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PLANETARY DATA SYSTEM

SYSTEM REQUIREMENTS REVIEW

July 29, 1986

Planetary Data System
System Requirements Review
July 29, 1986

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PDS System Requirements Review

PDS Project Overview

J. T. Renfrow

July 29, 1986

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PDS Project Overview — PDS System Requirements Review

Topics To Be Covered

- Mission of the Planetary Data System
- Components of the PDS Project
- PDS Measures of Success
- Characteristics of the Three Versions of the PDS Operational System
- PDS Project Organization
- PDS Work Breakdown Structure
- PDS Top Level Schedules

Mission of Planetary Data System

- Provide a system which planetary scientists can use to locate, examine and retrieve useful planetary science data.
- Restore and preserve planetary science data so that it will still exist in usable form when needed by planetary scientists in the future.

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PDS Project Overview — PDS System Requirements Review

Components of PDS Project – Technology Evaluation

- Data Storage – Optical Disk technology
- Communications – Networks (DECnet and TCP/IP and ISO)
- Data Presentation – Navigation, Image, Workstations
- Data Management – Data base machines, Storage and retrieval of scientific data types
- Standards – Storage, Transfer, and Data Administration

Components of PDS Project – Integrated Science Testbeds

- Represent the broad spectrum of planetary science disciplines
- Help to define requirements for operational PDS
- Prepare data sets and data catalog information
- Evaluate the technology components in the context of actually "doing science"

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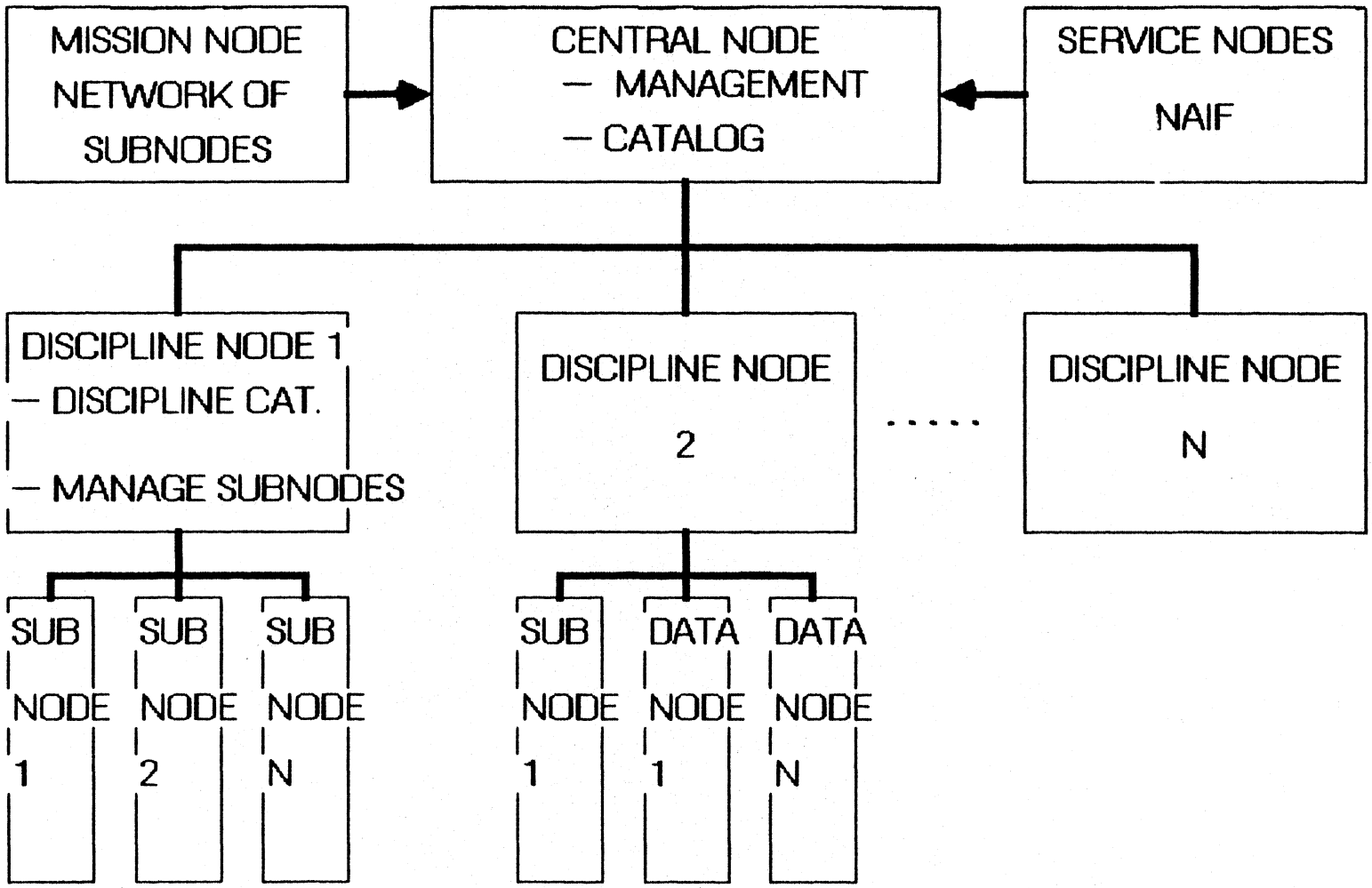
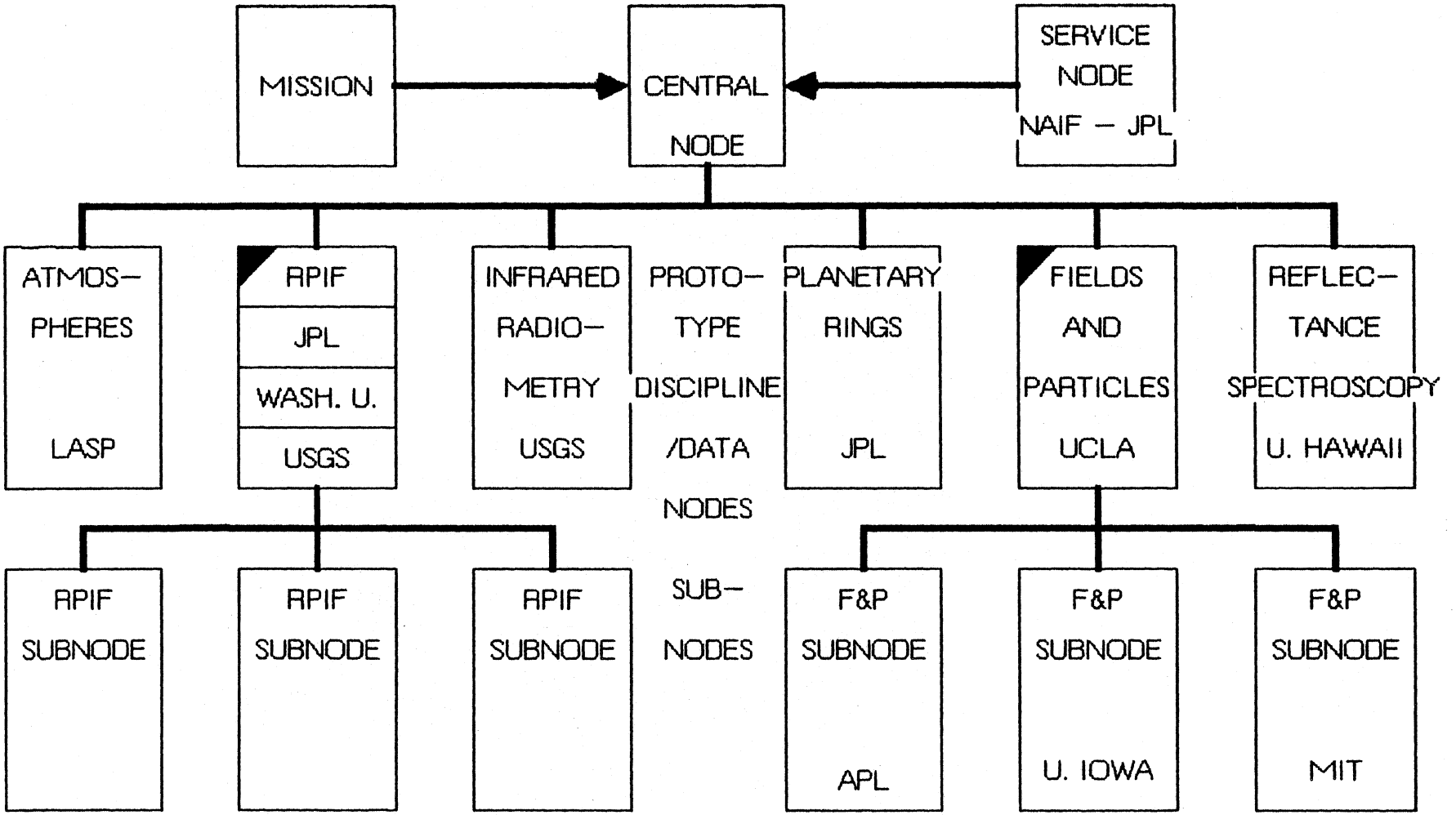
Generic Representation of Node Types



Version One Discipline Node Participation



= NODES TO HAVE DETAILED — LEVEL CATALOGS AT CENTRAL NODE AND DISCIPLINE NODE IN COMPLETED VERSION 1.0

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Components of PDS Project – Operational PDS

- Develop requirements and design concept for PDS
- Define and develop the PDS interface with the planetary missions (This is known as the Mission Interface)
- Develop interface with NSSDC and other entities handling planetary science data
- Define and establish distributed Discipline/Data Nodes
- Establish standards and procedures for system wide operations
- Build and operate three successive Versions of the PDS

PDS Version 1.0

- 1) Design the structure (logical and conceptual models) for a high-level catalog at the central node for use by ALL prototype discipline/data nodes.
- 2) Implement the design for the high-level catalog and populate the database with data (for structures defined in 1 above).
- 3) Design and develop the basic portion of a solid, consistent user interface (TAE and/or FREEFORM menus), both at the central node and, as feasible, at the remote sites.
- 4) Develop a detailed-level catalog at the central node for use by TWO prototype discipline/data nodes, namely imaging (RPIF) and fields and particles (F & P).

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PDS Project Overview — PDS System Requirements Review

PDS Version 1.0 (Cont.)

- 5) Implement the design for the detailed-level catalog and populate the database with data (for structures defined in 4 above).
- 6) Provide remote access to the PDS VAX 11/780.
- 7) Provide limited (and perhaps non-automated) data distribution capability.
- 8) Plan and coordinate the data set restoration activities of the prototype discipline/data nodes, and the integration of these data sets into the PDS database.
- 9) Descope functional capability, as necessary, to deliver by Mid FY'87.

PDS Version 2.0

- 1) Select the actual discipline nodes, sub-nodes and data nodes which will be part of the "official" PDS system.
- 2) Refine the high-level catalog and develop a detailed-level catalog at the central node for EACH of the discipline nodes.
- 3) Implement the design for the detailed-level catalogs and populate the database with data (for structures defined in 2 above).
- 4) Assist TWO of the discipline nodes, possibly F&P and RPIF, in the development of their own detailed-level catalogs on their own hardware/software system.
- 5) Orchestrate the access to the TWO selected discipline nodes and assure a common user interface and design.

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PDS Version 2.0 (Cont.)

- 6) Continue to plan and coordinate the data set restoration activities of the discipline nodes, and to oversee the integration of actual science data into the PDS system.

- 7) Refine the data distribution and the system management capabilities, including limited accounting procedures.

- 8) Select a site for a "deep" archive for PDS data. Establish and integrate the interface between PDS and the data archive facility.

- 9) Refine and develop the remaining portion of the user interface.

- 10) Provide a reliable network or communication path for users to access the discipline nodes "in a transparent fashion".

- 11) Use software cost models to determine a reasonable delivery date for implementing the above functional capability. (mid FY'89 ?)

PDS Version 3.0

- 1) Assist the REMAINING discipline nodes in the development of their own detailed-level catalogs on their own hardware/software system.
- 2) Orchestrate the access to the REMAINING discipline nodes and assure a common user interface.
- 3) Incorporate an integrated browse capability and graphics capability into the PDS System.
- 4) Refine the user interface and data presentation capability.
- 5) Establish and implement systematic user accounting/charging procedures.

PDS Version 3 (Cont.)

- 6) Refine data duplication and distribution capabilities, as well as the system management capability, based on feedback from the user community.
- 7) Continue to coordinate with the discipline nodes to add science data to the PDS system.
- 8) Incorporate a limited data analysis capability into the PDS System.
- 9) Use software cost models to determine a reasonable delivery date for implementing the above functional capability. (mid FY'91 ?)

PDS Measures of Success

- It is important to define what will constitute a successful project and how we can measure this.
- The measurement and interpretation process is difficult.
  - Some measures of success are strictly qualitative.
  - Other measures can be quantitative but the translation between system qualitative measurements and measures of success may not be well understood.

Proposed Measures of Success

- The number of planetary scientists who use the system should increase over time and eventually reach a large portion of the planetary scientists conducting active research projects sponsored by NASA.

- The frequency and severity of the problems encountered by the planetary scientists using the system should decrease over time. The problems of a first time user should diminish, the later a planetary scientist becomes a first time user because the training methods and materials and system user friendliness will have improved.

- The percentage of user questions to the support staff that can be answered to the user's satisfaction should increase over time.

Proposed Measures of Success (Cont.)

- The cost of maintaining the system.
- The cost of replicating the system to another Discipline Node.
- The cost of preparing data for submission to the PDS.
- The cost of restoring data sets.
- The cost over time of running the system,
  - per number of requests to the system,
  - per the number of data sets stored in the system, and
  - per the volume of data delivered.

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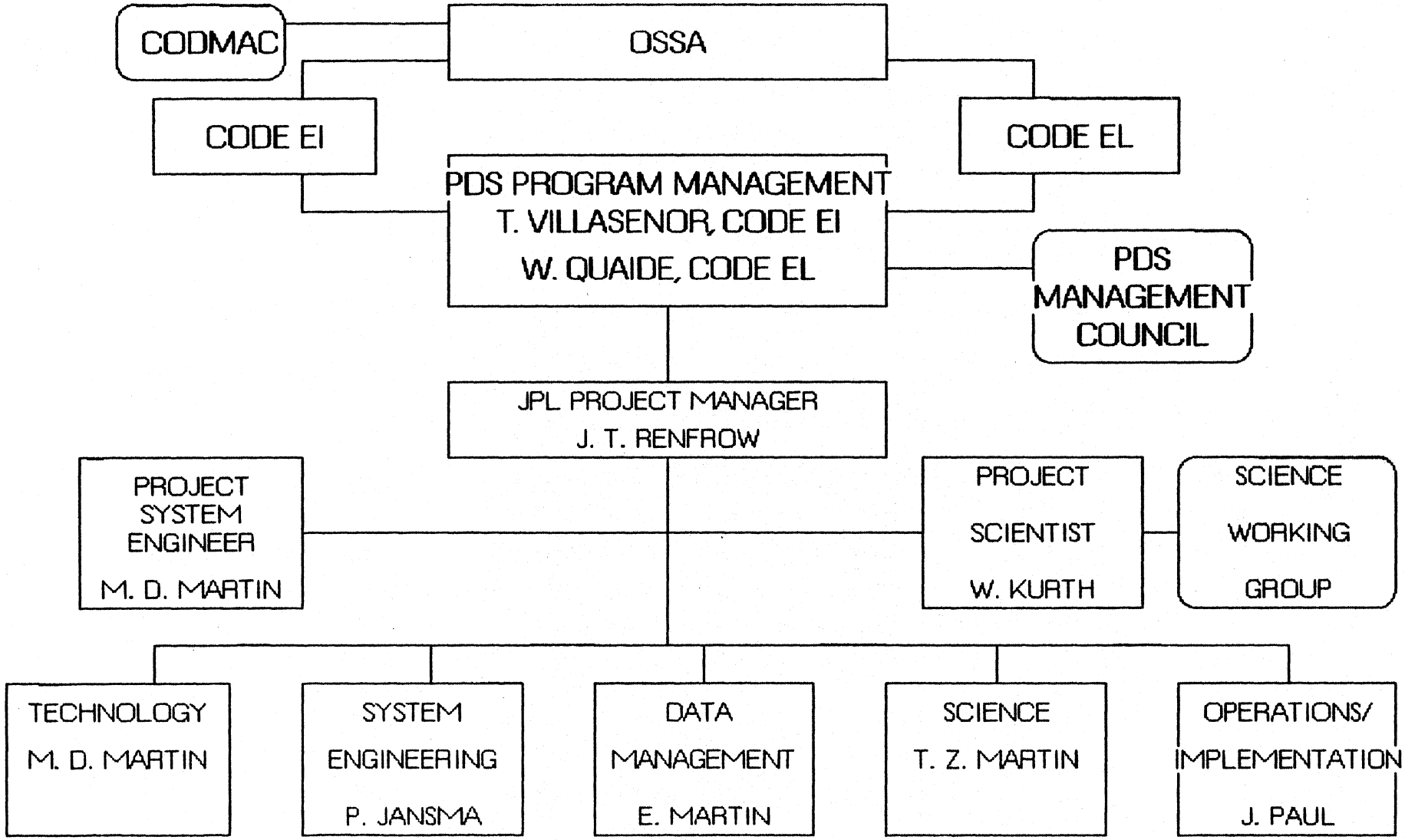
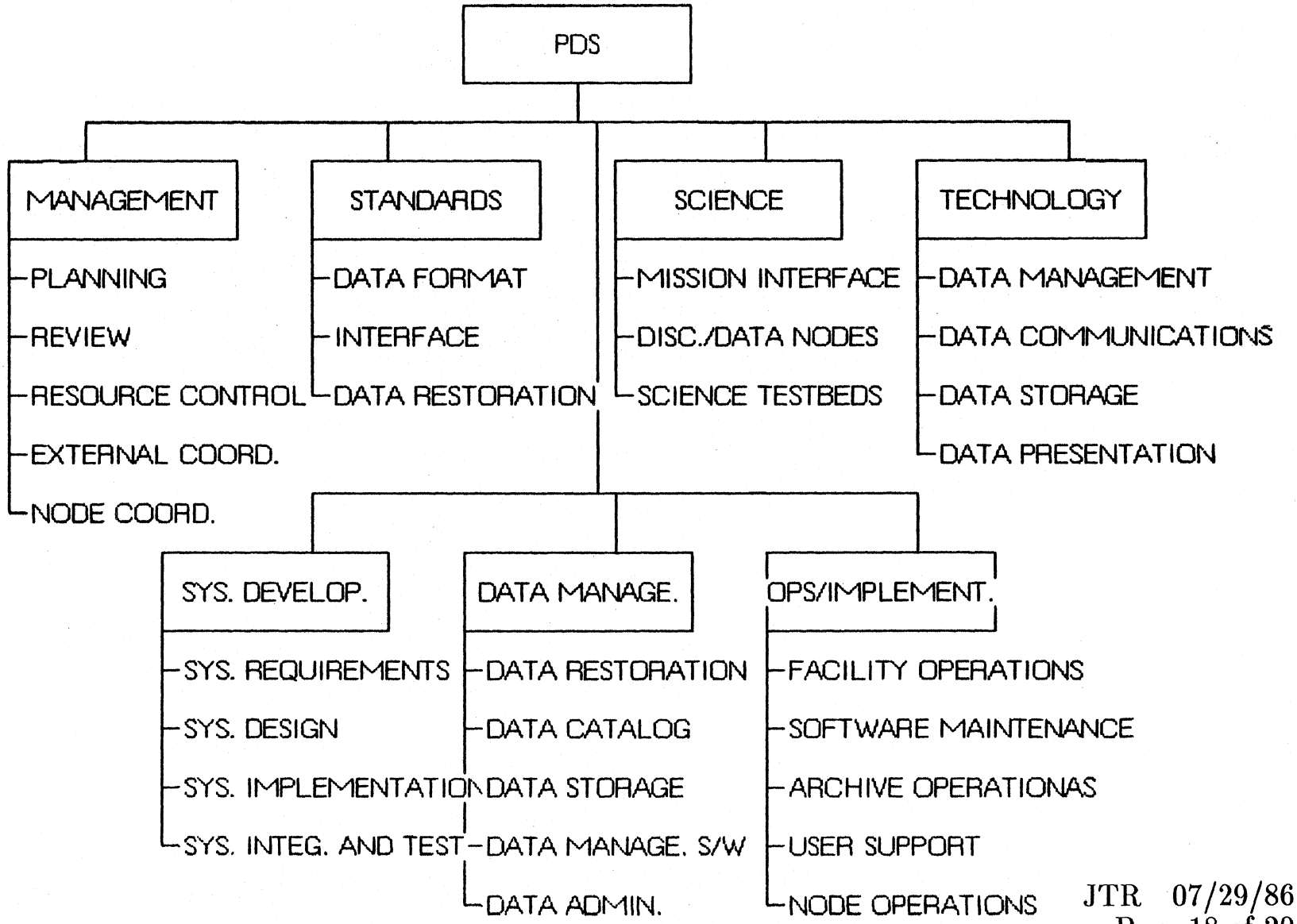
PDS Project Overview — PDS System Requirements Review

