS Operator Function (1.2.3.1) 	DAP Function (1.2.1)	<ul style="list-style-type: none"> System control specifications in DAS internal format System test request specifications in DAS internal format
Op_Reports	N/A	N/A	DAP Function (1.2.1)	<ul style="list-style-type: none"> DARCM Function (1.2.3) DAS Operator Function (1.2.3.1) 	<ul style="list-style-type: none"> System control status reports Performance monitoring and fault isolation reports in DAS internal format
Planning_Request	PT_Requests	N/A	DA Planning Tool Function (1.1)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> Planning information request in DAS internal format

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
PT_Info	N/A	N/A	<ul style="list-style-type: none"> • DACDHS Function (1.2) • DAP Function (1.2.1) • Service Request Handler Function (1.2.1.1) 	DA Planning Tool Function (1.1)	<ul style="list-style-type: none"> • Planning data in GUI format • Service status reports
PT_Requests	N/A	<ul style="list-style-type: none"> • Planning Request • Service Request 	DA Planning Tool Function (1.1)	<ul style="list-style-type: none"> • DACDHS Function (1.2) • DAP Function (1.2.1) • Service Request Handler Function (1.2.1.1) 	<ul style="list-style-type: none"> • Planning information request in DAS internal format • DA service requests in DAS internal format
Request_Params	N/A	N/A	Service Request Handler Function (1.2.1.1)	Service Resource Analyzer Function (1.2.1.4)	<ul style="list-style-type: none"> • Planning information request specifications • DA service validation request specifications • Service Resource Analyzer Function test request specifications
Request_Eval	N/A	N/A	Service Resource Analyzer Function (1.2.1.4)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> • Planning information reports • Service request resource availability verification report • Service Resource Analyzer Function status and test request reports

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
Return_Data	User_Info	N/A	<ul style="list-style-type: none"> • DACDHS Function (1.2) • DAB Function (1.2.2) • Data Routing Function (1.2.2.4) 	DAS User	<ul style="list-style-type: none"> • Formatted UP return data • Formatted tracking measurement data
RLDRS_Config	N/A	N/A	<ul style="list-style-type: none"> • DACDHS Function (1.2) • DARCM Function (1.2.3) • RLDRS Controller Function (1.2.3.3) 	• DA RLDRS Function (1.4)	<ul style="list-style-type: none"> • RLDRS equipment and DA service configuration data • RLDRS equipment test requests
RLDRS_Output	N/A	<ul style="list-style-type: none"> • RLDRS_Status • Up_Data 	DA RLDRS Function (1.4)	DACDHS Function (1.2)	<ul style="list-style-type: none"> • Unformatted UP data and tracking measurement data extracted from the IF signal • RLDRS equipment performance monitoring and fault isolation reports in internal DAS format
RLDRS_Status	RLDRS_Output	N/A	DA RLDRS Function (1.4)	<ul style="list-style-type: none"> • DARCM Function (1.2.3) • RLDRS Controller Function (1.2.3.3) 	<ul style="list-style-type: none"> • RLDRS equipment performance monitoring and fault isolation reports in internal DAS format
Router_Config	N/A	N/A	DAB Service Manager Function (1.2.2.1)	Data Routing Function (1.2.2.4)	<ul style="list-style-type: none"> • DA service routing specifications • Data Routing Function DA system control request specifications • Data Routing Function test request specifications

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
Router_Status	N/A	N/A	Data Routing Function (1.2.2.4)	DAB Service Manager Function (1.2.2.1)	<ul style="list-style-type: none"> DA service routing status reports Data Routing Function performance monitoring and fault isolation reports
Service_Request	PT_Requests	N/A	DA Planning Tool Function (1.1)	Service Request Handler Function (1.2.1.1)	<ul style="list-style-type: none"> DA service requests in DAS internal format
TGBFS_Config	N/A	N/A	<ul style="list-style-type: none"> DACDHS Function (1.2) DAP Function (1.2.1) TGBFS Controller Function (1.2.3.2) 	TGBFS Function (1.3)	<ul style="list-style-type: none"> TGBFS equipment and DA service configuration data TGBFS equipment test requests Direction cosines at a 2 sec update rate for each DAR user
TGBFS_Status	N/A	N/A	TGBFS Function (1.3)	<ul style="list-style-type: none"> DACDHS Function (1.2) DAP Function (1.2.1) TGBFS Controller Function (1.2.3.2) 	<ul style="list-style-type: none"> TGBFS equipment performance monitoring and fault isolation reports in internal DAS format
TUT_Sched	NCC_TUT	N/A	NCC	Service Resource Analyzer Function (1.2.1.4)	<ul style="list-style-type: none"> TUT schedule update
Unbuffered	N/A	N/A	Data Formatting Function (1.2.2.3)	Data Routing Function (1.2.2.4)	<ul style="list-style-type: none"> Formatted DAF and DAR commands and data to be forwarded immediately without buffering having occurred