PDS Project Organization



PDS Work Breakdown Structure



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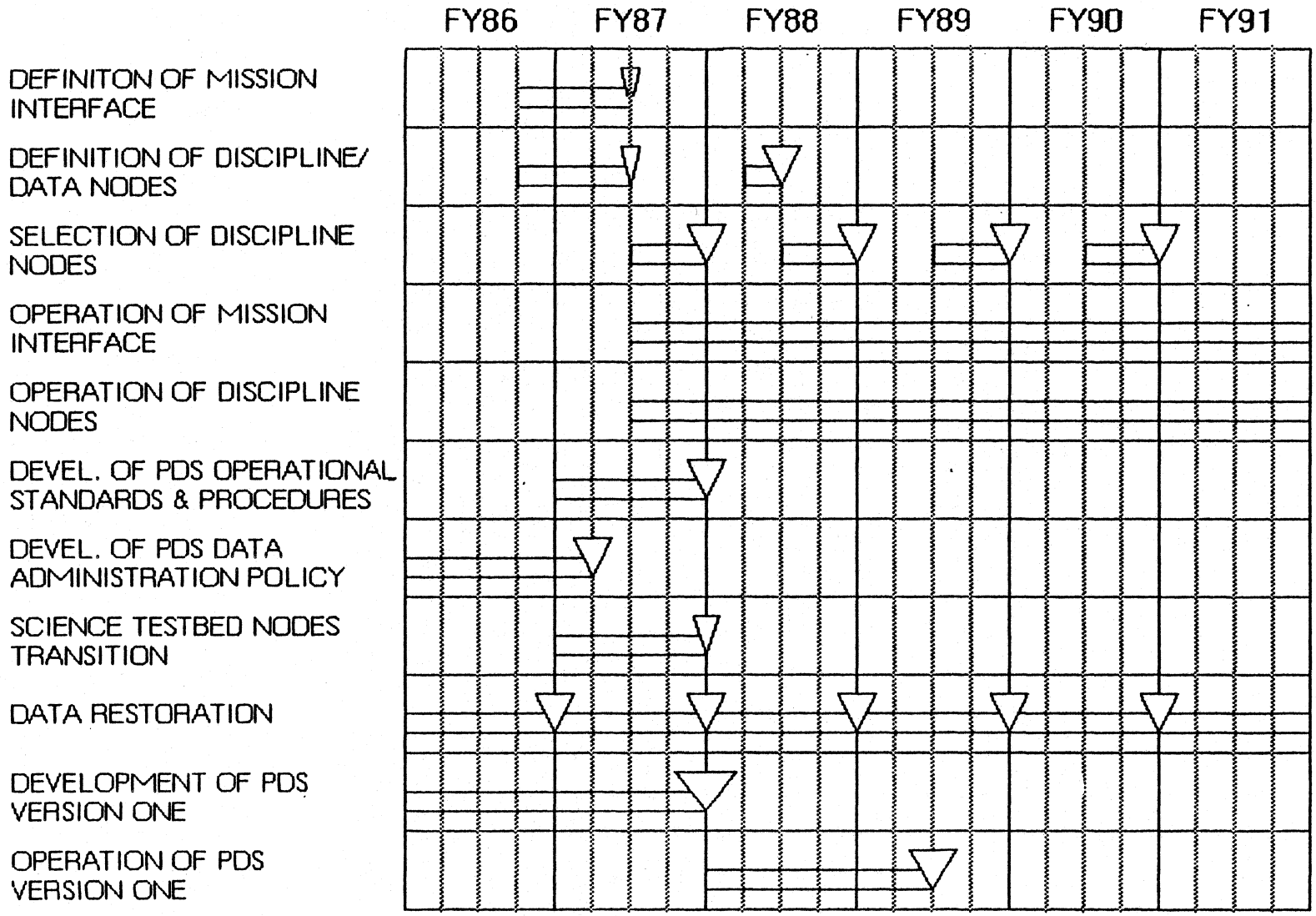
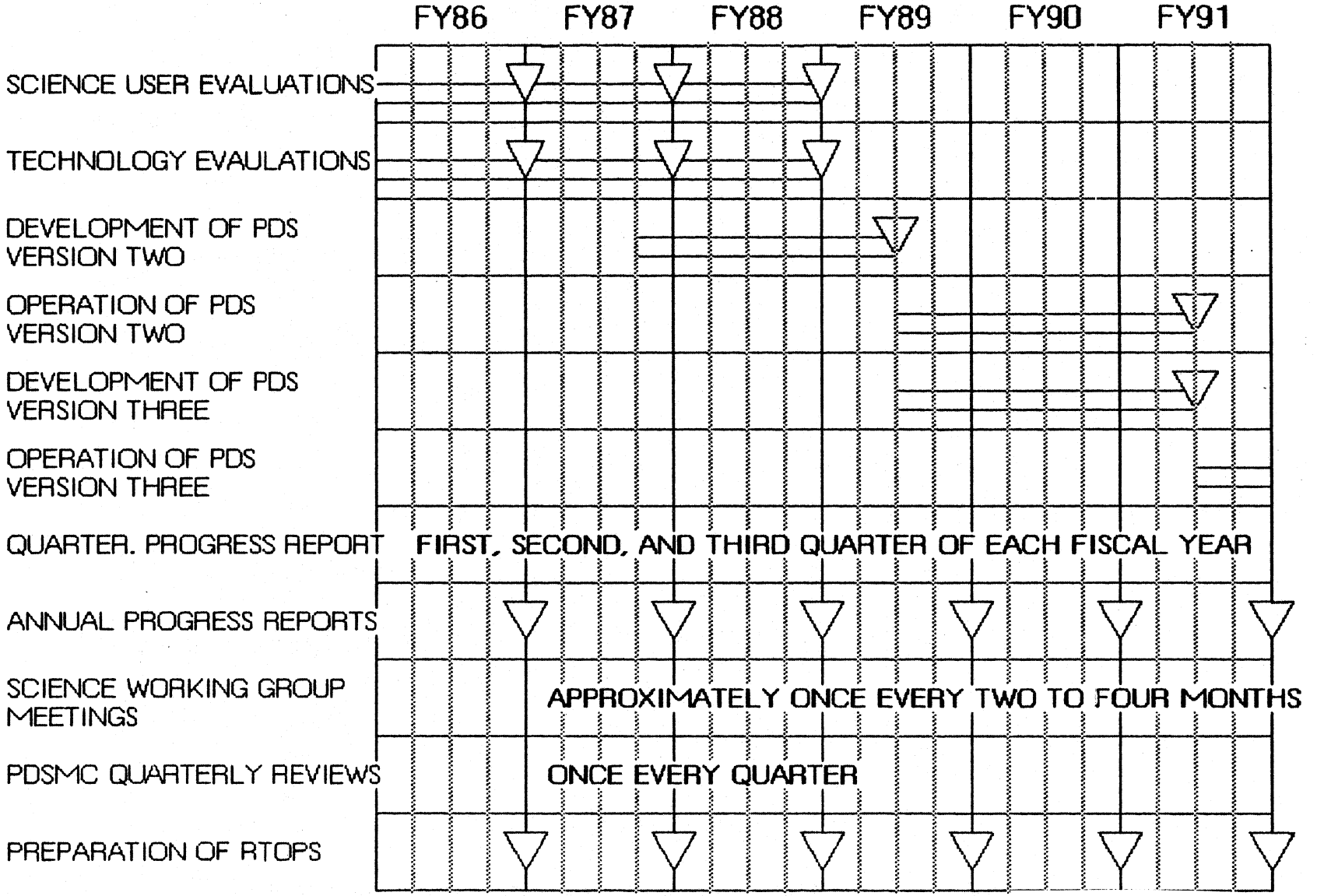
PDS Project Overview — PDS System Requirements Review

PDS Top Level Schedule – Part 1



PDS Top Level Schedule – Part 2



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PDS System Requirements Review

PPDS Legacy to PDS

M. D. Martin

July 29, 1986

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PDS SYSTEM REQUIREMENTS REVIEW

PPDS LEGACY TO PDS VERSION 1.0

Overview

- System Development Environment.
- Technology Inheritance.
- Hardware Inheritance.

PPDS LEGACY TO PDS VERSION 1.0

System Development Environment.

- Requirements for successful development effort in place.
  - Strong central management structure.
  - Automated tools for budget, scheduling and document preparation.
  - Teleconferencing and regular meetings with node representatives.
  - Well-defined reporting requirements.
  - Electronic mail for majority of PDS communications.
- System design methodology and tools.
  - Structured analysis and system specification.
  - PDS system model maintained in PSL/PSA database.
  - Tools for report and diagram generation and design validation.

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PPDS LEGACY TO PDS VERSION 1.0

System Development Environment - Continued.

- Active Science Testbed Support.
  - — Committment to PDS development for common good.
  - — Understanding of data management design considerations.
  - — Interdisciplinary exchange of analysis tools and data.
  - — Insight into need for standards to support correlative analysis.

PPDS LEGACY TO PDS VERSION 1.0

Technology Inheritance

- PPDS Catalog.
  - Comprehensive scientific catalog in place.
  - Automated tools for data dictionary development and maintenance.
  - Automated tools for menu development (FREEFORM).
  - Evaluation of potential user-interface approaches.
  - Interdisciplinary definitions for many parameters.
  - Standards for nomenclature and data formats under development.

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PDS SYSTEM REQUIREMENTS REVIEW

PPDS LEGACY TO PDS VERSION 1.0

Technology Inheritance - Continued

- Optical storage.
  - — Working optical storage systems in use at 4 nodes.
  - — Major data publication activity underway to distribute Voyager Uranus image data on CDROM.
- Analysis Tools for science data display and manipulation.
  - — Interactive Display Language (XIDL).
  - — XG radiometry analysis package.
  - — PPDS image processing system.
  - — Nodes developing a Micro-VAX-based imaging workstation.

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PPDS LEGACY TO PDS VERSION 1.0

Hardware Inheritance.

- Host computer and operating system - DEC VAX VMS.
- Communications network - Space Physics Analysis Network (SPAN).
- Data base management system - Britton-Lee Data Base Machine.

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PDS SYSTEM REQUIREMENTS REVIEW

PPDS LEGACY TO PDS VERSION 1.0

Configuration of Pilot Nodes

	JPL	WASHU	FLAG	NAIF	LASP	UCLA	IOWA
HOST	VAX	VAX	VAX	VAX	VAX	VAX	VAX
OP SYS	VMS	VMS	VMS	VMS	VMS	VMS	VMS
EXEC	NONE	TAE	TAE	NONE	NONE	NONE	NONE
DBMS	B/L	S1032	NONE	ORACLE	B/L	B/L	NONE
TOOLS	XIDL		XG		XIDL		
LANGUAGE	FORT	FORT	FORT	FORT	FORT	FORT	FORT
NETWORK	SPAN	SPAN	SPAN	SPAN	SPAN	SPAN	SPAN

PPDS LEGACY TO PDS VERSION 1.0

Host Computer and Operating System

- With VAX/VMS hosts at every pilot node VAX/VMS is the only logical choice for Version 1.0.

- A recent survey of Planetary Science community members participating in the Interactive Data Interchange Workshop found:
  - 54 percent using VAX hosts.
  - 8 percent using other hosts.
  - 38 percent using PC's (primarily IBM compatibles).

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PDS SYSTEM REQUIREMENTS REVIEW

PPDS LEGACY TO PDS VERSION 1.0

Communications Network

- PPDS evaluated several communication options in 1984.
  - Telenet useful for mail but not for data.
  - Telephone links/modems too complex and error prone.
  - SPAN net chosen for PPDS internode communications. Lines installed to all PPDS nodes in FY85 and FY86.
- SPAN/DECnet system provides integrated access to remote systems for VAX users.
  - Mail transfer and access to data nearly transparent.
  - Line costs for all SPAN links absorbed by NASA's PSCN.
  - Hardware and software for Version 1.0 in place.
  - Any other option might have substantial cost implications.

PDS SYSTEM REQUIREMENTS REVIEW

PPDS LEGACY TO PDS VERSION 1.0

Data Base Management System

- Relational architecture chosen over heirarchical or network models.
  - — Availability of a wide variety of products for VAX hosts.
  - — Simplicity of application development.
- Hardware versus software DBMS.
  - — Minimal overhead on host computer.
  - — Faster access to relational data bases.
  - — Variety of mainframe, mini and micro hosts supported.
- Coordination with other NASA efforts.
  - — NSSDC, SFOC, Space Telescope using Britton-Lee hardware.

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PDS System Requirements Review

System Overview of PDS

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D. B. Childs

July 29, 1986

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PDS System Requirements Review
System Overview of PDS

- Concepts of Structured Analysis
- External View
- Functional View
- Configurational View
- Operational View
- Taxonomy of Data

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PDS System Requirements Review

Concepts of Structured Analysis and System Specification*

- A structured specification consists of an integrated set of:
  - Data Flow Diagrams — showing the major decomposition of functions and all the interfaces among the pieces.
  - Data Dictionary — documenting each of the interface flows and data stores on any of the data flow diagrams.
  - Process Descriptions — documenting the internals of the DFD processes in a rigorous fashion (usually through the use of structured English, decision tables, and decision trees)
- A structured specification should have the following qualities:

graphic	maintainable	precise and concise
partitioned	iterative	highly readable
rigorous	logical, not physical	

* Excerpted from *Structured Analysis and System Specification* by Tom DeMarco, Prentice-Hall Software Series, 1979 Yourdon, Inc.

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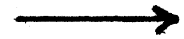
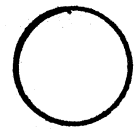
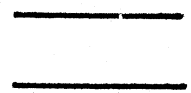
PDS System Requirements Review
Data Flow Diagrams

- Data Flow Diagrams (DFDs) are made up of only four basic elements:
  - Data flows, represented by named vectors. 
    - A data flow is a pipeline through which packets of information of known composition flow.
  - Processes, represented by circles or "bubbles" 
    - A process is a transformation of incoming data flow(s) into outgoing data flow(s)
  - Files, represented by open-ended rectangles (or straight lines) 
    - A file is a temporary repository of information
  - Data sources and sinks, represented by boxes (squares) 
    - A source or sink is a person or organization, lying outside the context of a system, that is a net originator or receiver of system data.

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PDS System Requirements Review
External View

- Inputs
  - User inputs (Menu Selections, Commands)
  - Submitted science data and analysis software
    - Restoration of existing data archives
    - Refinements of original data sets
  - MOUs with Data Suppliers for data and software
- Outputs
  - System Responses
    - Responses to menu selections or commands
    - Status messages or error messages
  - Data for Physical Distribution
  - User Education Materials or Documentation
  - Limited distribution of analysis software
  - Rejected Data and Software

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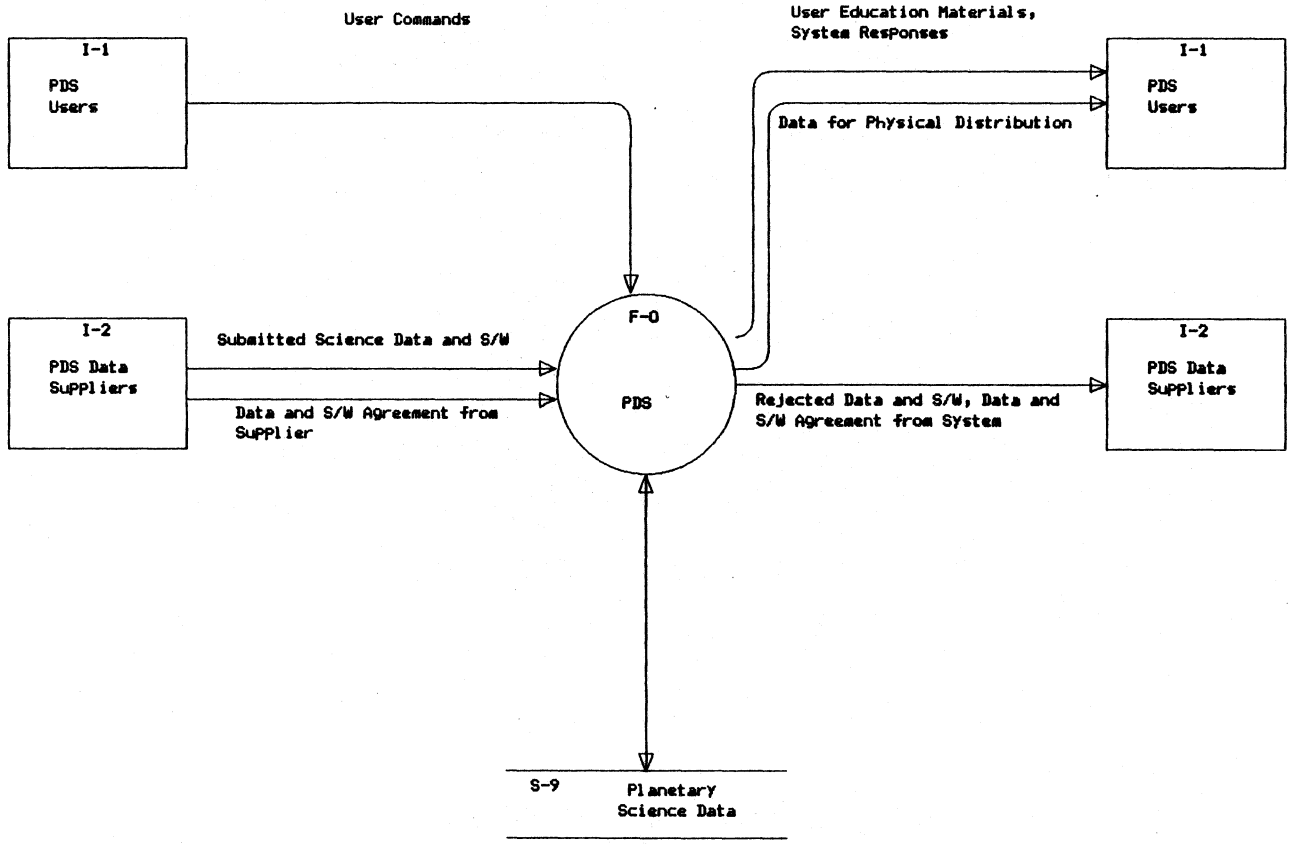
PDS System Requirements Review

System Overview of PDS External View



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PDS System Requirements Review
External Overview (cont')

- External Interfaces
  - PDS Data Suppliers
    - PDS Nodes and Constituents
      - Discipline Nodes
        - Planetary Atmospheres Node
        - Fields and Particles Node
        - Infrared Radiometry Node
        - Planetary Rings Node
        - Regional Planetary Imaging Facility (RPIF) Node
        - Reflectance Spectroscopy Node
      - Discipline Subnodes
        - RPIFs
        - Fields and Particles (APL, MIT, Univ. of Iowa)
      - Service Node
        - Navigation Ancillary Information Facility (NAIF)

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PDS System Requirements Review
External View (cont')

- External Interfaces (cont')
  - Institutions and Facilities
    - Space Flight Operations Center (SFOC)
    - National Space Science Data Center (NSSDC)
  - PDS Users
    - Pilot Users
    - Selected Outside Users

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PDS System Requirements Review
Functional View

- The functional components of the PDS are:
  - Access System
  - Inspect Data
  - Order Data
  - Distribute Data
  - Administer System
  - Prepare Data

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PDS System Requirements Review
Functional View (cont')

- Access System
  - Manages the interaction of the user with the system
  - Controls the communications function for the user
  - Provides an interface to other system functions
  - Handles the on-line transfer of data to the user
- Inspect Data
  - Retrieves catalog, sample, summary, and science data
  - Manipulates and displays data
  - Provides user help facilities
- Order Data
  - Validates a data order
  - Locates the ordered data (on-line and off-line)
  - Routes order to the distribution function

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PDS System Requirements Review
Functional View (cont')

- Distribute Data
  - Distributes data orders
  - Provides manual distribution and automatic (electronic) distribution
- Administer System
  - Manages the PDS system activities
  - Provides customer support
  - Provides facilities management
  - Provides planning and scheduling
  - Provides database administration
  - Provides system logging and accounting
- Prepare Data
  - Manages the receipt of data from outside sources
  - Performs quality control checks

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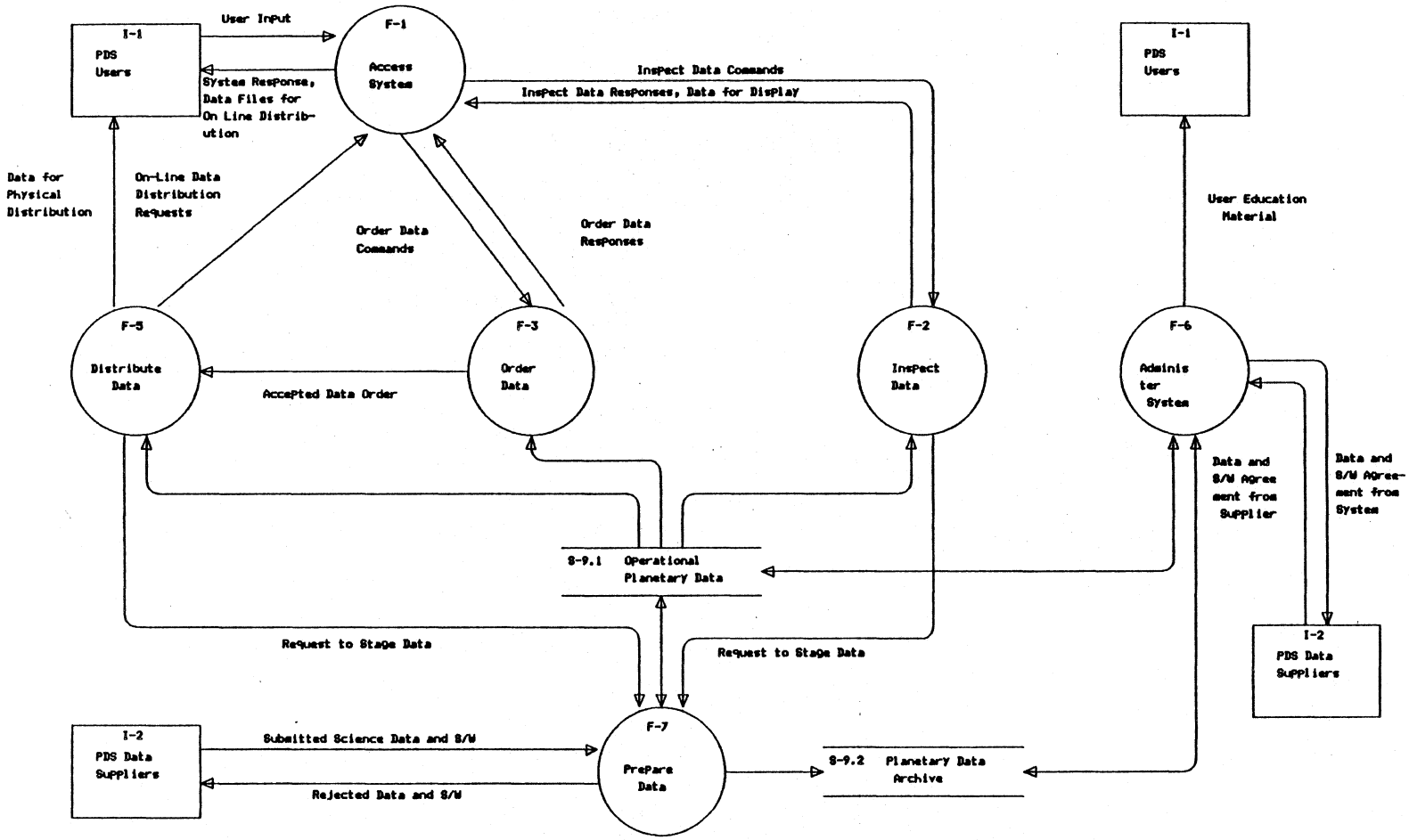
PDS System Requirements Review

System Overview of PDS (Cont'd)
Functional View (cont')

Diagram DFD-0



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PDS System Requirements Review

System Overview of PDS (Cont'd)

Configurational View

- PDS Architecture
- Central and Distributed Node Overview
- Central Node Automated Functions
- Levels of Integration
- Prototype Discipline/Data Node with Britton Lee
- Prototype Discipline/Data Node without Britton Lee

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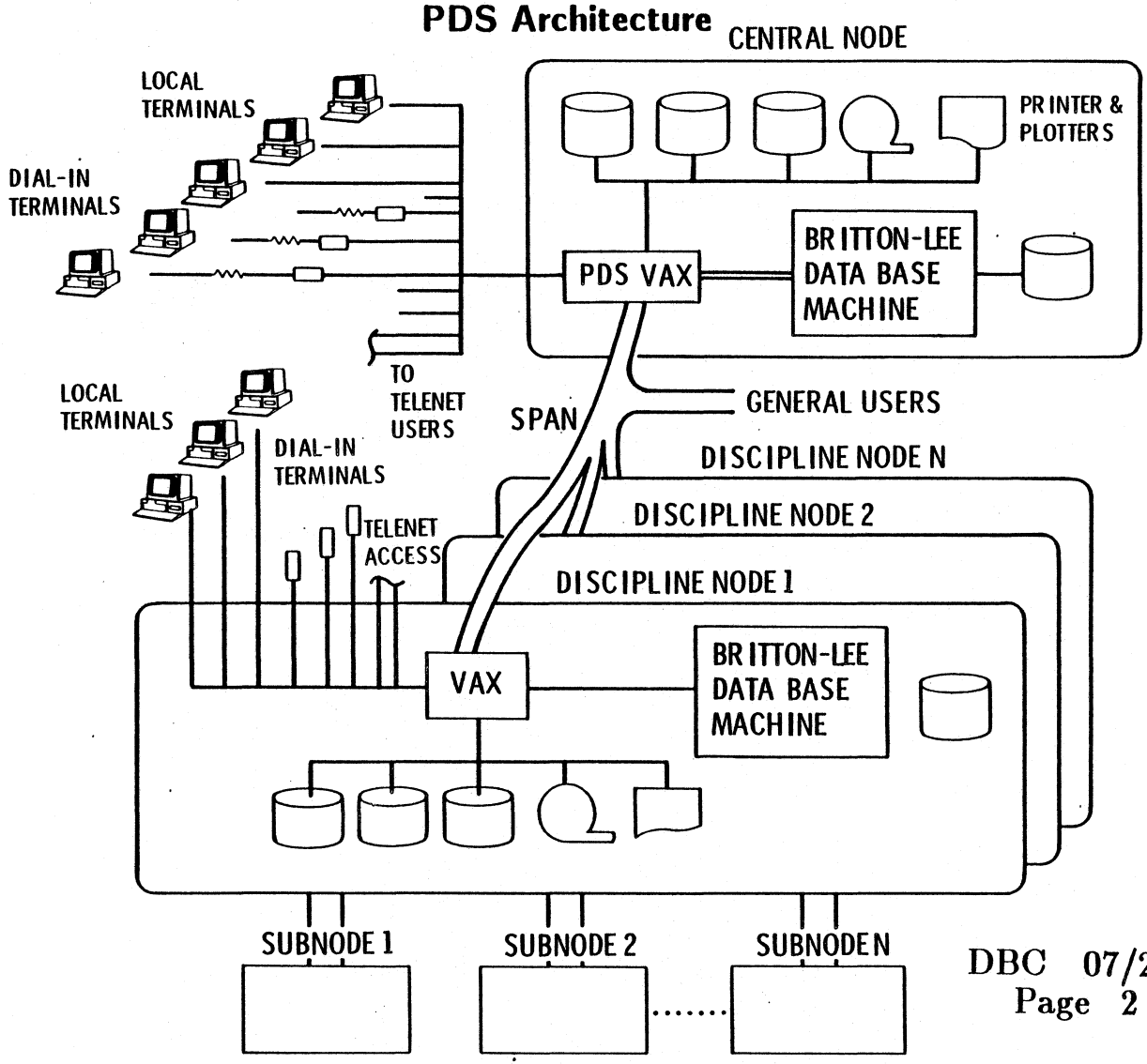
System Overview of PDS (Cont'd)

PDS Architecture



PDS System Requirements Review

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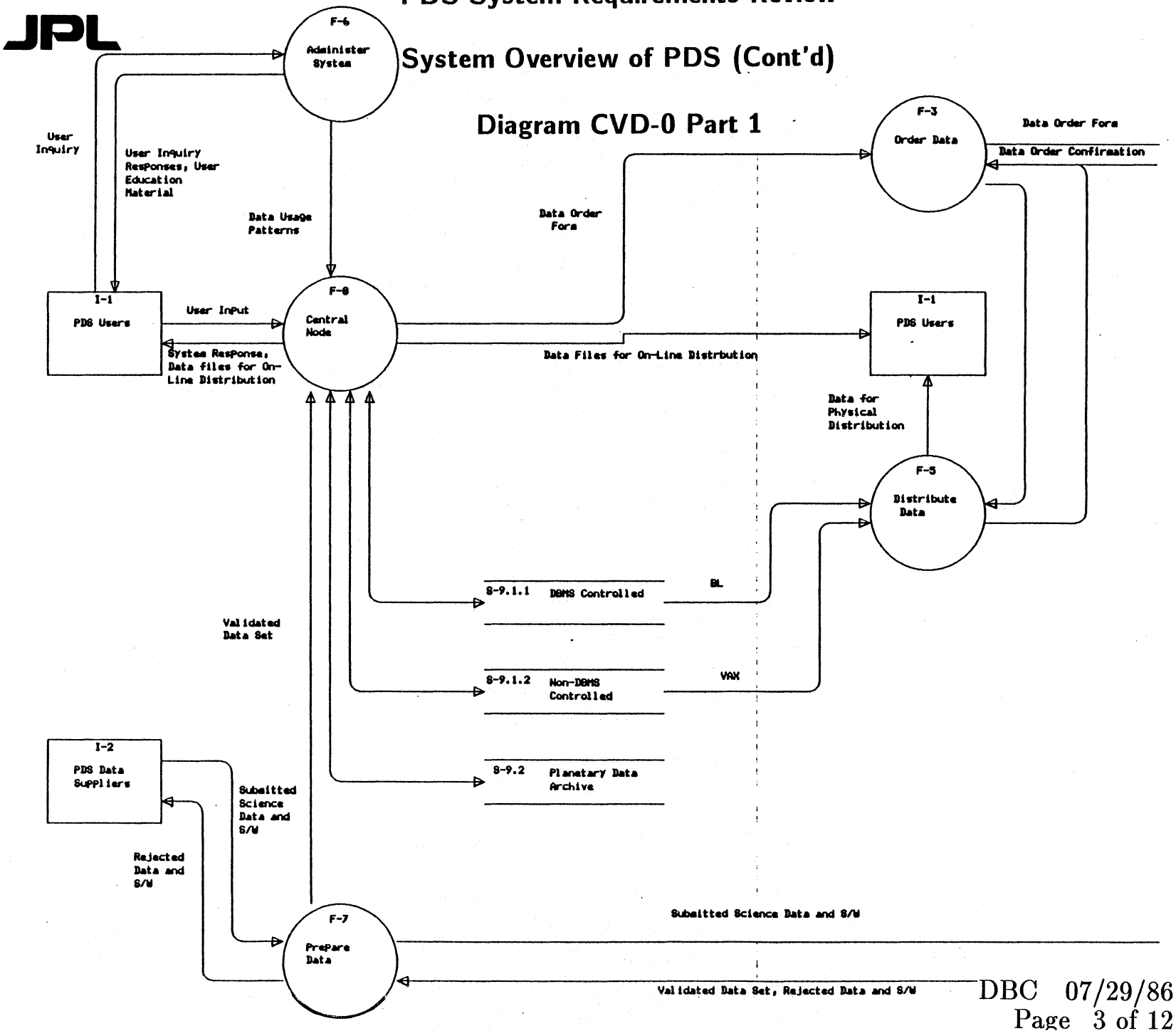
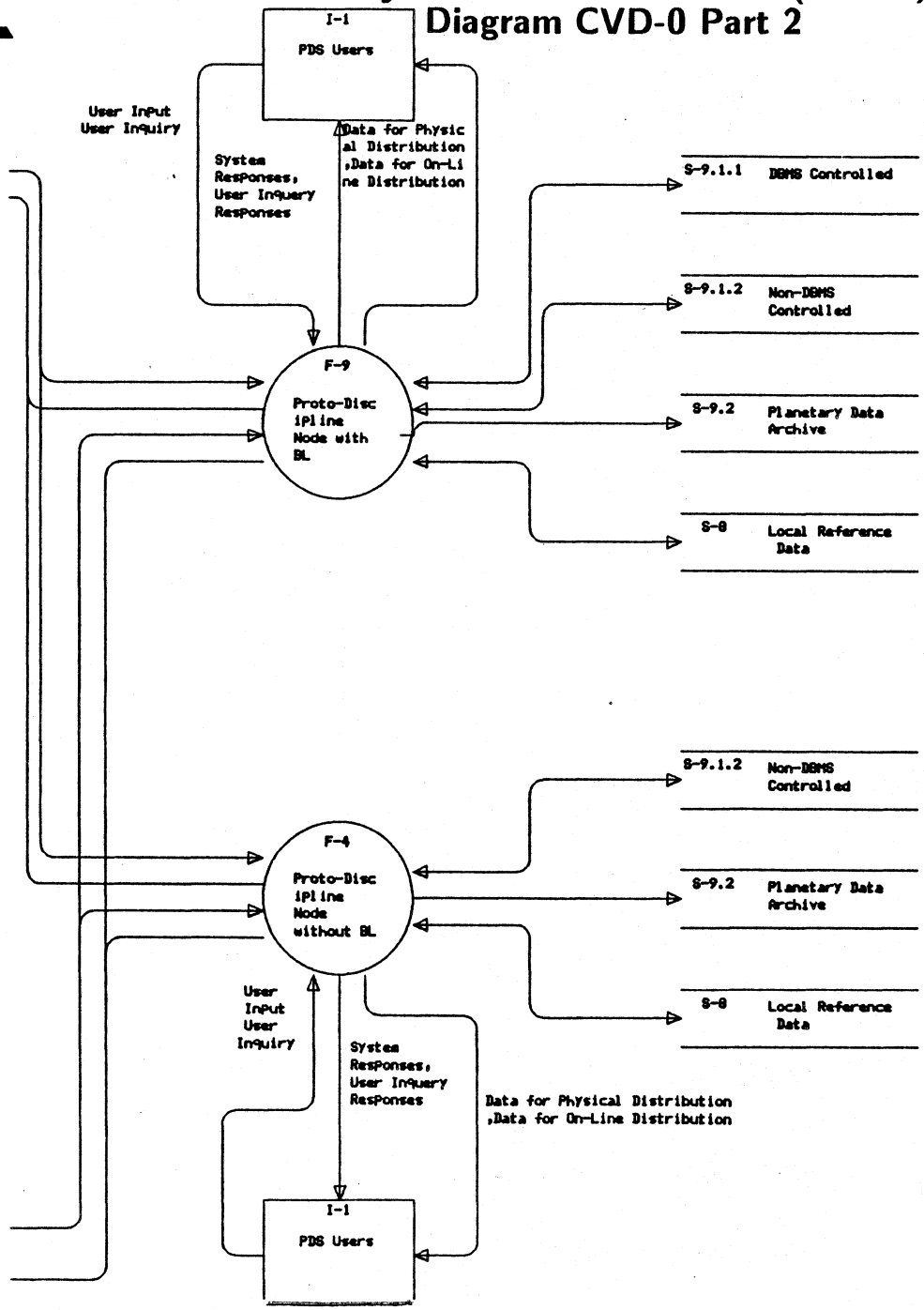
System Overview of PDS (Cont'd)

Diagram CVD-0 Part 1



PDS System Requirements Review
System Overview of PDS (Cont'd)
Diagram CVD-0 Part 2



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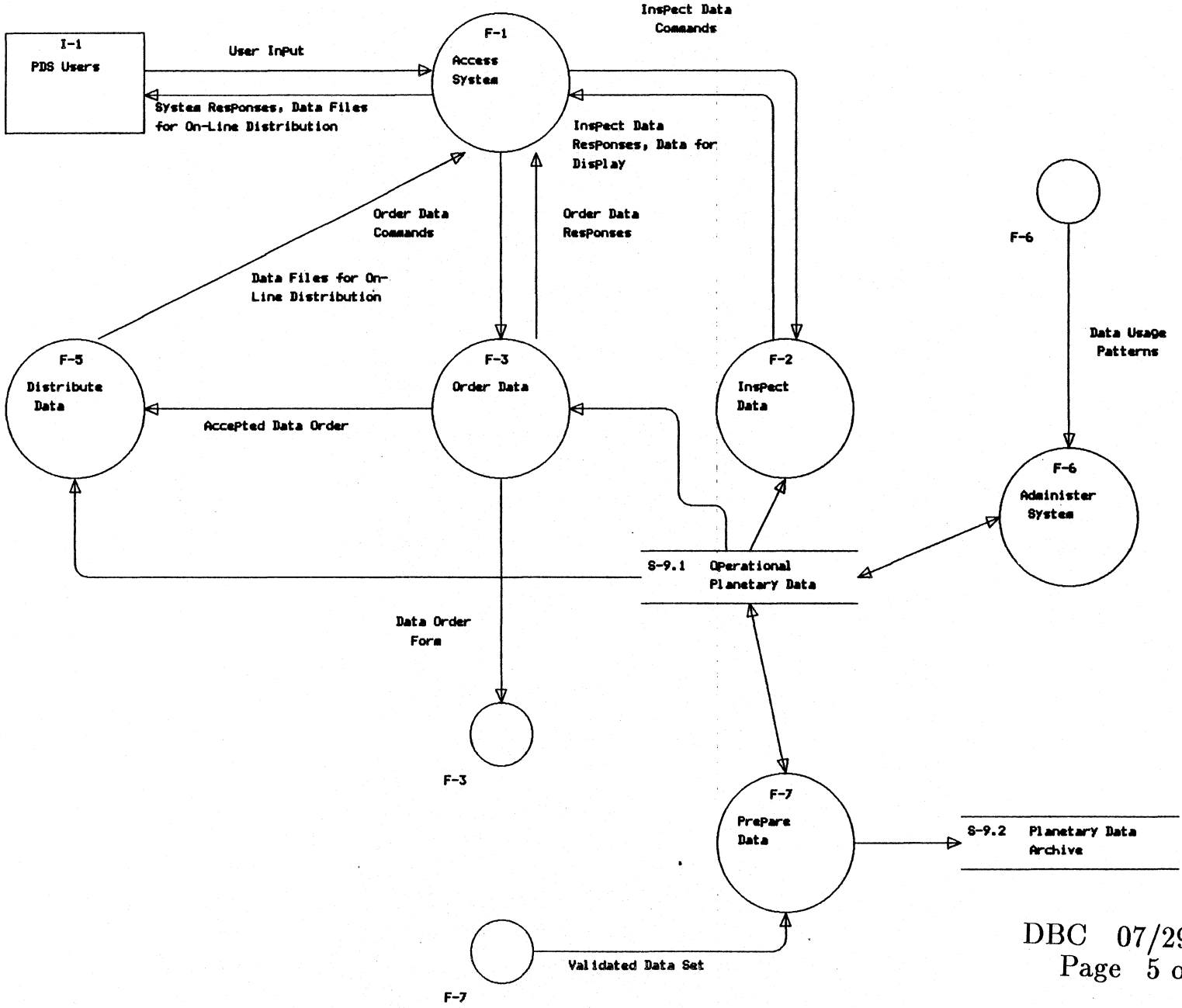
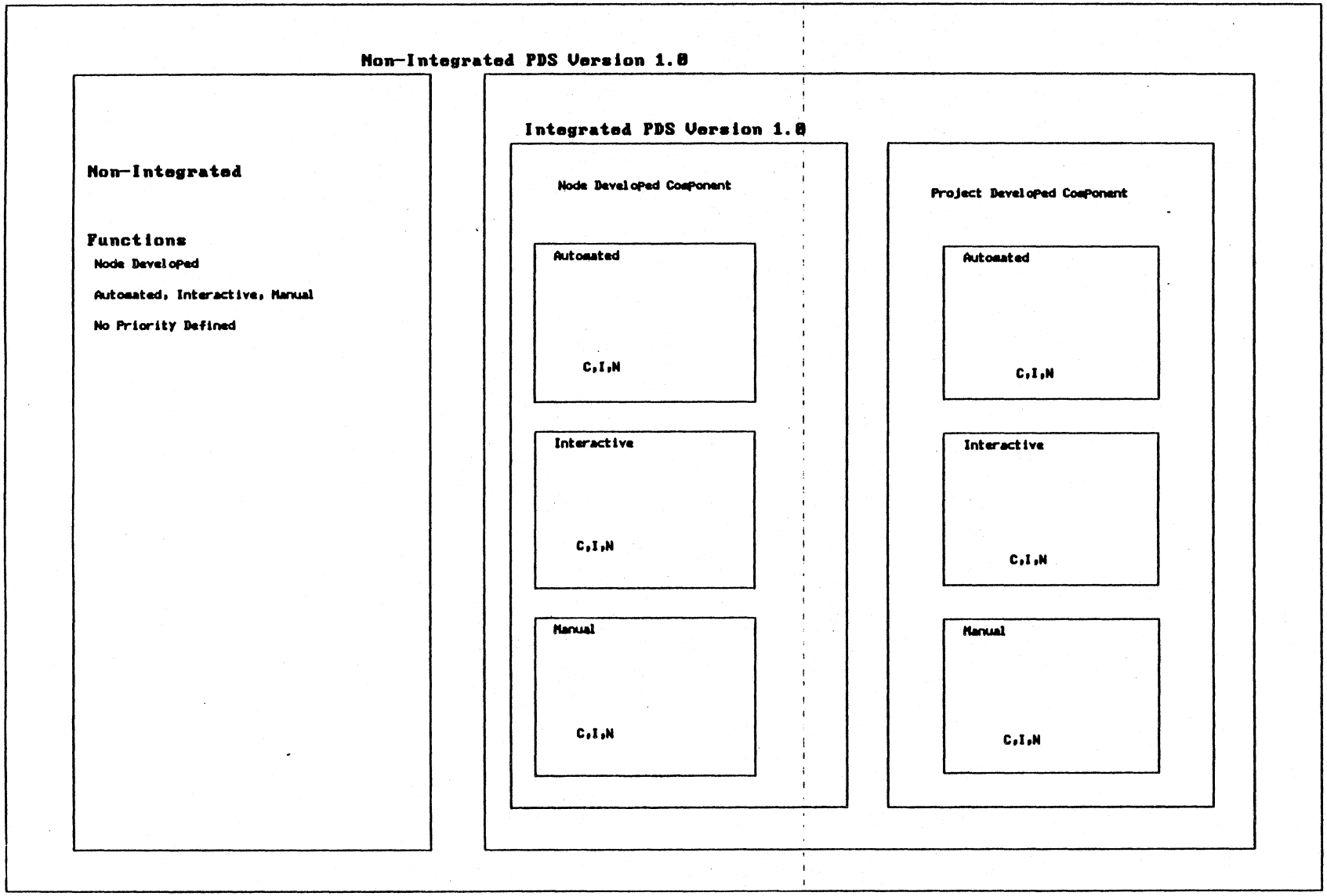
CVD-8 PDS SYSTEM REQUIREMENTS **REVIEW**

Central Node



PDS System Requirements Review
System Overview of PDS (Cont'd)
Levels of Integration



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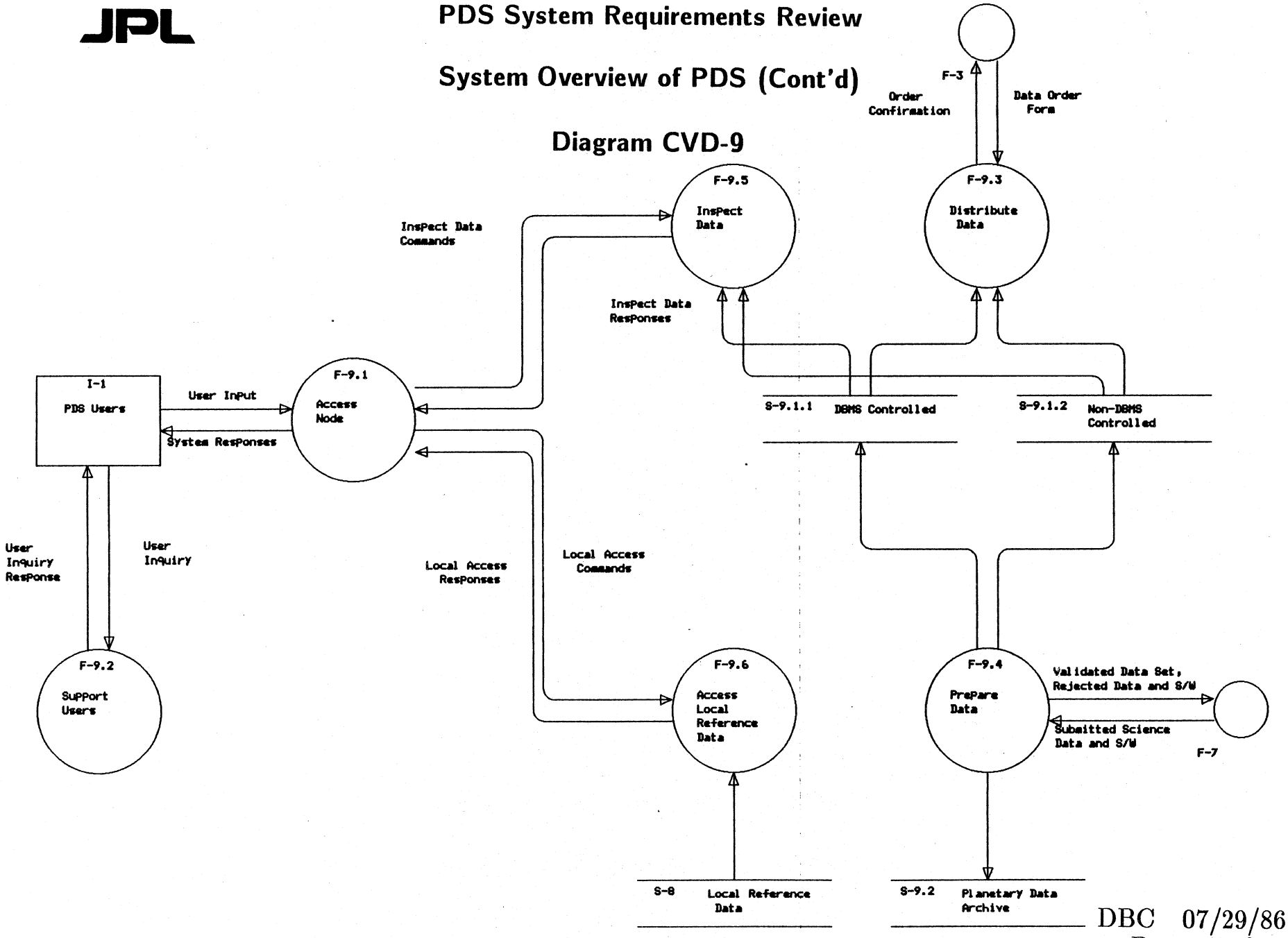
PDS System Requirements Review

System Overview of PDS (Cont'd)

Diagram CVD-9



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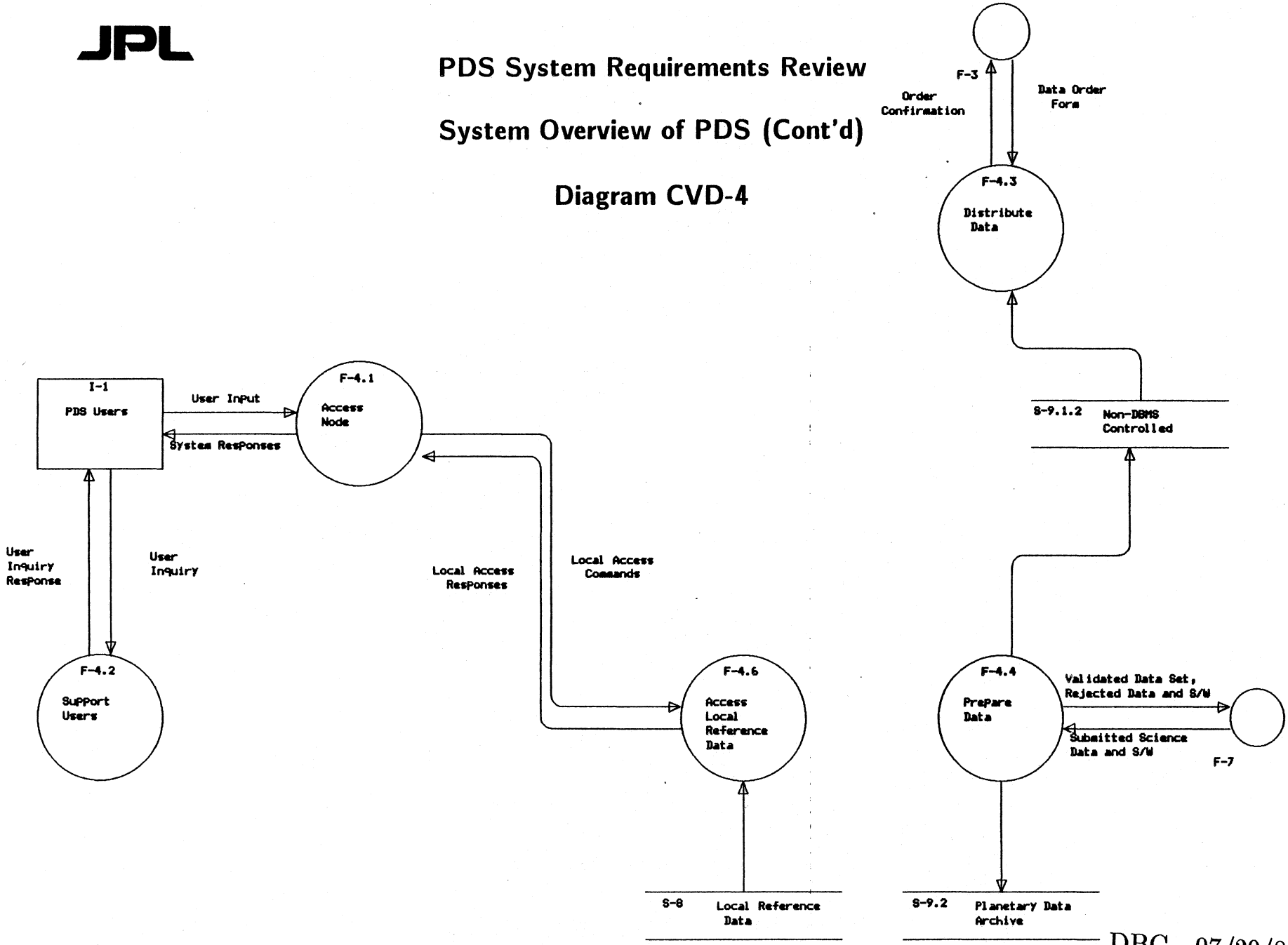
PDS System Requirements Review