Table 6-1 DAS Data Flow Dictionary (Continued)

Data Flow Name	Parent Data Flow Name	Children Data Flow Names	Hierarchy of Data Flow Sources	Hierarchy of Data Flow Destinations	Data Flow Contents
UP_ CMDs/Data	User_Requests	N/A	DAS User	<ul style="list-style-type: none"> • DACDHS Function (1.2) • DAB Function (1.2.2) • Data Formatting Function (1.2.2.3) 	<ul style="list-style-type: none"> • Commands and data for buffering and uplinking to UP
UP_data	N/A	N/A	DA RLDRS Function (1.3)	<ul style="list-style-type: none"> • DAB Function (1.2.2) • Data Formatting Function (1.2.2.3) 	<ul style="list-style-type: none"> • Unformatted UP data and tracking measurement data extracted from the IF signal
User_Info	N/A	<ul style="list-style-type: none"> • User_Planning_Info • Return_Data 	DAS Function (1.0)	DA User	<ul style="list-style-type: none"> • Planning information in GUI presentation format • DA service status in GUI format • UP return data • Tracking measurement data
User_Planning_Info	User_Info	N/A	DA Planning Tool Function (1.1)	DAS User	<ul style="list-style-type: none"> • Planning information in GUI format • DA service status in GUI format
User_Planning_Info_Requests	User_Requests	N/A	DAS User	DA Planning Tool Function (1.1)	<ul style="list-style-type: none"> • Planning information and DA service requests in GUI format
User_Requests	N/A	<ul style="list-style-type: none"> • User_Planning_Info_Requests • UP_CMDs/Data 	DAS User	DAS Function (1.0)	<ul style="list-style-type: none"> • Planning information and DA service requests in GUI presentation data format • Commands and data for buffering and uplinking to UP

7. Abbreviations and Acronyms

CMD	Command
DAB	Demand Access Buffer
DACDHS	Demand Access Control Data Handling System
DAF	Demand Access Forward
DAP	Demand Access Processor
DAR	Demand Access Return
DARCM	Demand Access Return Control/Monitoring
DARCMS	Demand Access Return Control/Monitoring System
DAS	Demand Access System
DASDOC	Demand Access System Description and Operations Concept
DASICD	Demand Access Interface Control Document
DASRS	Demand Access System Requirements Specification
DFD	Data Flow Diagram
FDF	Flight Dynamics Facility
GSFC	Goddard Space Flight Center
GT	Ground Terminal
GUI	Graphical User Interface
IF	Intermediate Frequency
IBU	Independent Beamformer Unit
IONet	Input/Output Network
MA	Multiple Access
MABE	Multiple Access Beamforming Equipment
MAF	Multiple Access Forward
MAR	Multiple Access Return
NCC	Network Control Center
N/A	Not Applicable
PN	Pseudorandom Noise
POCC	Project Operations Control Center
RF	Radio Frequency
RLDRS	Return Link Data Recovery Subsystem
SDD	Software Design Document
SGL	Space Ground Link
SGLT	Space Ground Link Terminal
SHO	Schedule Request Order
SN	Space Network
SRO	Service Reconfiguration Operation
STDN	Spaceflight Tracking and Data Network
SV	State Vector
TDRS	Tracking and Data Relay Satellite
TDRSS	Tracking and Data Relay Satellite System
TDM	Tracking Data Message
TGBFS	Third Generation Beamforming System
TUT	TDRS Unused Time
UP	User Platform
USAT	User Satellite
USO	Ultra-Stable Oscillator

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