System Overview of PDS (Cont'd)

Diagram CVD-4



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PDS System Requirements Review

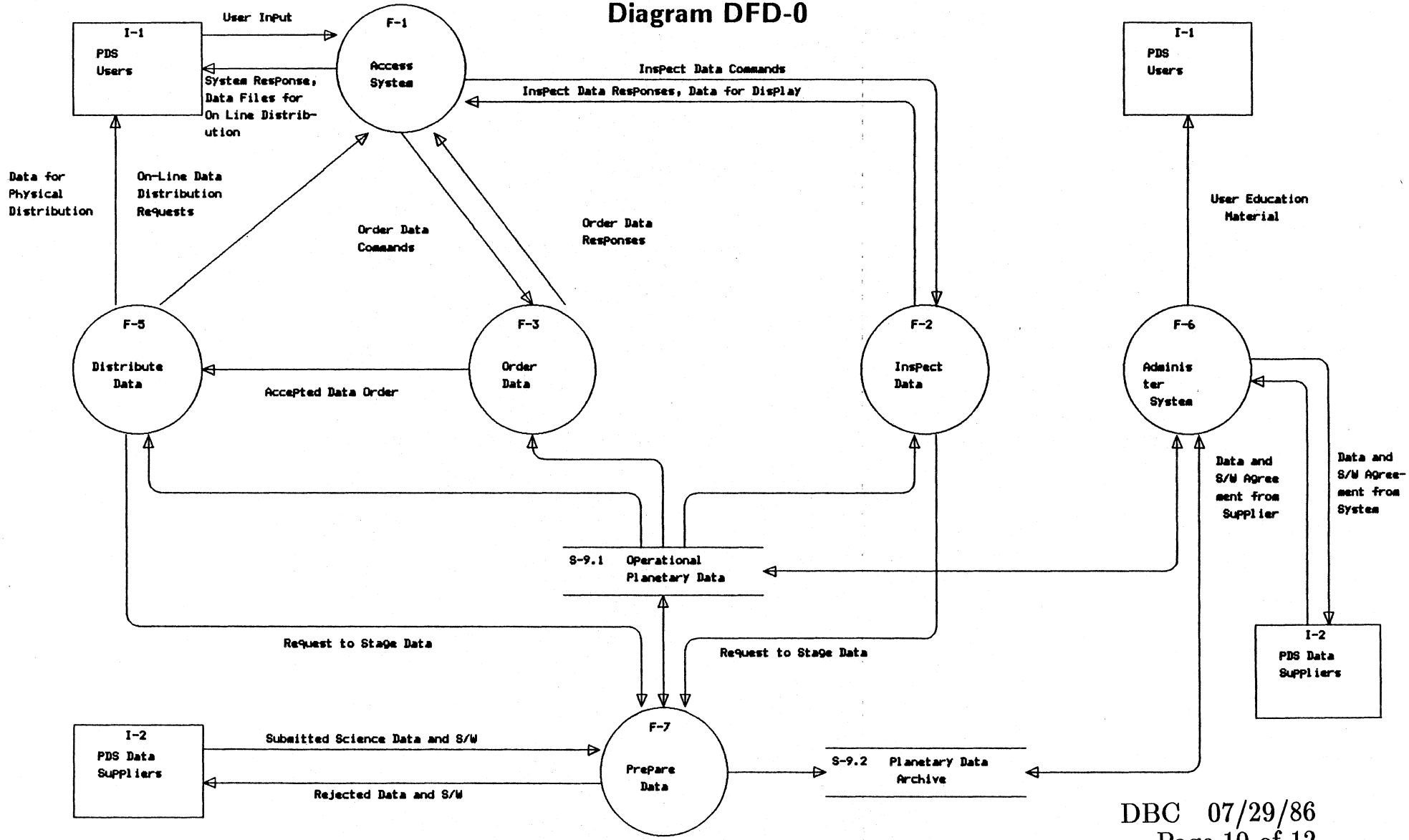
System Overview of PDS (Cont'd)

Operational View

- Identification and Ordering of Planetary Data by the User
  - Accessing the System
  - Perusing the Catalog
  - Examining Data Characteristics
  - Placing an Order
  - Filling the Order
  - Confirming the Order
- Archiving of Planetary Data by the System
  - Solicitation for Data
  - Preparation of Data by the Suppliers
  - Validation of the Data by the System
  - Archiving the Data by the System

System Overview of PDS (Cont'd)

Diagram DFD-0



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PDS System Requirements Review

System Overview of PDS (Cont'd)

Taxonomy of Data

- Planetary Science Data
  - Operational Planetary Data
    - DBMS Controlled
    - Working Data Set
    - Non-DBMS Controlled
  - Planetary Data Archive

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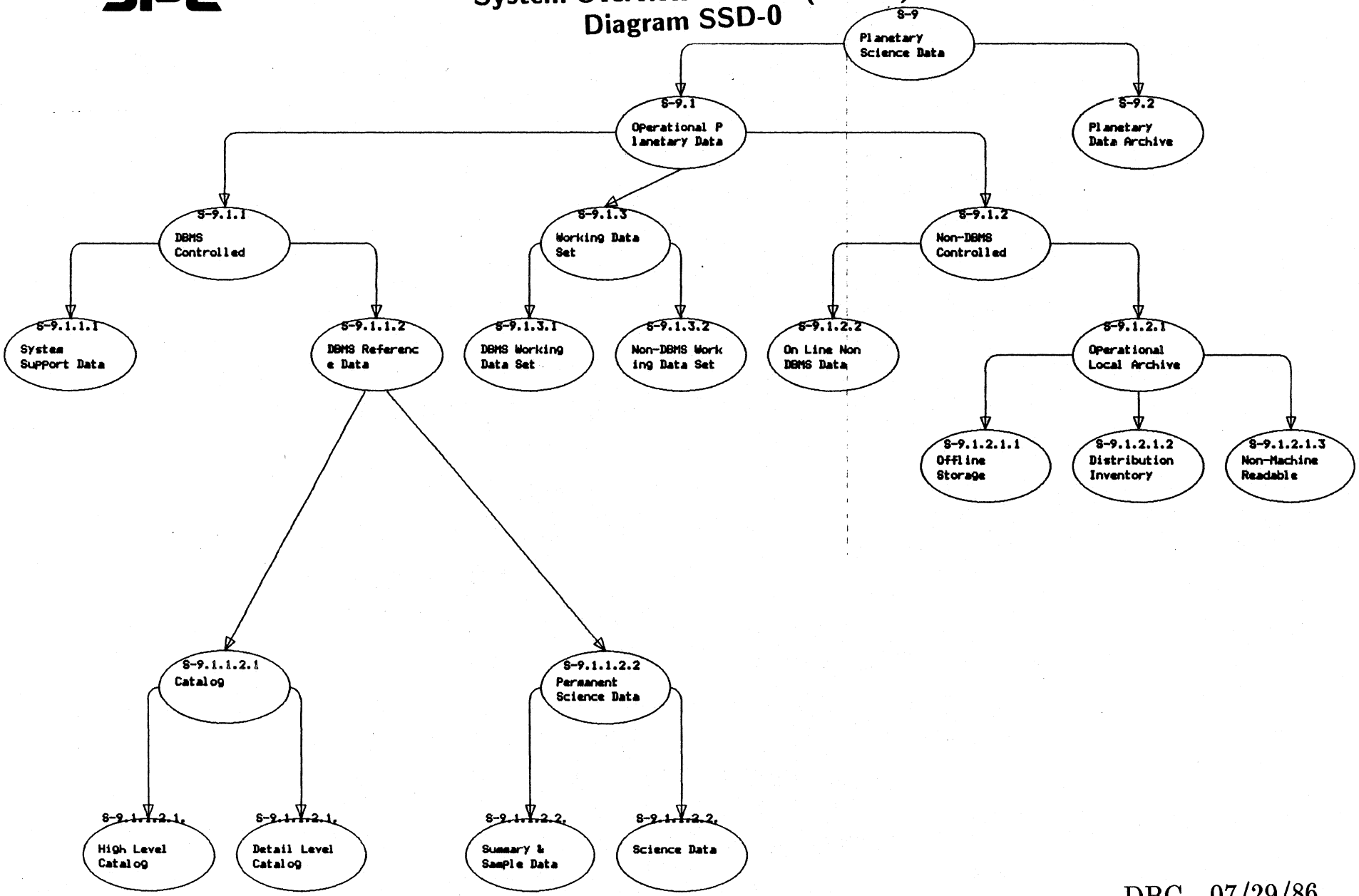
System Overview of PDS (Cont'd)
Diagram SSD-0



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PDS System Requirements Review

System Functional Requirements (Cont'd)

Access System

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System Functional Requirements (Cont'd)

Access System

- General Requirements of Access System
  - Support Electronic User Access
  - Provide Standard Access Philosophy
  - Provide Assistance to Users
  - Support Electronic Distribution
  - Provide Framework for Distributed PDS Operation
- Functional Organization
  - Support Communications Function
  - High Level User Interface Function
  - Transfer Data Function
  - Process Mail Function

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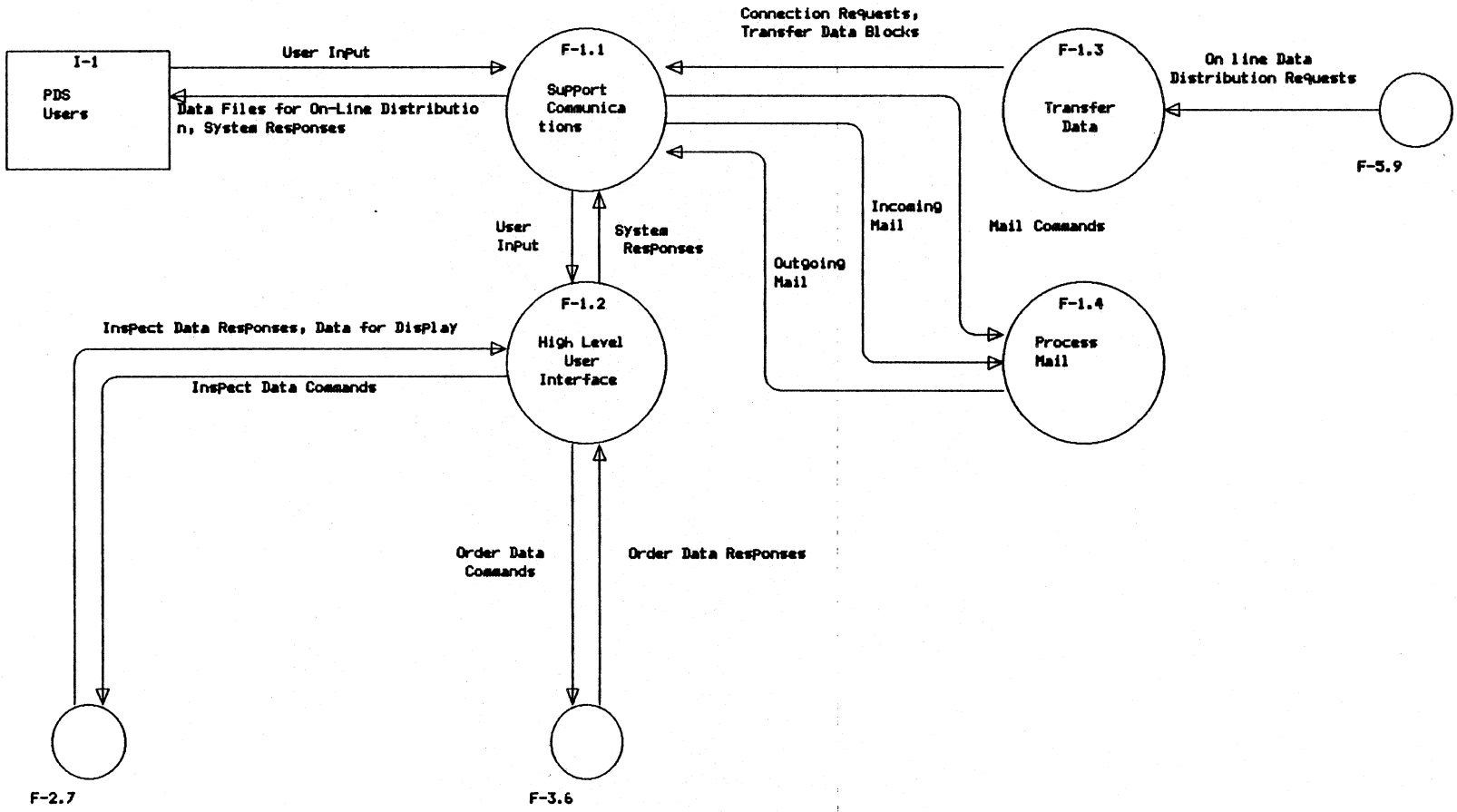
PDS System Requirements Review

System Functional Requirements (Cont'd)

Access System



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System Functional Requirements (Cont'd)

Support Communications

- General Requirements
  - Support Interactive Terminal Access
  - Support the Space Physics Analysis Network (SPAN)
  - Provide Electronic Data Transfers
  - Insure Access Security
- Physical Support Requirements
  - Communications Facilities
    - Direct Connections
    - Dial In by Public Switched Network
    - Telenet Access
    - JPL ILAN Access
    - SPAN Access
  - Terminal Support
    - VT-100 (and compatible) Terminals
    - PC (and compatible) Terminals
    - Graphic Terminals (as supported by Display Graphics Function)
    - Image Display Terminals (as supported by Image Display Function)

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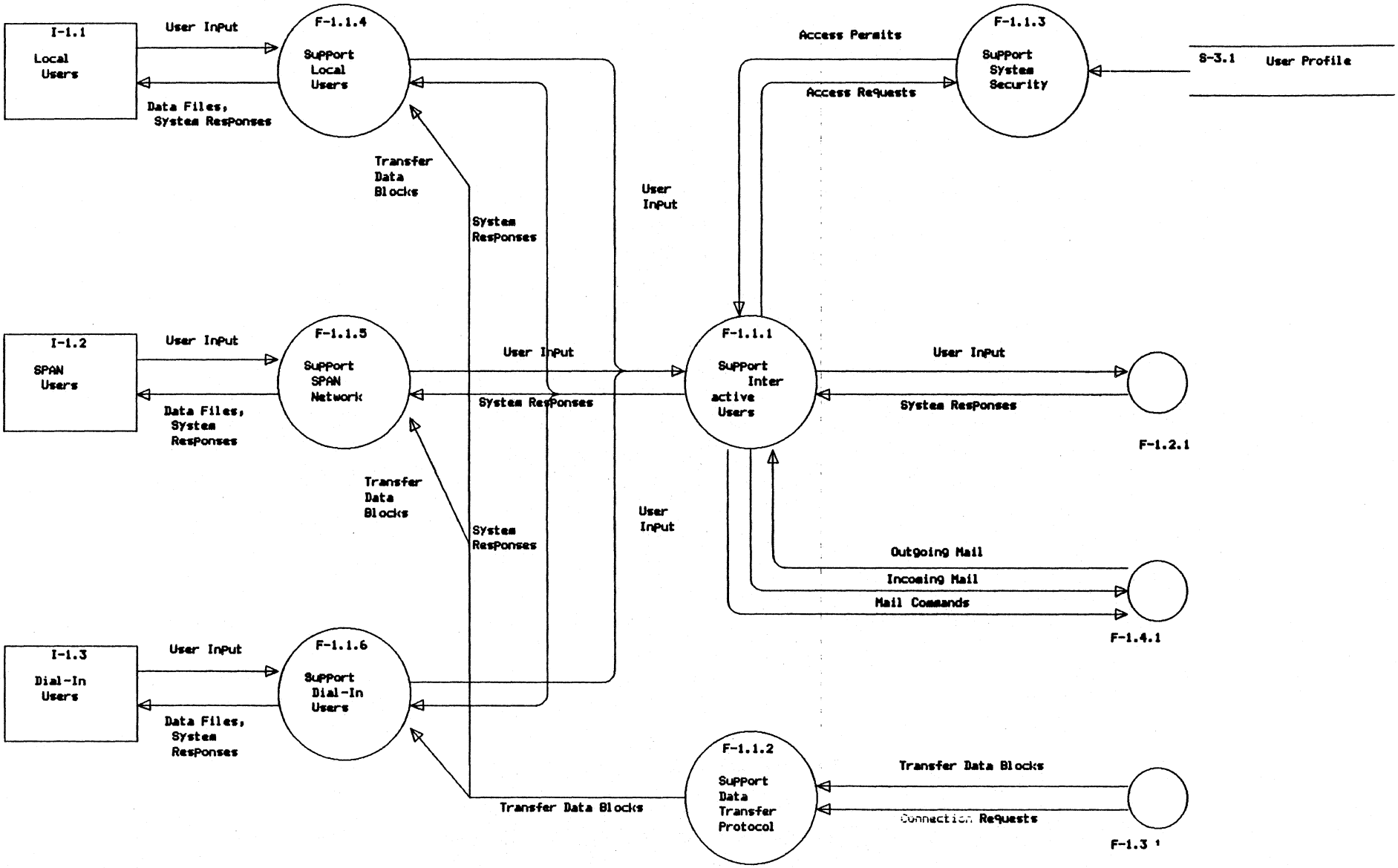
System Functional Requirements (Cont'd)

Support Communications



JPL

System Functional Requirements (Cont'd)

Support Communications

- Logical Requirements
  - Support DecNet (SPAN)
  - SPAN Network Copies
  - Asynchronous File transfers
  - System Security
  - Buffering
  - Flow Control

JPL

PDS System Requirements Review

System Functional Requirements (Cont'd)

High Level User Interface

- General Requirements
  - Provide Uniform User Interface
  - Minimize Redundant User Interface Development
  - Provide Menu Capabilities for Novice Users
  - Provide a Command Language for Expert Users
  - Provide Help Capability at All Levels
  - Support a Distributed System Interface
- Functional Operation
  - Route Input
  - Manage Menu
  - Interpret Menu
  - Interpret Command/Command Help
  - Start Process/Communicate with Process
  - Execute System Request

System Functional Requirements (Cont'd)

High Level User Interface (Cont'd)

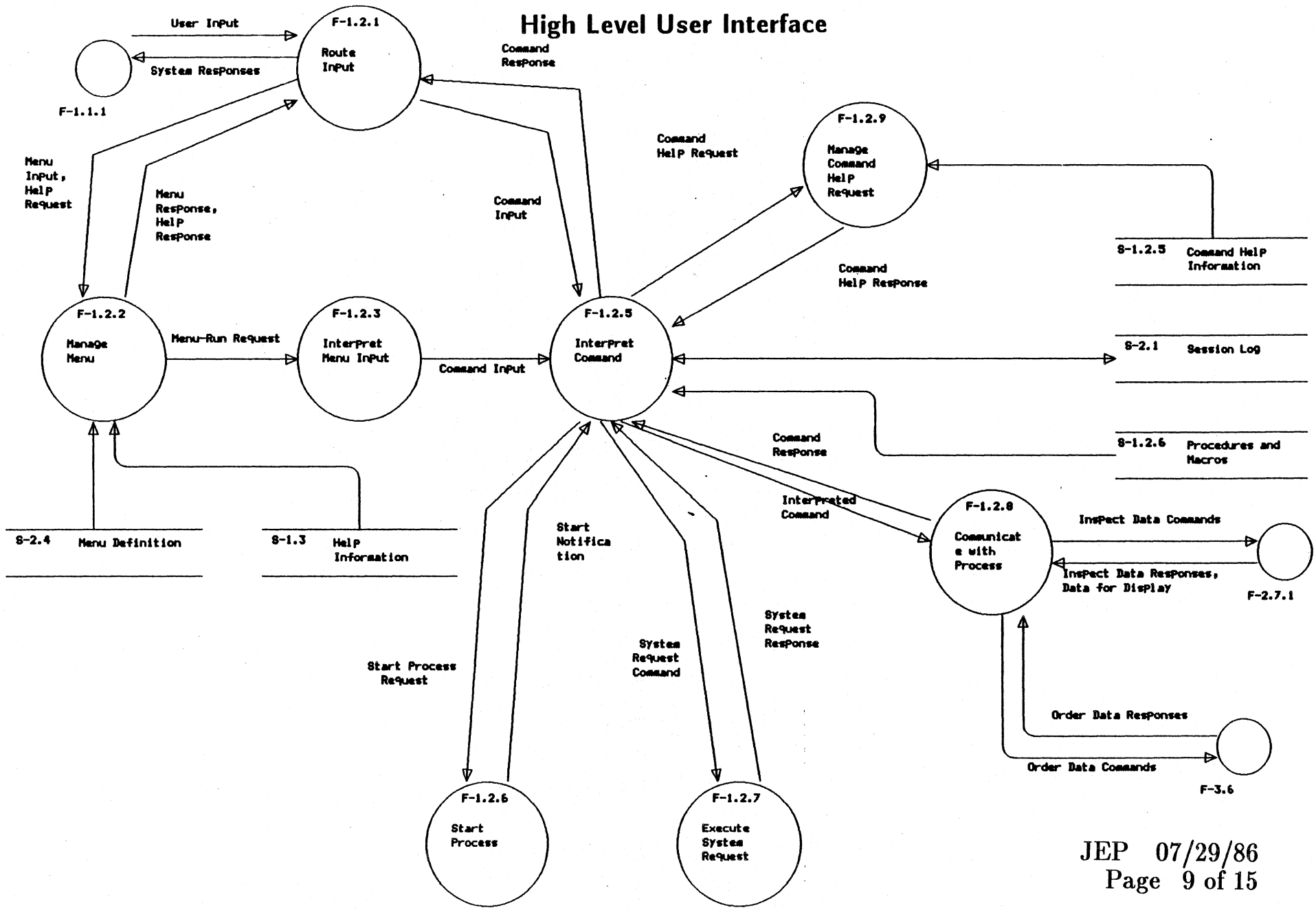
- Implementation Possibilities
  - Transportable Application Executive (TAE)
  - Britton Lee Freeform

JPL

PDS System Requirements Review

System Functional Requirements (Cont'd)

High Level User Interface



JPL

System Functional Requirements (Cont'd)

Transfer Data

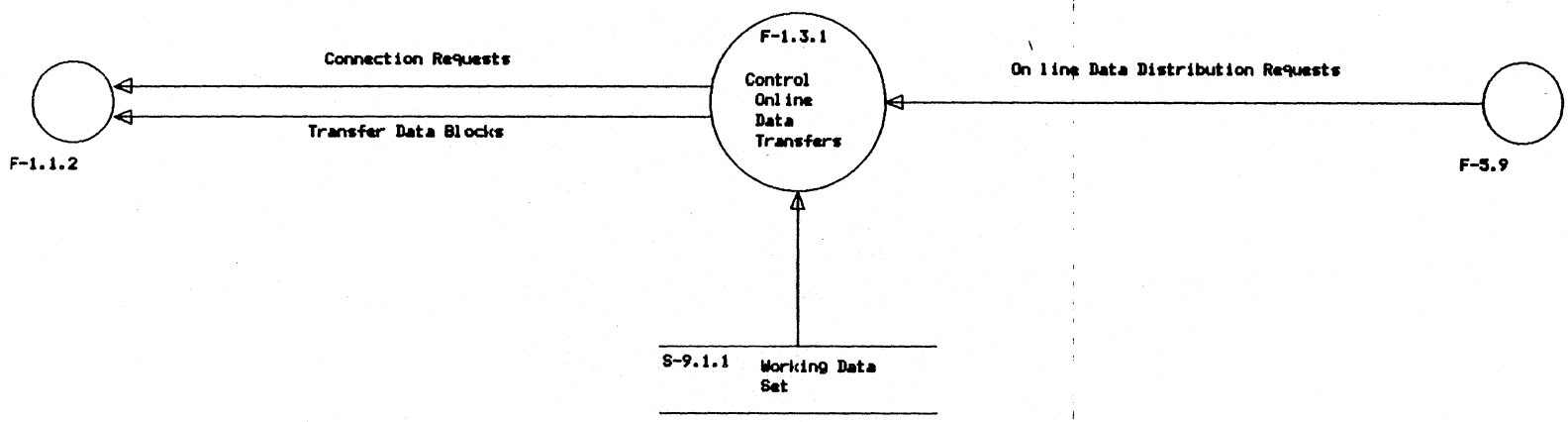
- General Requirements
  - Electronic Data Transfers
  - Scheduling of Data Transfers
  - Data Retrieval
- Functional Requirements
  - SPAN Copy
  - Asynchronous File Transfer Protocols
    - XMODEM
    - Kermit

JPL

PDS System Requirements Review

System Functional Requirements (Cont'd)

Transfer Data



JPL

System Functional Requirements (Cont'd)

Process Mail

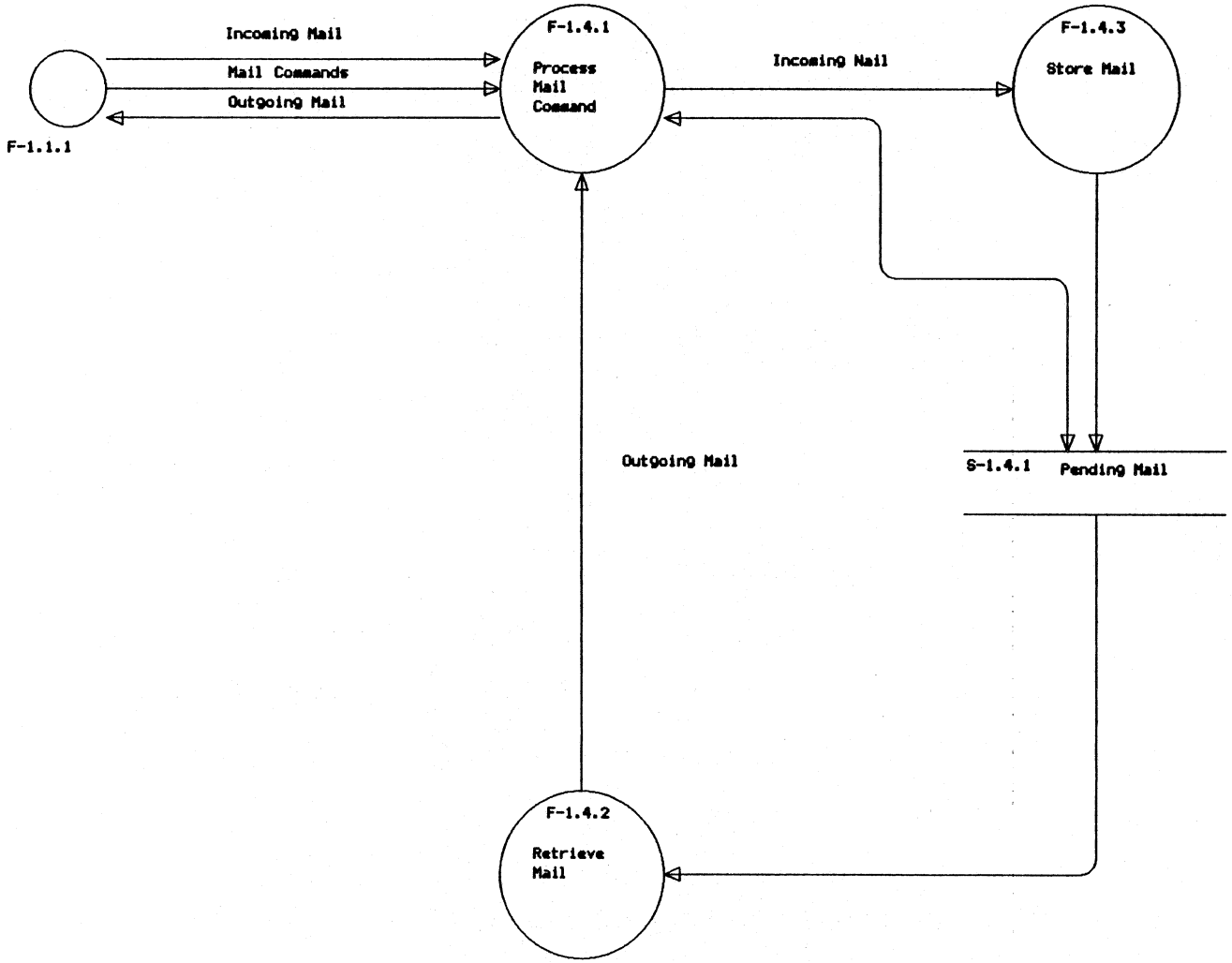
- General Requirements
  - Support Communications with Off Line Users
  - Support Communications Between PDS Operations and Users
- Functional Requirements
  - Receive Mail from PDS Processes for Users
  - Support User Retrieval of Mail Messages
  - Determine Status of Mail Messages
  - Delete Mail Mail Messages
  - Receive Mail from Users for PDS Operations
- Implementation Possibilities
  - VAX Mail
  - Telemail

JPL

PDS System Requirements Review

System Functional Requirements (Cont'd)

Process Mail



System Functional Requirements (Cont'd)

Scope

- Support Communications Function
  - Automated (A)
  - Critical (C)
  - Small Effort Using Available Functionality (SE)
- High Level Interface Function
  - Automated (A)
  - Critical Priority (C)
  - Large Effort Using Available Functionality (LE)
- Transfer Data Function
  - Automated (A)
  - Important Priority (I)
  - Medium Effort Using Available Functionality (ME)

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PDS System Requirements Review

System Functional Requirements (Cont'd)

- Process Mail Function
  - Automated (A)
  - Important Priority (I)
  - Small Effort Using Available Functionality (SE)

Responsibility

- All functions developed at Central Node

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

INSPECT DATA

E.A. MARTIN

JULY 29, 1986

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

INSPECT DATA

- REQUIREMENTS
  - SUPPORT USER IN DETERMINING THE EXISTENCE, DESCRIPTION, LOCATION, AND AVAILABILITY OF INFORMATION OF INTEREST FOR PLANETARY SCIENCE RESEARCH.
  - ALLOW USERS TO QUERY, RETRIEVE, MANIPULATE, AND DISPLAY DATA INTERACTIVELY.

- INSPECT DATA FUNCTIONS
  - INTERPRET INSPECT COMMANDS
  - RETRIEVE INSPECT DATA
  - DISPLAY DATA
  - MANIPULATE DATA

DFD-2
Inspect Data

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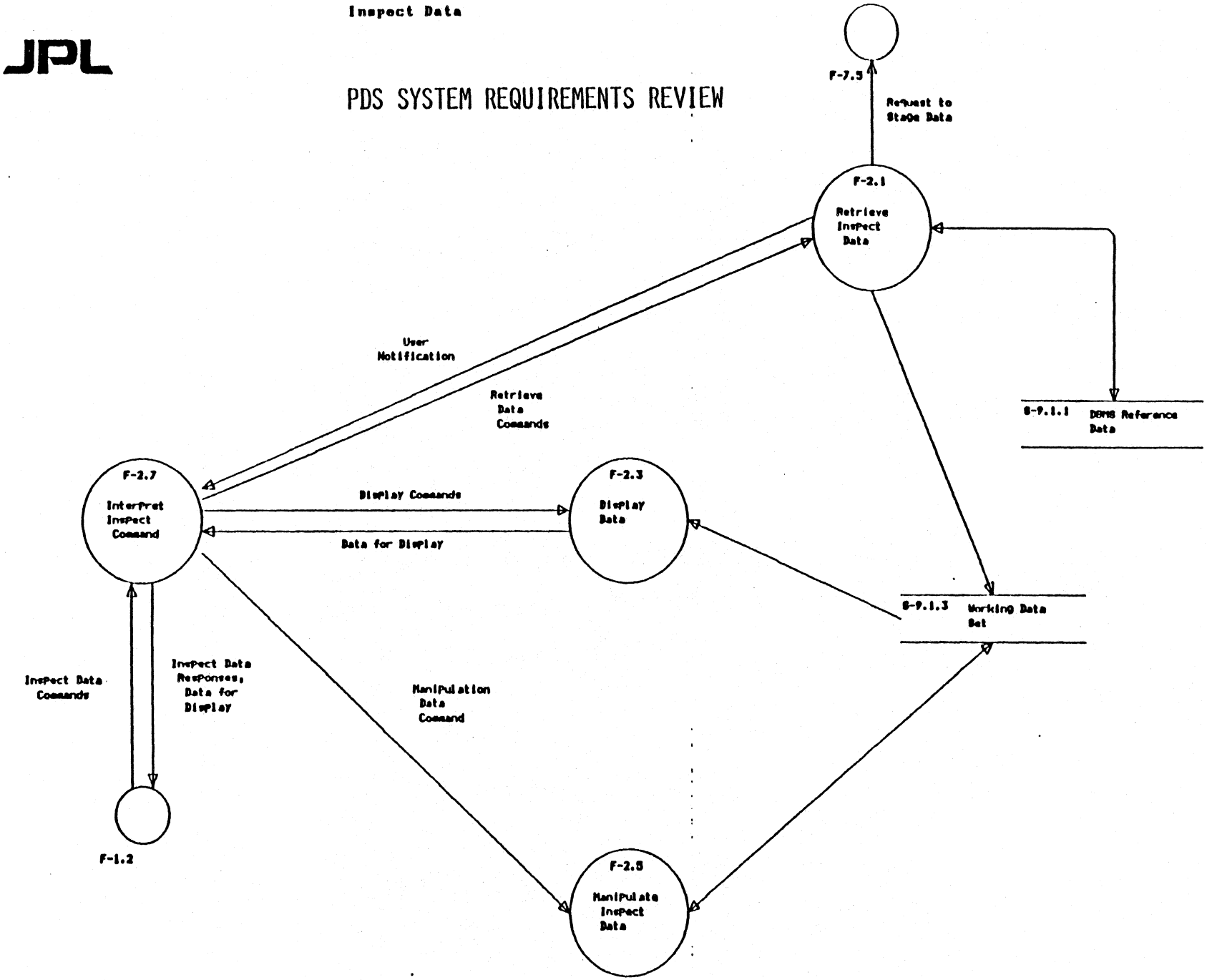
PDS SYSTEM REQUIREMENTS REVIEW



PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

INSPECT DATA

- INTERPRET INSPECT COMMAND
  - **Analyze, validate, and route inspect data commands to the appropriate inspect data subfunctions.**

- RETRIEVE INSPECT DATA
  - **Retrieve data which is on-line or request the staging of data which is currently available in off-line storage.**

- DISPLAY DATA
  - **Provide the primary capability to display data in text form, and if possible, the secondary capabilities to display data in graph and image form.**

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

INSPECT DATA

- MANIPULATE INSPECT DATA
  - Provide a set of basic processing operations (statistical, sampling, mathematical) that can be applied to data retrieved from the Working Data Set to make it easier for a user to assess the data.

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

INTERPRET INSPECT COMMAND (INSPECT DATA)

INTERPRET INSPECT COMMAND FUNCTION HAS TWO SUB-FUNCTIONS:

- PARSE COMMAND/PREPARE RESPONSE
  - **Receive, parse, and decompose inspect commands.**
  - **Route response data from the Inspect Data functions to the interactive user.**

- ROUTE PARSED COMMANDS
  - **Accept a parsed command with associated parameters.**
  - **Route the command to the appropriate inspect data sub-function.**

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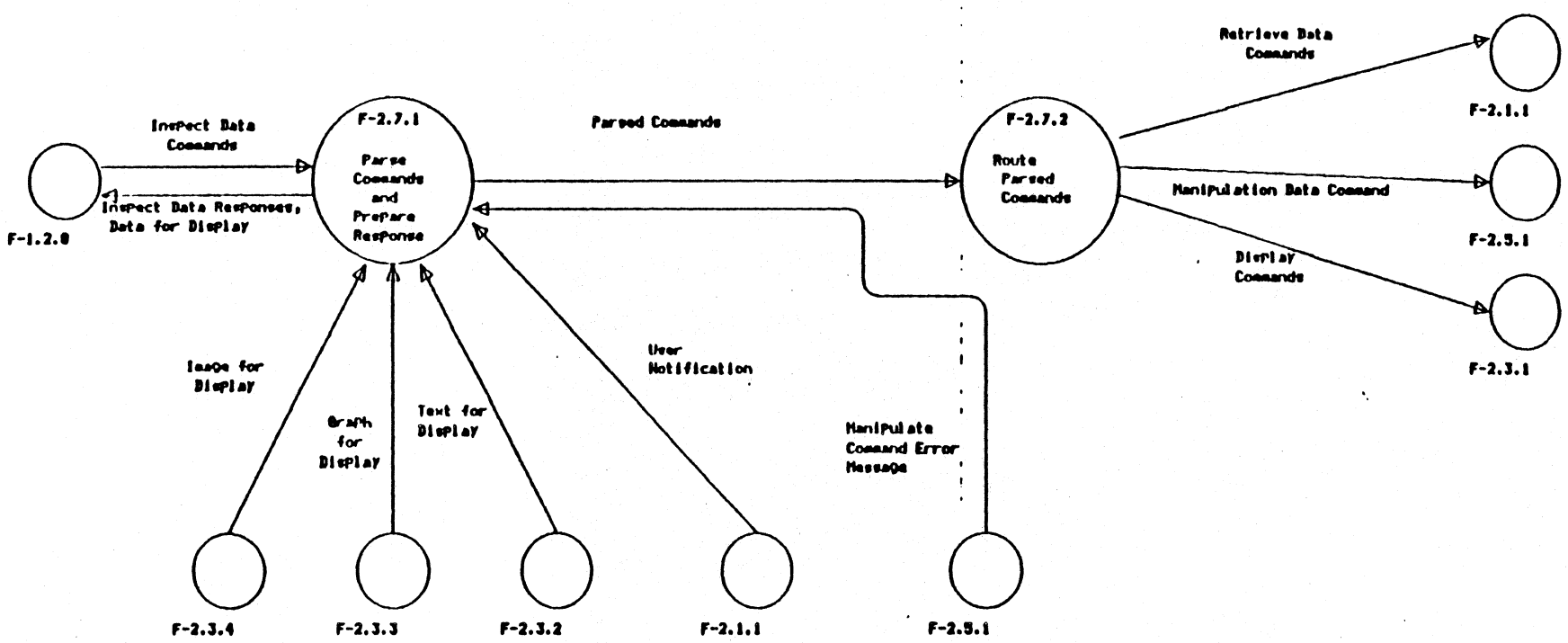
PDS SYSTEM REQUIREMENTS REVIEW

DFD-2.7

Interpret Inspect Command



PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

RETRIEVE INSPECT DATA (INSPECT DATA)

RETRIEVE INSPECT DATA FUNCTION HAS THREE SUB-FUNCTIONS:

- INTERPRET RETRIEVE COMMAND
  - **Interpret a retrieve request.**
  - **Determine where the requested data is stored.**
  - **Route the command to the appropriate retrieve inspect data sub-function, if it is on-line.**
  - **Issue a Request to Stage Data if data is not on-line but can be brought on-line.**

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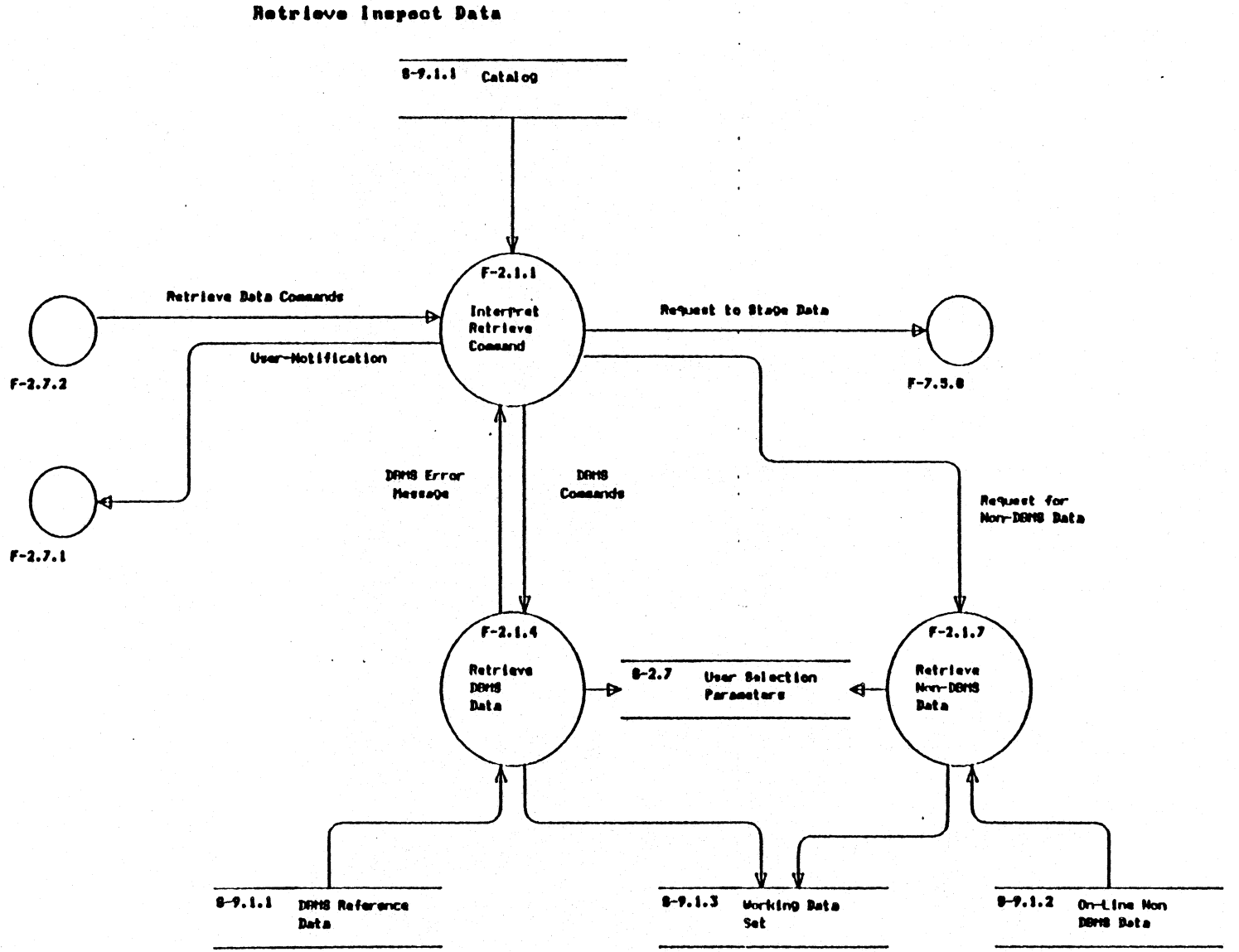
PDS SYSTEM REQUIREMENTS REVIEW

DFD-2.1



PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

RETRIEVE INSPECT DATA (INSPECT DATA)
(Continued)

- RETRIEVE DBMS DATA
  - Accept a DBMS command.
  - Retrieve the specified DBMS controlled data using relational operators.
  - Logically place the retrieved data into the Working Data Set for further processing.

- RETRIEVE NON-DBMS DATA
  - Accept retrieve request.
  - Retrieve data which is not under DBMS control.
  - Logically relocate data to the Working Data Set for further processing.

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

DISPLAY DATA (INSPECT DATA)

DISPLAY DATA FUNCTION HAS FOUR SUB-FUNCTIONS:

- INTERPRET DISPLAY COMMAND
  - Accept parsed display commands,
  - Verify request is compatible with user's display device.
  - Convert display command.
  - Route it to the appropriate display sub-function.

- DISPLAY TEXT
  - Accept display commands for text output.
  - Retrieve data from Working Data Set.
  - Format data into ASCII text.
  - Route the output to user's device.

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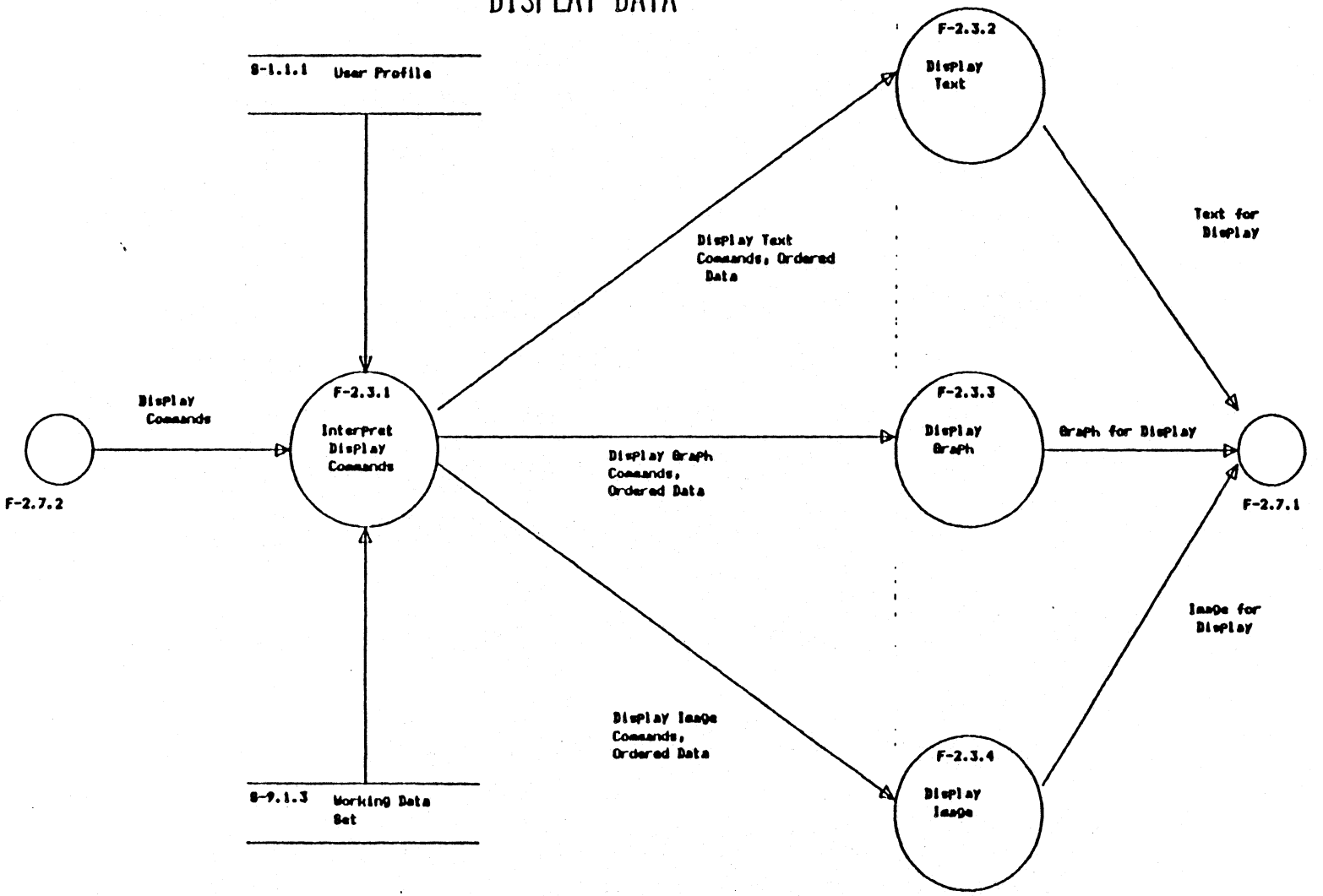
PDS SYSTEM REQUIREMENTS REVIEW

DFD-2.3
DISPLAY DATA



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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

DISPLAY DATA (INSPECT DATA)
(Continued)

- DISPLAY GRAPH
  - Accept display commands for graphic output.
  - Retrieve data from Working Data Set.
  - Format data into a graph or chart.
  - Route output to user's display device.

- DISPLAY IMAGE
  - Accept display image command.
  - Retrieve data from Working Data Set.
  - Display image on user's display device.

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

MANIPULATE INSPECT DATA (INSPECT DATA)

MANIPULATE INSPECT DATA FUNCTION HAS FIVE SUB-FUNCTIONS:

- o INTERPRET MANIPULATE COMMAND
  - Accept and validate data manipulation command.
  - Convert command to manipulation directives.
  - Route directives to appropriate manipulation sub-function.

- o STATISTICAL FUNCTIONS
  - Receive statistical directive
  - Retrieve specified data
  - Perform specified statistical function on data
  - Store results in Working Data Set
  - Statistical functions are Total, Averages, Minimum and Maximum Values, Standard Deviations, and Linear Least Squares Fit.
  - Limited to functions and associated data provided by discipline nodes.

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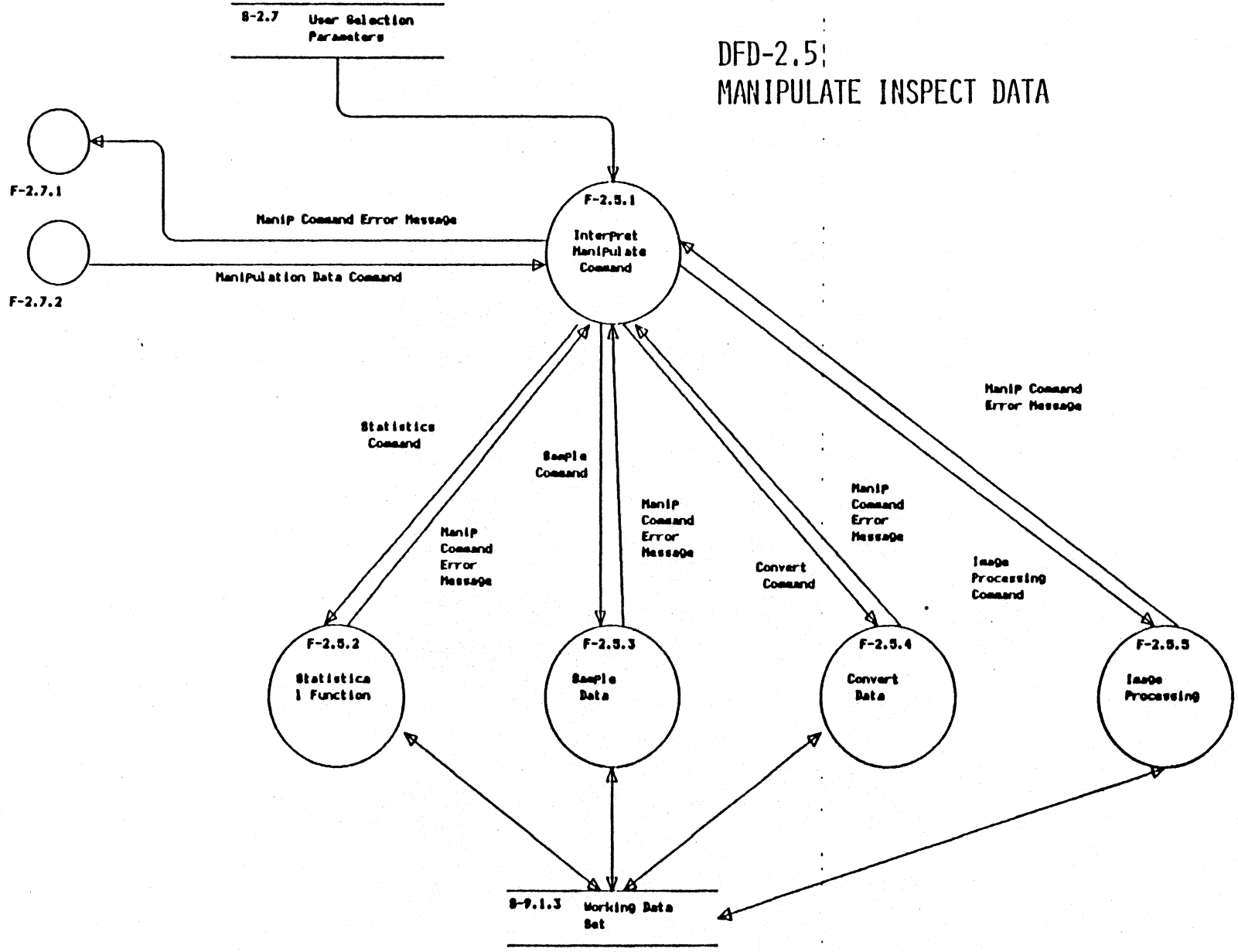
PDS SYSTEM REQUIREMENTS REVIEW

DFD-2.5: MANIPULATE INSPECT DATA



PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

MANIPULATE INSPECT DATA (INSPECT DATA)
(Continued)

- SAMPLE DATA
  - Accept data sampling directive
  - Retrieve specified data
  - Perform specified data sampling on data
  - Store results in Working Data Set
  - Sampling options are:
    - Select total of n values
    - Select n values at specified regular intervals
    - Select through random sampling
  - Limited to functions and associated data provided by discipline nodes.

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

MANIPULATE INSPECT DATA (INSPECT DATA)
(Continued)

- o CONVERT DATA
  - Accept data conversion directive
  - Retrieve specified data
  - Perform specified data conversion on the data
  - Store results in Working Data Set
  - Data Conversion Types are:
    - . 3-D cartesian vectors to spherical coordinates and reverse
    - . data conversions: integers to real numbers, reals to integer, single precision to double precision, etc.
    - . mathematical operations: additions, subtractions, division, multiplication, logarithms, absolute value, etc.
  - Limited to functions and associated data provided by discipline nodes.

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

MANIPULATE INSPECT DATA (INSPECT DATA)
(Continued)

- IMAGE PROCESSING
  - Accept image processing directive
  - Retrieve specified data
  - Perform specified image processing on data
  - Store results in Working Data Set
  - Limited to functions and associated data provided by discipline nodes.

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

INSPECT DATA

LEGEND:

Priority:	C	Critical
	I	Important
	N	Nice
Automation:	A	Fully Computerized Function
	I	Interactive Function
	M	Manual Function
Nodes:	C	Central Node (JPL)
	D	All Data Nodes
	S	All Data Suppliers
	F	Fields and Particles (UCLA)
	L	Laboratory of Atmospheric Space Physics
	W	Washington University
	R	RPIF (JPL)
Scope:	S	Small Effort
	M	Medium Effort
	L	Large Effort
	V	Very Large Effort
	SE	Small Effort using existing software package
	ME	Medium Effort using existing software package
	LE	Large Effort using existing software package
	VE	Very Large Effort using exising software package

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

INSPECT DATA

PDS DEVELOPMENT PRIORITIES

TASK NAME	DFD NUMBER	PRIOR	AUTO	NODE	SCOPE
Inspect-Data	F-2	C	A	C	SE
Retrieve-Inspect-Data	F-2.1	C	A	C	SE
Interpret-Retrieve-Command	F-2.1.1	C	A	C	ME/L
Retrieve-DBMS-Data	F-2.1.4	C	A	C	SE
Retrieve-Non-DBMS-Data	F-2.1.7	I	A	C,R,W,L	LE/V
Display-Data	F-2.3	C	A	C	SE
Interpret-Display-Command	F-2.3.1	C	A	C	ME
Display-Text	F-2.3.2	C	A	C	ME
Display-Graph	F-2.3.3	I	A	F	LE/VE
Display-Image	F-2.3.4	I	A	R	LE/VE
Manipulate-Inspect-Data	D-2.5	I	A	C,L,F,R	ME
Interpret-Manipulate-Command	F-2.5.1	I	A	C	ME
Statistical-Functions	F-2.5.2	I	A	F	LE
Sample-Data	F-2.5.3	I	A	F,L	ME
Convert-Data	F-2.5.4	I	A	F,L	LE/VE
Image-Processing	F-2.5.5	I	A	R	LE/VE
Interpret-Inspect-Commands	F-2.7	C	A	C	ME/L
Parse-Command/Prepare-Response	F-2.7.1	C	A	C	ME/L
Route-Parse-Commands	F-2.7.2	C	A	C	ME/L

EAM 7/29/86
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PDS System Requirements Review

System Functional Requirements

Order Data

David Childs

29 July 1986

System Functional Requirements

Order Data

- Requirements
  - Users shall be able to order planetary science data and supporting information for analysis at their home institutions.
- Order Data Transactions
  - Orders for On Line Distribution
  - Orders for Manual Distribution
- Order Data Functions
  - Interpret Order Commands
  - Extract User Information
  - Verify User Information Complete
  - Extract Data Definition
  - Verify Data Definition Correct
  - Accept Order
  - Select On Line Orders
  - Prepare Order Form

PDS System Requirements Review

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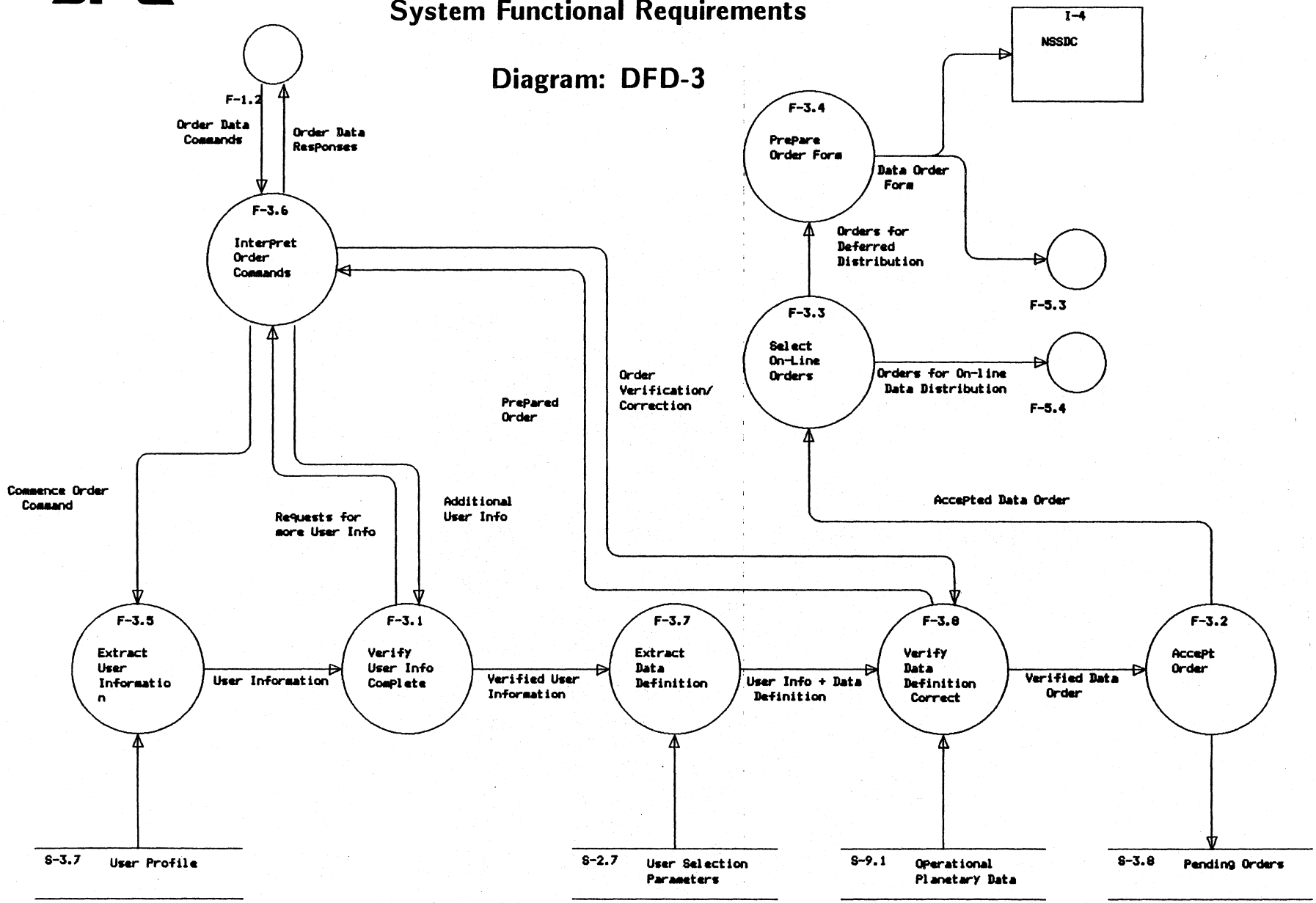
System Functional Requirements

Diagram: DFD-3



System Functional Requirements

Order Data

- Interpret Order Commands
  - Interpret and route all user inputs and commands for ordering
  - Route and format all order function responses
- Extract User Information
  - Extract user information necessary to fill an order and note deficiencies
- Verify User Information Complete
  - Determine if user information is complete
  - Query user for missing information
- Extract Data Definition
  - Extract the data logical name, data qualifiers, and processing instructions for ordered data

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PDS System Requirements Review

System Functional Requirements

Order Data

- Verify Data Definition Correct
  - Determine if data definition of ordered data is valid
  - Query user about invalid information
  - Present completed order to user
  - Accept user verification or corrections
- Accept Order
  - Assign a unique order identification number
  - Enter order in pending order file
- Select On Line Orders
  - Determine the location and media of the ordered data
  - Determine if an order can be filled immediately by electronic data transfers
- Prepare Order Form
  - Prepare a data order form for data which cannot be distributed on line
  - Transmit data order form to appropriate data node

System Functional Requirements

Order Data Priority, Development Effort, and Development Responsibility

•

Function Name	DFD Number	Priority	Node	Automation	Scope
Verify User Info Complete	F-3.1	I	C	A	S
Accept Order	F-3.2	I	C	A	S
Select On Line Orders	F-3.3	C	C	A	S
Prepare Order Form	F-3.4	I	C	I	S
Extract User Information	F-3.5	I	C	A	S
Interpret Order Commands	F-3.6	I	C	A	S
Extract Data Definition	F-3.7	I	C	A	M
Verify Data Definition Correct	F-3.8	I	C	A	S

— Priority - C = Critical, I = Important, N = Nice

— Node - C = Central, D = Discipline Nodes, A = All Nodes

— Automation - A = Automated, I = Interactive, M = Manual

— Scope - S = Small Effort, M = Medium Effort, L = Large Effort, VL = Very Large Effort

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PDS System Requirements Review

System Functional Requirements

Distribute Data

David Childs

29 July 1986

System Functional Requirements

Distribute Data

- Requirements
  - Users shall be able to obtain planetary science data and supporting information that have been ordered for analysis at their home institutions.
  - All distributions shall be prepared using a duplicate copy of the master record. At no time shall the master records be used for data distribution.
- Distribute Data Transactions
  - On Line Data Distribution
  - Manual Data Distribution
- Distribute Data Functions
  - Retrieve Ordered Data
  - Distribute Data On Line
  - Process Order Manually
  - Remove Pending Order
  - Send Order Confirmation Mail

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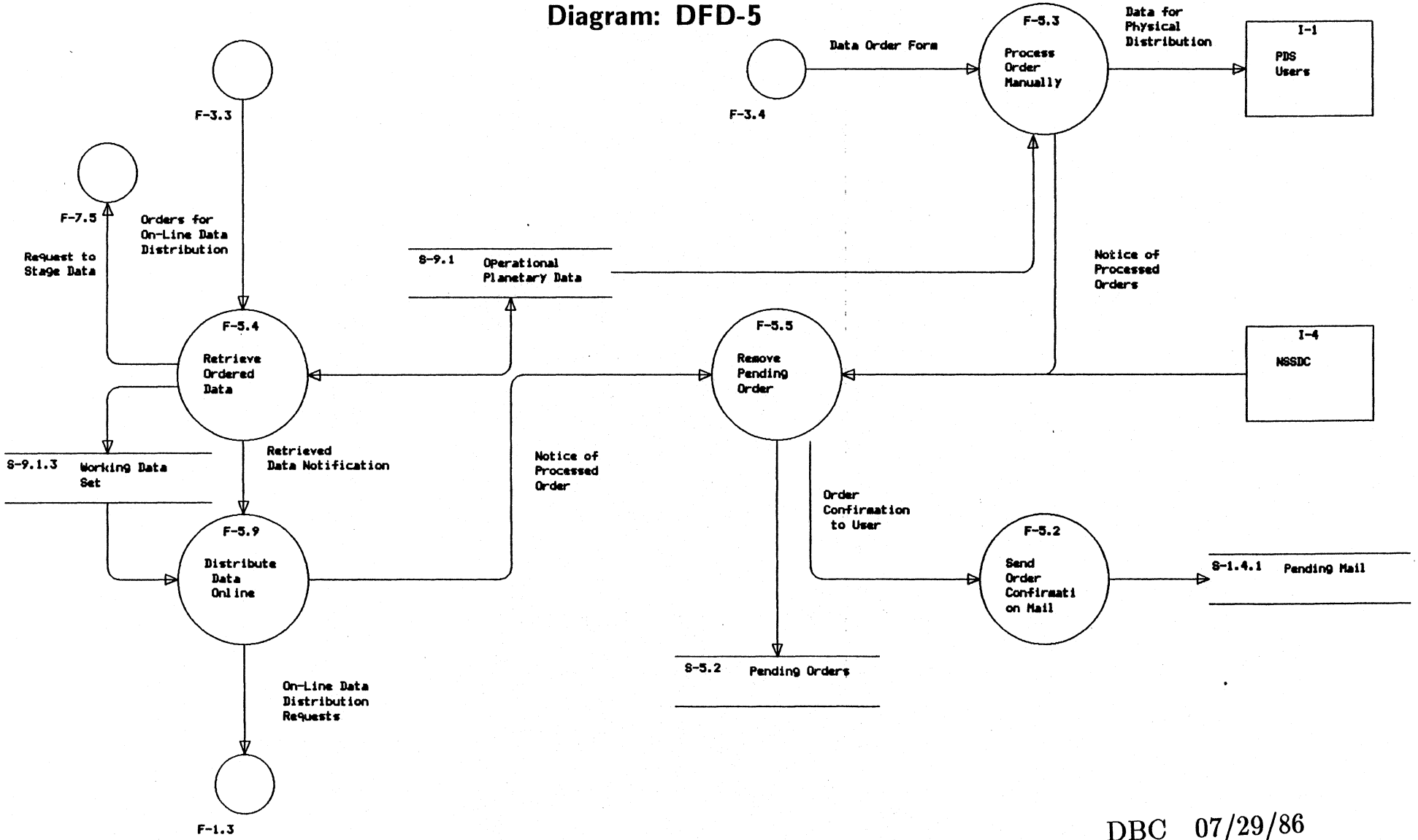
PDS System Requirements Review

System Functional Requirements

Diagram: DFD-5



System Functional Requirements

Distribute Data

- Retrieve Ordered Data
  - Same functionality as Retrieve Inspect Data
- Distribute Data On Line
  - Prepare data set for distribution in real time over communication links
- Process Order Manually
  - Retrieve requested data
  - Process data as required
  - Prepare distribution media
  - Ship the requested data

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PDS System Requirements Review

System Functional Requirements

Distribute Data

- Remove Pending Order
  - Receive notice of processed order
  - Remove order entry from pending order file
- Send Order Confirmation Mail
  - Notify the user when the data order has been executed

System Functional Requirements

Distribute Data Priority, Development Effort, and Development Responsibility

•

Function Name	DFD Number	Priority	Node	Automation	Scope
Send Order Confirmation Mail	F-5.2	I	C	I	S
Process Order Manually	F-5.3	I	D	M	M
Retrieve Ordered Data	F-5.4	C	C	A	SE
Retrieve Order DBMS Data	F-5.4.3	C	C	A	SE
Interpret Order Retrieve Cmd	F-5.4.5	C	C	A	ME/L
Retrieve Order Non DBMS Data	F-5.4.7	I	R,W,L	A	LE/V
Remove Pending Order	F-5.5	I	C	I	S
Distribute Data On Line	F-5.9	C	C	A	S

— Priority - C = Critical, I = Important, N = Nice

— Node - C = Central, D = Disc. Nodes, R = RPIF, W = WashU, L = LASP

— Automation - A = Automated, I = Interactive, M = Manual

— Scope - S = Small Effort, M = Medium Effort, L = Large Effort, VL = Very Large Effort E = Existing Software

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PDS System Requirements Review

System Functional Requirements

Prepare Data

David Childs

29 July 1986

System Functional Requirements

Prepare Data

- Requirements
  - All data entered into the PDS shall be in the PDS standard format.
  - All data shall be given a quality rating. No data with a "bad" rating shall be included.
  - Data shall be more tightly screened for reliability and accuracy as the processing or compression of the data increases.
- Prepare Data Transaction
- Prepare Data Functions
  - Check Data Format
  - Check/Sample Data Content
  - Validate Software
  - Review of Data by Peers
  - Store Data

PDS System Requirements Review

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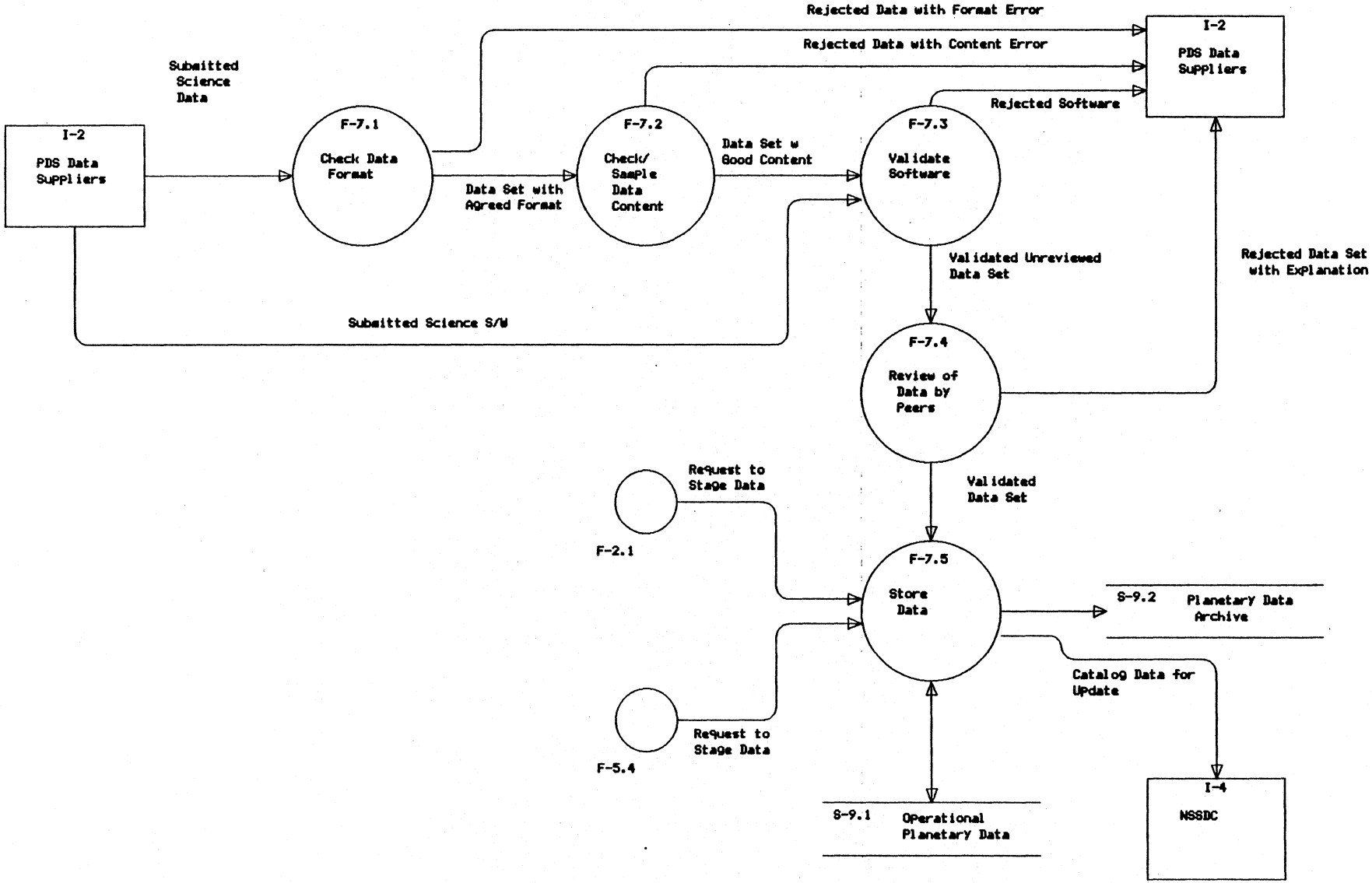
System Functional Requirements

Diagram: DFD-7



System Functional Requirements

Prepare Data

- Check Data Format
  - Determine if the format of a submitted data set is recognizable
  - Convert a data set from non-machine readable into machine readable
  - Check the documentation of a data set for a format description
  - Determine if a data set is in the standard PDS format
  - Determine if it is cost effective to correct the format of a data set
  - Reformat a data set to the PDS standard
  - Convert elements of a data set to another data type
- Check/Sample Data Content
  - Determine if any data in a data set is missing
  - Determine if any parameters in a data set are out of range
  - Evaluate data sets with out of range data for inclusion in the system

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PDS System Requirements Review

System Functional Requirements

Prepare Data

- Validate Software
  - Determine if any software components are missing
  - Evaluate the quality of the software
  - Administer software evaluation activities and allocate resources
  - Test submitted software components
  - Integrate software components for use in operational system
- Review of Data by Peers
  - Schedule a review to evaluate a prepared data set
  - Prepare and distribute the review materials
  - Conduct the data set review
  - Determine if a data set is suitable for inclusion in the system

System Functional Requirements

Store Data (Prepare Data)

- Requirements
  - Update operational planetary data master records
  - Update planetary data archive
  - Service data staging requests
- Store Data Transactions
  - Store prepared, validated data sets
  - Service data staging requests
- Store Data Functions
  - Extract Data
  - Prepare Catalog Data
  - Prepare Sample/Summary Data
  - Prepare Science Data
  - Prepare Software Library
  - Prepare Ancillary Data
  - Service Data Storage Requests
  - Service Data Staging Requests

PDS System Requirements Review

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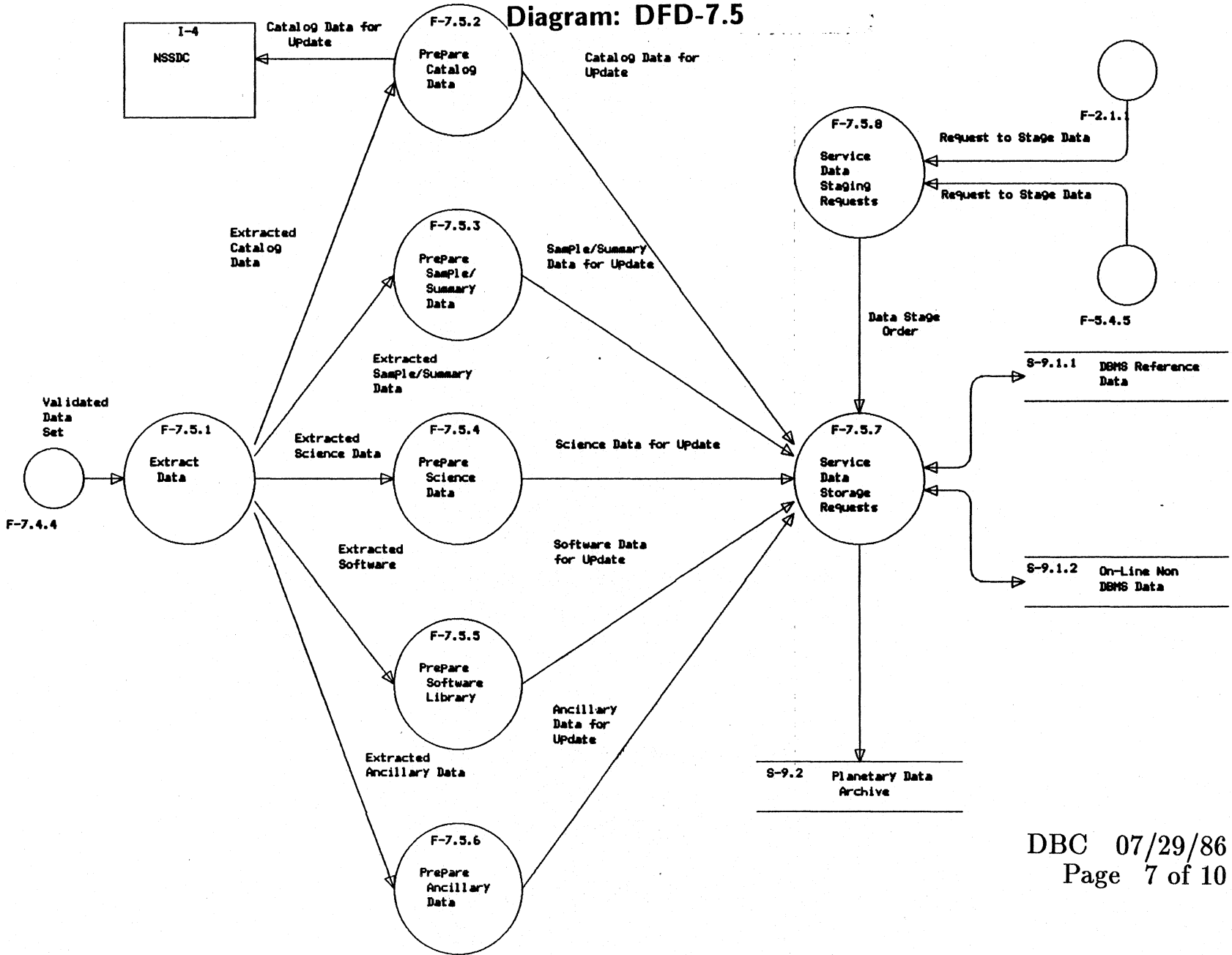
System Functional Requirements

Diagram: DFD-7.5



System Functional Requirements

Store Data (Prepare Data)

- Extract Data
  - Extract subsets of data from a validated data set to update the storage hierarchy
- Prepare Catalog Data
- Prepare Sample/Summary Data
- Prepare Science Data
- Prepare Software Library
- Prepare Ancillary Data
  - Validate extracted data subset
  - Prepare routines to load data subset
  - Generate an entry to the update log
  - Initiate a message indicating availability of new data

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PDS System Requirements Review

System Functional Requirements

Store Data (Prepare Data)

- Service Data Storage Requests
  - Fulfill requests to store data in the storage hierarchy
  - Prepare data package for deep archive
  - Fulfill requests to relocate data in the storage hierarchy
- Service Data Staging Requests
  - Determine the most cost effective and efficient way to stage data
  - Issue an order to stage data

System Functional Requirements

Prepare Data Priority, Development Effort, and Development Responsibility

Function Name	DFD Number	Priority	Node	Automation	Scope
Check-Data-Format	F-7.1	I	A	M	M
Check/-Sample-Data-Content	F-7.2	N	A	M	M
Validate-Software	F-7.3	N	A	M	M
Review-of-Data-by-Peers	F-7.4	N	A	M	M
Store-Data	F-7.5	C	C	I	M
Extract-Data	F-7.5.1	C	C	I	M
Prepare-Catalog-Data	F-7.5.2	C	C	I	SE
Prepare-Sample/-Summary-Data	F-7.5.3	I	C	I	M
Prepare-Science-Data	F-7.5.4	I	C	I	ME/L
Prepare-Software-Library	F-7.5.5	N	C	I	ME
Prepare-Ancillary-Data	F-7.5.6	N	C	I	ME/L
Service-Data-Storage-Requests	F-7.5.7	C	C	I	ME/L
Service-Data-Staging-Requests	F-7.5.8	I	C	I	M

- Priority - C = Critical, I = Important, N = Nice
- Node - C = Central Node, A = All Nodes
- Automation - A = Automated, I = Interactive, M = Manual
- Scope - S = Small Effort, M = Medium Effort, L = Large Effort, VL = Very Large Effort E = Existing Software

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PDS SYSTEM REQUIREMENTS REVIEW

SYSTEM FUNCTIONAL REQUIRMENTS

ADMINISTER SYSTEM

E.A. MARTIN

JULY 29, 1986

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER SYSTEM

- REQUIREMENTS
  - MANAGE ALL OF THE PDS SYSTEM ACTIVITIES.

- ADMINISTER SYSTEM FUNCTIONS
  - CUSTOMER SUPPORT
  - FACILITIES
  - PLANNING AND SCHEDULING
  - ACCOUNTING
  - ADMINISTER DATA

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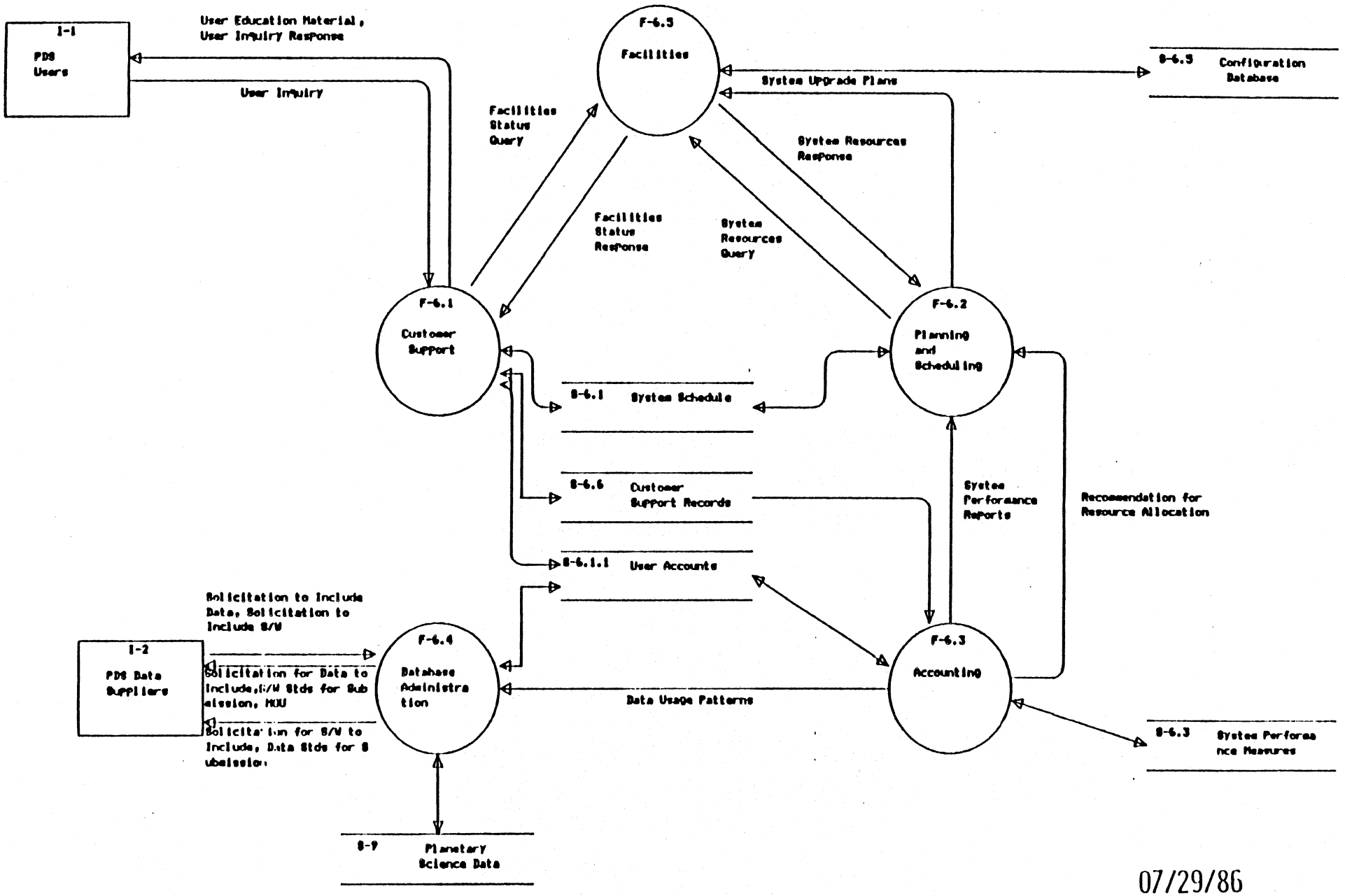
PDS SYSTEM REQUIREMENTS REVIEW
DFD-6
ADMINISTER SYSTEM



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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER SYSTEM

- CUSTOMER SUPPORT
  - Accept and process all user inquiries.
  - Provide consulting help on use of system and usage of data.
  - Provide documentation on system, data sets, analysis software, education materials.

- FACILITIES FUNCTION SHALL PERFORM TWO MAJOR FUNCTIONS
  - Identify configuration of system and control changes to this configuration.
  - Maintain integrity and traceability of configuration throughout all phases of the system life cycle.

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER SYSTEM

- o PLANNING AND SCHEDULING
  - Schedule heavy system periods, system upgrades, extended system down time.
  - Develop, manage, and maintain overall system schedule.
  - Monitor system performance, resolve system resource conflicts, and develop system upgrade plans.
  - Manage and maintain system resource allocations.

- o ACCOUNTING
  - Create, maintain, and delete user accounts including logging, accounting, and charges for all user transactions, if any.
  - Capture, maintain, analyze, and delete system performance measu
  - Audit system operations.
  - Audit Data Order Log and Data Preparation Log, expedite order if necessary.

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER SYSTEM

- ADMINISTER DATA
  - Maintain and enforce data standards and software standards.
  - Maintain technical design and maintenance of all data stores used in the system.
  - Maintain storage hierarchy.
  - Maintain data integrity and data accounting.

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

CUSTOMER SUPPORT (ADMINISTER SYSTEM)

CUSTOMER SUPPORT FUNCTION HAS FIVE SUB-FUNCTIONS:

- ROUTE USER REQUEST
  - Accepts user inquiries and requests from phone or electronic mail.
  - Enters user inquiry into a customer support log.
  - Routes user inquiries to appropriate customer support function.

- REGISTER USERS
  - Accept user inquiry to register new user.
  - Validate request against authorized list.
  - Set up new user account, authorizations, and limits.
  - Collect and store user information in user profile.
  - Update customer support record and notify user of new account information.

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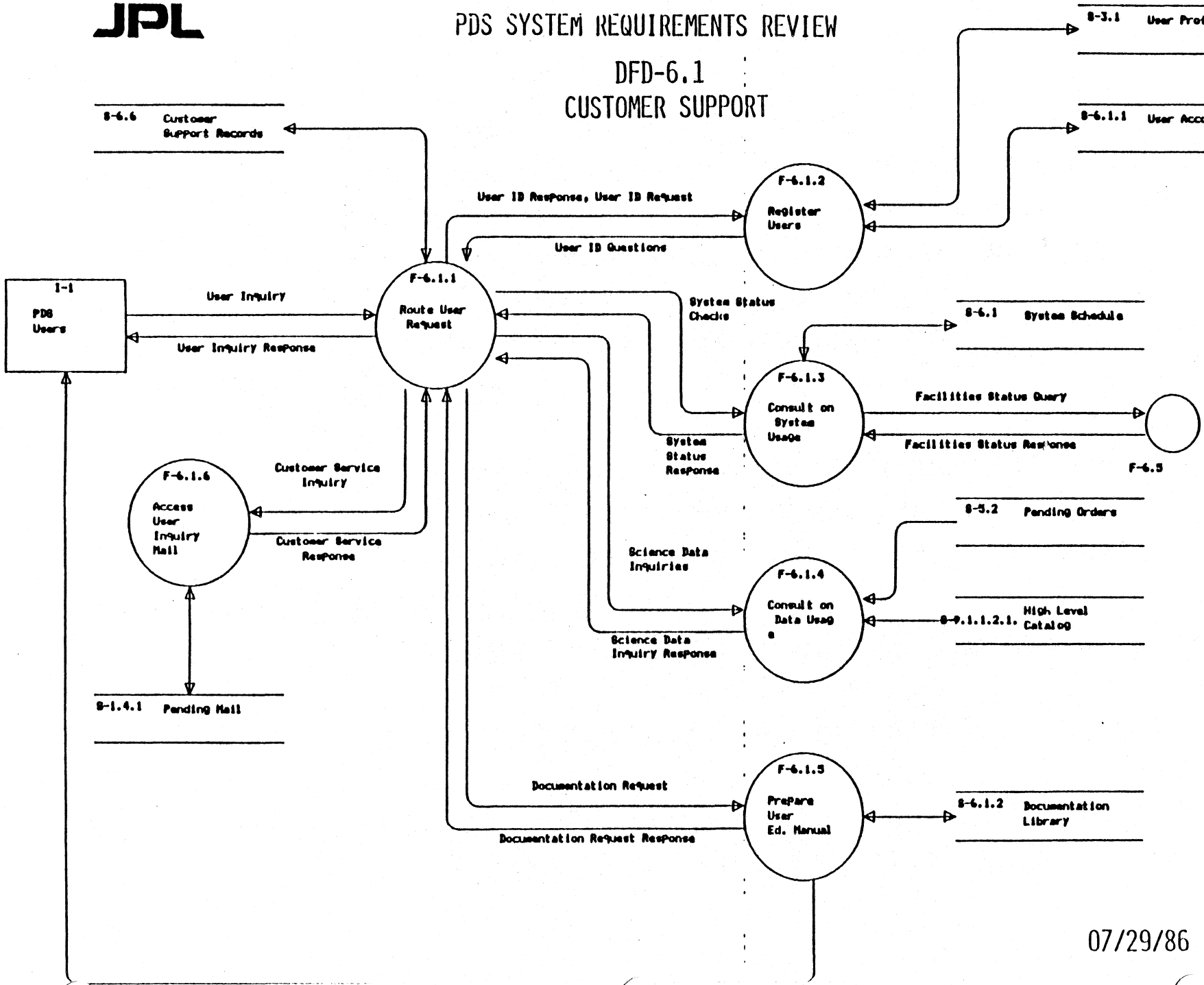
PDS SYSTEM REQUIREMENTS REVIEW

DFD-6.1
CUSTOMER SUPPORT



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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

CUSTOMER SUPPORT (ADMINISTER DATA)
(Continued)

- o CONSULT ON SYSTEM USAGE
  - Accept user inquiry on system problems.
  - Resolve user complaints, system error reports, hardware failures.
  - Perform system status checks.
  - Enter system errors in System Error Report file.
  - Provide information to user as requested on:
    - . User of System
    - . System Status Checks Information
    - . Resolution of User Complaints and System Errors

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

CUSTOMER SUPPORT (ADMINISTER SYSTEM)
(Continued)

- CONSULT ON DATA USAGE
  - Accept user inquiry on PDS data.
  - Perform one of the following as per the request:
    - Check on status of user's data order and expedite, if necessary.
    - Check on status of user's data preparation order and expedite, if necessary.
    - Research information to answer user inquiry on PDS data.
  - Provide this information to user.

- PREPARE USER EDUCATION MANUAL
  - Accept user inquiry for documentation.
  - Select specified PDS documentation or educational material.
  - Send material to user.

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

CUSTOMER SUPPORT (ADMINISTER SYSTEM)
(Continued)

Additionally,

- **Prepare user education material.**
- **Maintain library of all PDS documentation.**
- **Provide PDS demonstrations and introductory training, as required.**

o ACCESS USER INQUIRY MAIL

- **Receive user inquiries via electronic mail and send them on to Route User Inquiries.**
- **Receive customer service inquiries and send to user via electronic mail.**
- **Mail messages shall be stored in Pending Mail waiting to be read by receiver.**

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER DATA (ADMINISTER SYSTEM)

ADMINISTER DATA FUNCTION HAS SEVEN SUB-FUNCTIONS:

- MAINTAIN STORAGE HIERARCHY
  - Evaluate data usage patterns and DBMS data usage statistics.
  - Based upon evaluation, revise priorities and accessibility of data sets by changing their position on storage hierarchy.
  - Initiate requests to relocate data set based on information above (remove from on-line storage, store on-line, etc.).

- MAINTAIN ARCHIVE
  - Maintain, curate, and refurbish deep archive contents.
  - Accept order to restore data.
  - Retrieve specified data from Operational Local Archive.
  - Send specified data to Maintain On-Line PDS.

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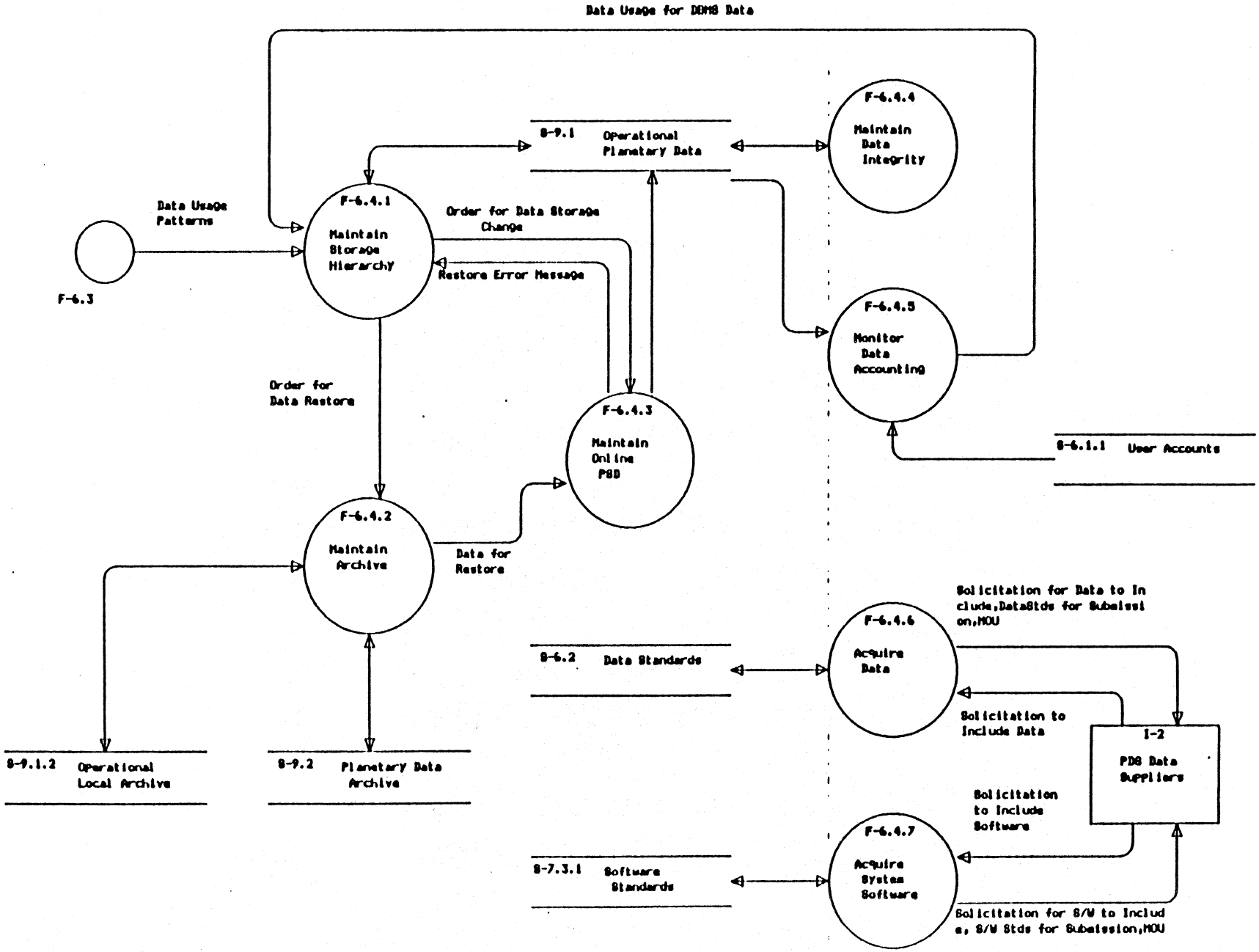
PDS SYSTEM REQUIREMENTS REVIEW
DFD-6.4
ADMINISTER DATA



PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER DATA (ADMINISTER SYSTEM)
(Continued)

- MAINTAIN ON-LINE PDS
  - Accept order for data change.
  - Validate order.
  - If problem, return error message to Maintain Storage Hierarchy.
  - If restore order, receive data from Maintain Archive and load it into designated on-line storage structure.
  - If delete order, validate copy of data exists in off-line storage and then delete data from on-line storage location.

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER DATA (ADMINISTER SYSTEM)
(Continued)

- MAINTAIN DATA INTEGRITY
  - Maintain data integrity within PDS Storage Hierarchy.
  - Periodically check PDS data using integrity check procedures.
  - Correct any integrity problems found.
  - Periodically review Prepare Data Functions to make sure data is being properly validated before loading into system.

- MONITOR DATA ACCOUNTING
  - Provide and maintain security and privacy controls on all PDS stored data.
  - Monitor all user access of data.
  - Analyze data access patterns and make recommendations for performance tuning of various databases.
  - Send DBMS usage statistic and recommendations to Maintain Storage Hierarchy.

PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER DATA (ADMINISTER SYSTEM)
(Continued)

- ACQUIRE DATA
  - Develop and maintain PDS data standards.
  - Receive solicitation requests to include data in PDS.
  - Validate request.
  - Negotiate Memorandum of Understanding (MOU) with data supplier.
  - Send Solicitation for Data and PDS data standards to data supplier.
  - Facilitate and monitor loading of submitted data into Operational Planetary Data.

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER DATA (ADMINISTER SYSTEM)
(Continued)

- ACQUIRE SOFTWARE
  - Develop, maintain, and distribute PDS software standards.
  - Solicit data producer for analysis software to be included in PDS.
  - Handle administrative aspects of acquiring software.
  - Facilitate and monitor loading of submitted software into the PDS operational software library.
  - Evaluate all software to be included in operational PDS to ensure that there is no interaction detrimental to overall system performance or to the database's performance.

ADMINISTER SYSTEM

LEGEND:

Priority:	C	Critical
	I	Important
	N	Nice
Automation:	A	Fully Computerized Function
	I	Interactive Function
	M	Manual Function
Nodes:	C	Central Node (JPL)
	D	All Data Nodes
	S	All Data Suppliers
	F	Fields and Particles (UCLA)
	L	Laboratory of Atmospheric Space Physics
	W	Washington University
	R	RPIF (JPL)
Scope:	S	Small Effort
	M	Medium Effort
	L	Large Effort
	V	Very Large Effort
	SE	Small Effort using existing software package
	ME	Medium Effort using existing software package
	LE	Large Effort using existing software package
	VE	Very Large Effort using exising software package

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PDS SYSTEM REQUIREMENTS REVIEW
SYSTEM FUNCTIONAL REQUIREMENTS

ADMINISTER DATA

PDS DEVELOPMENT PRIORITIES

TASK NAME	DFD NUMBER	PRIOR	AUTO	NODE	SCOPE
Administer-System	F-6	C	M	C	SE
Customer-Support	F-6.1	C	M	C	SE
Route-User-Request	F-6.1.1	C	M	C	SE
Register-Users	F-6.1.2	C	M	C	SE
Consult-on-System-Usage	F-6.1.3	I	M	C	SE
Consult-on-Data-Usage	P-6.1.4	C	M	C	SE
Prepare-User-Ed-Manual	F-6.1.5	C	M	C	ME
Access-User-Inquiry-Mail	F-6.1.6	C	M	C	SE
Planning-and-Scheduling	F-6.2	N	M	C	SE
Accounting	F-6.3	N	M	C	ME
Administer-Data	F-6.4	C	I	C	SE
Maintain-Storage-Hierarchy	F-6.4.1	C	M	C	ME
Maintain-Archive	F-6.4.2	C	M	C	SE
Maintain-Online-PDS	F-6.4.3	C	I	C	ME
Maintain-Data-Integrity	F-6.4.4	C	M	C	SE
Monitor-Data-Accounting	F-6.4.5	I	I	C	ME
Acquire-Data	F-6.4.6	I	M	C	SE
Acquire-System-Software	F-6.4.7	I	M	C	SE
Facilities	F-6.5	I	M	C	SE

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PDS SYSTEM REQUIREMENTS REVIEW

DATA MANAGEMENT REQUIREMENTS

E.A. MARTIN

JULY 29, 1986

PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

- DATA ADMINISTRATION PLAN
- PDS TAXONOMY OF DATA
- PDS GLOBAL DATA MODEL
- PDS PRIORITY DATASET LIST (For Version 1.0)

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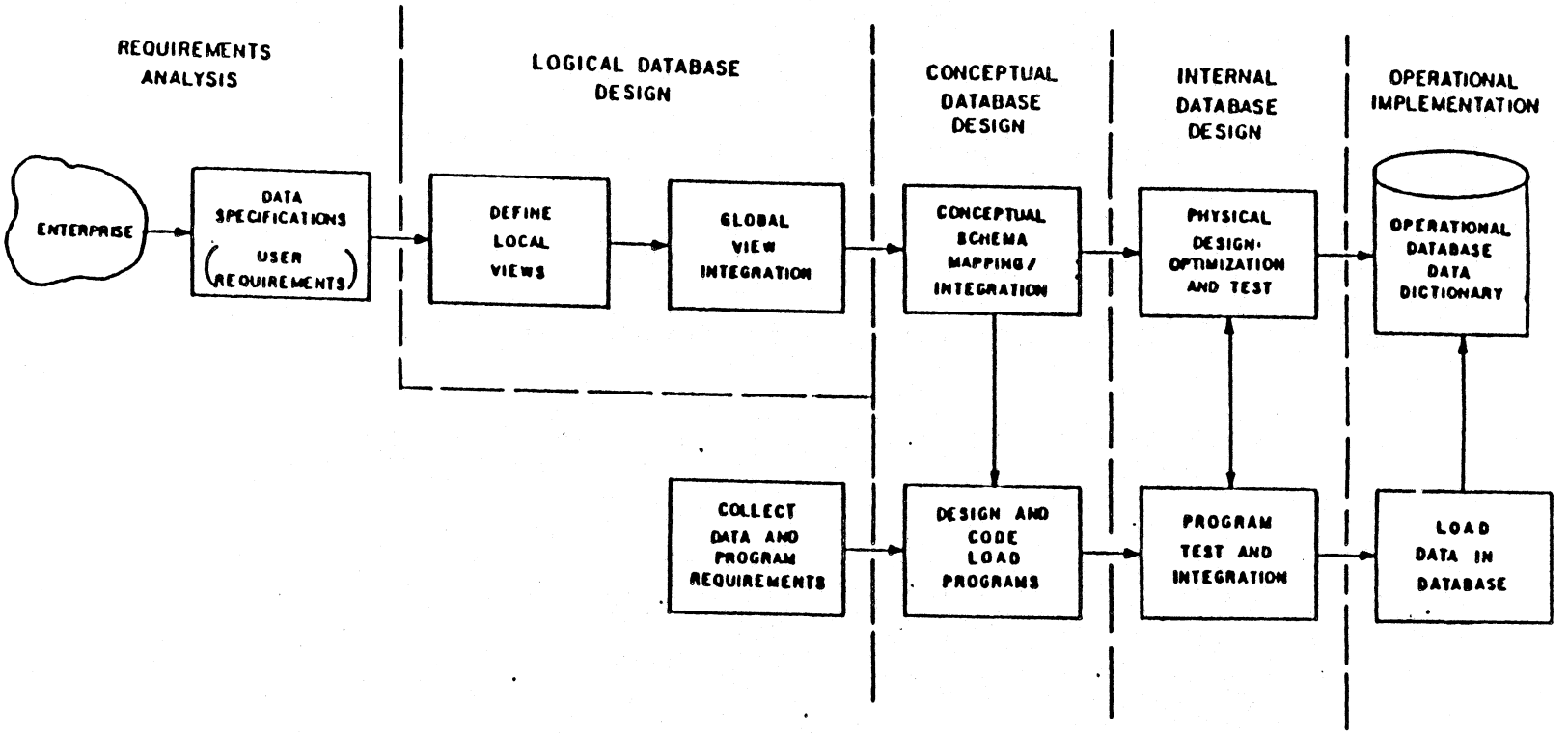
PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATA ADMINISTRATION PLAN

- DATA MODELING METHODOLOGY
- PDS STANDARD DATA DICTIONARY
- DATA ADMINISTRATION (DA) PROCEDURES AND POLICIES
- DATABASE ADMINISTRATION (DBA) PROCEDURES AND POLICIES

PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS



INFORMATION MODELING: DATABASE DESIGN

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PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATA DICTIONARY

- DATA DICTIONARY (DD) GUIDELINES
  - NAMING CONVENTIONS
  - DATA MODEL STANDARDS (ENTITIES, GROUP, ELEMENTS, RELATIONSHIPS, ATTRIBUTES)
  - DATA INTEGRITY CONSTRAINTS
  - UTILIZE PSL/PSA TO MAINTAIN DD.

- DATA ELEMENT STANDARDIZATION

- BUILD UPON DATA DICTIONARY FROM PDS PROTOTYPE CATALOG
  - 80 ENTITIES
  - 145 GROUPS
  - 580 ELEMENTS

PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATA ADMINISTRATION

- POLICIES AND PROCEDURES SHALL BE PRODUCED FOR:
  - DATA MODEL DEVELOPMENT
  - DATA INTEGRITY
  - SECURITY CONTROL
  - PRIVACY CONTROL
  - AUDITABILITY CONTROL
  - RECOVERY
  - STANDARD DATA FORMAT DEVELOPMENT (SFDU)

- STAFF:
  - DATA ADMINISTRATOR (DA) AT CONTROL NODE
  - ONE SCIENCE REPRESENTATIVE FROM EACH DISCIPLINE NODE
  - DATABASE ADMINISTRATORS (DBAs)

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PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATA ADMINISTRATION
(Continued)

- ESTABLISH AND ENFORCE PDS DATA STANDARDS AND PROCEDURES: naming conventions, standard Data Dictionary, data design standards, data integrity constraints, security and privacy constraints.

- COORDINATE ESTABLISHMENT AND ENFORCEMENT OF SFDU AND SCIENCE DATA FORMAT STANDARDS FOR EACH DISCIPLINE.

- CREATE PDS STRATEGIES FOR DATA STORAGE HIERARCHY AN DATA RESOURCE MANAGEMENT.

PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATA ADMINISTRATION
(Continued)

- DEVELOP AND ADMINISTER MEASUREMENTS FOR EVALUATION OF DATA USAGE PATTERNS.

- PROVIDE TECHNICAL ASSISTANCE IN USE OF PDS DATA.

- IDENTIFY EVOLVING DATA INFORMATION NEEDS OF USERS AND MAKE RECOMMENDATIONS FOR FUTURE PDS ENHANCEMENTS.

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PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATABASE ADMINISTRATION

- POLICIES AND PROCEDURES SHALL BE DEVELOPED TO MAINTAIN:
  - DATA MODEL AND DATABASE DESCRIPTIONS
  - CONTROL OF DATA ACCESS
  - SYSTEM SUPPORT, PROTECTION AND PERFORMANCE TUNING
  - INFORMATION ENHANCEMENTS

- STAFF:
  - ONE DBA AT THE CENTRAL NODE
  - ONE DBA AT EACH DISCIPLINE NODE

PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATABASE ADMINISTRATION
(Continued)

- DATABASE DESCRIPTIONS
  - ENFORCE AND MAINTAIN ADHERENCE TO PDS DATA STANDARDS IN THE DESIGN OF ALL PDS DATA STORES.
  - MAINTAIN PDS OPERATIONAL DATA DICTIONARY
  - MAINTAIN DESCRIPTIONS OF ALL SCIENCE DATA FORMATS

- CONTROL OF DATA ACCESS
  - ASSIST IN MONITORING USER ACCESS TO DATA
  - MAINTAIN SECURITY AND PRIVACY CONTROLS
  - DEVELOP, MODIFY, AND MAINTAIN USER DATA ACCESS PRIVILEGES
  - ASSIST IN DEFINITION OF USER LOGICAL VIEWS

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PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATABASE ADMINISTRATION
(Continued)

- SYSTEM SUPPORT, PROTECTION, AND TUNING
  - FACILITATE AND MONITOR CONVERSION OF FILES INTO INTERNAL DATABASE
  - MONITOR PERFORMANCE OF DATABASES AND MODIFY WHERE NECESSARY TO IMPROVE PERFORMANCE
  - DEVELOP AND PERFORM PROCEDURES FOR DATABASE RECOVERY REORGANIZATION
  - MAINTAIN DATA INTEGRITY OF ALL PDS DATABASES.
  - MONITOR ALL DATA ACCESS SOFTWARE AND APPLICATION PROGRAMS TO ENSURE THAT THERE IS NO INTERACTION DETRIMENTAL TO OVERALL SYSTEM PERFORMANCE.

PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

DATABASE ADMINISTRATION
(Continued)

- INFORMATION ENHANCEMENTS
  - COLLECT, ANALYZE, AND MAKE RECOMMENDATIONS FOR FUTURE ENHANCEMENTS TO THE SYSTEM AND THE GLOBAL DATA MODEL.

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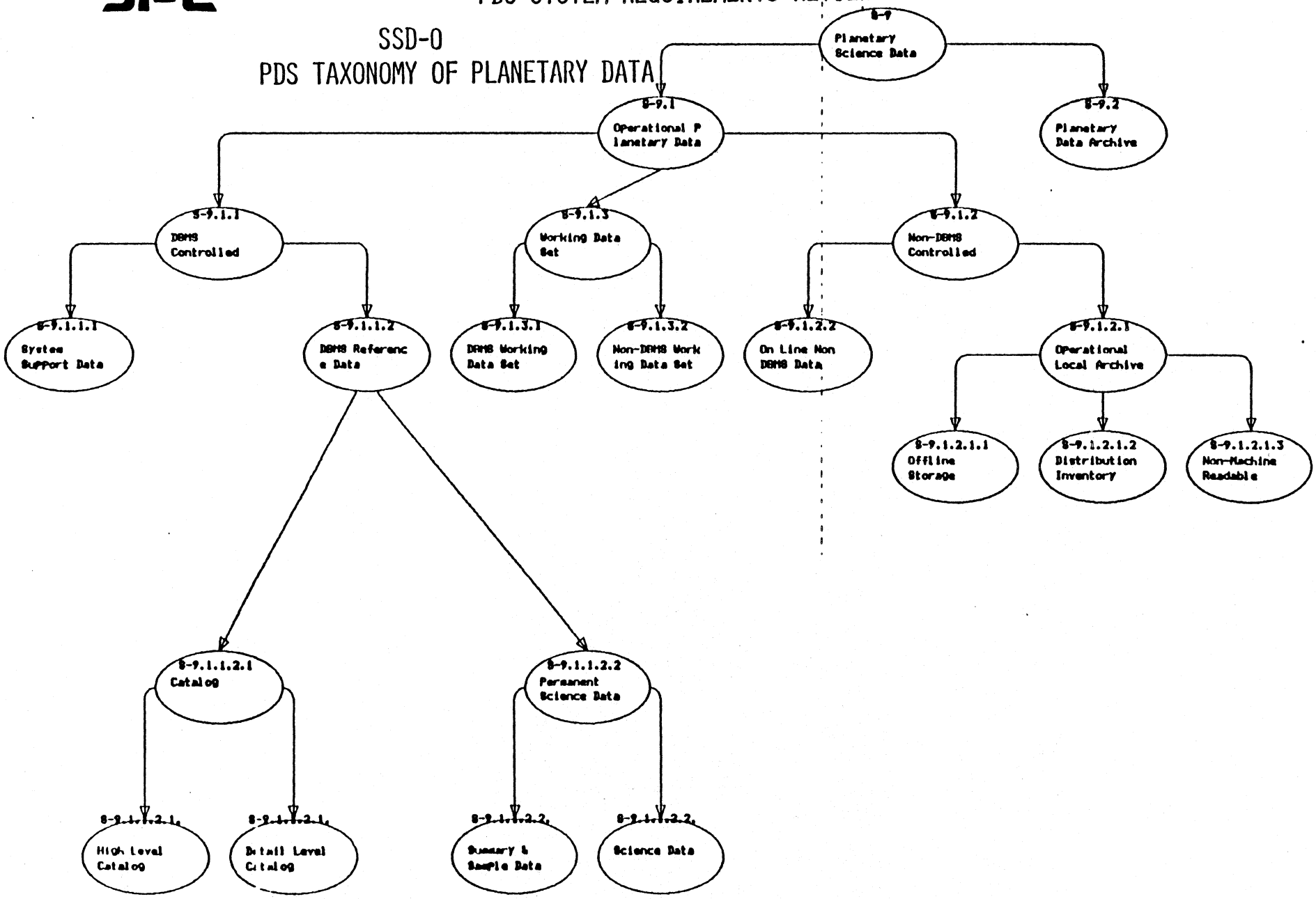
PDS SYSTEM REQUIREMENTS REVIEW

SSD-0

PDS TAXONOMY OF PLANETARY DATA



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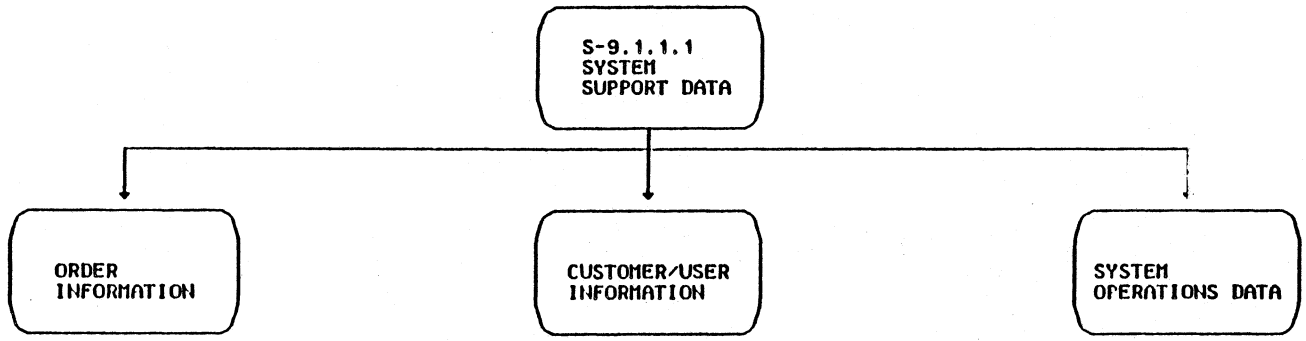
SYSTEM SUPPORT DATA



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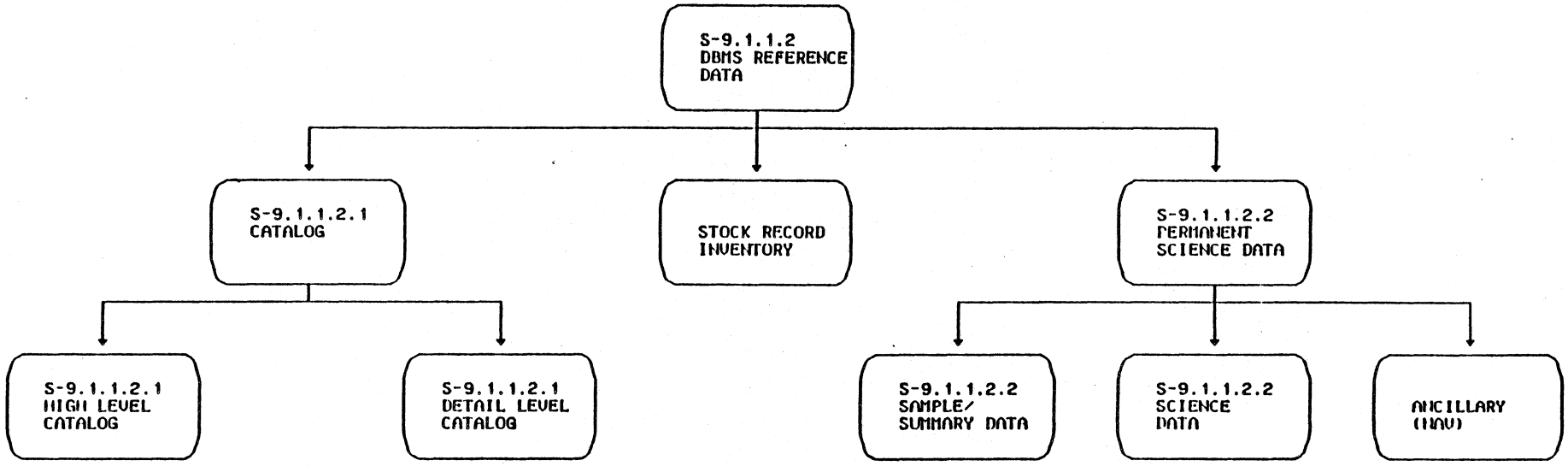
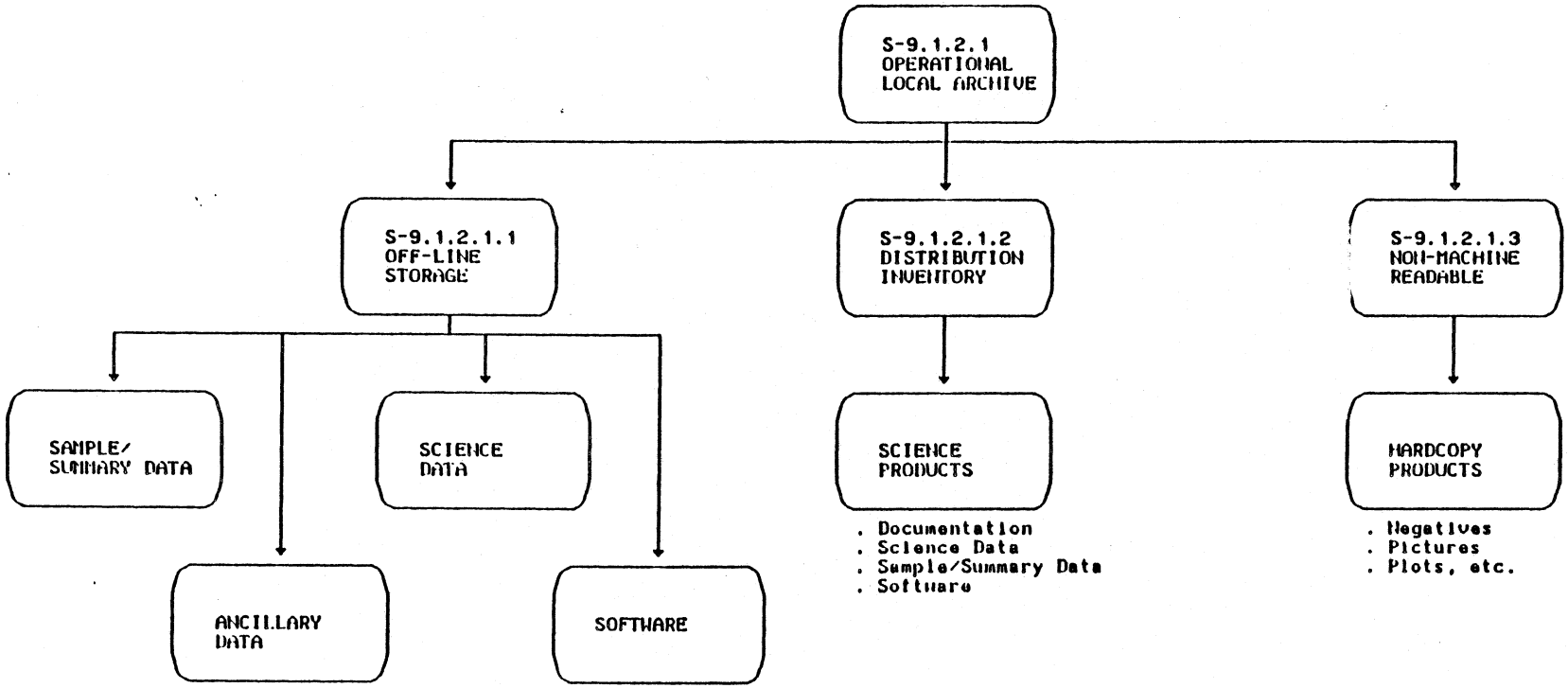
PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS
PDS TAXONOMY OF PLANETARY DATA

DBMS REFERENCE DATA



PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS
PDS TAXONOMY OF PLANETARY DATA

OPERATIONAL LOCAL ARCHIVE



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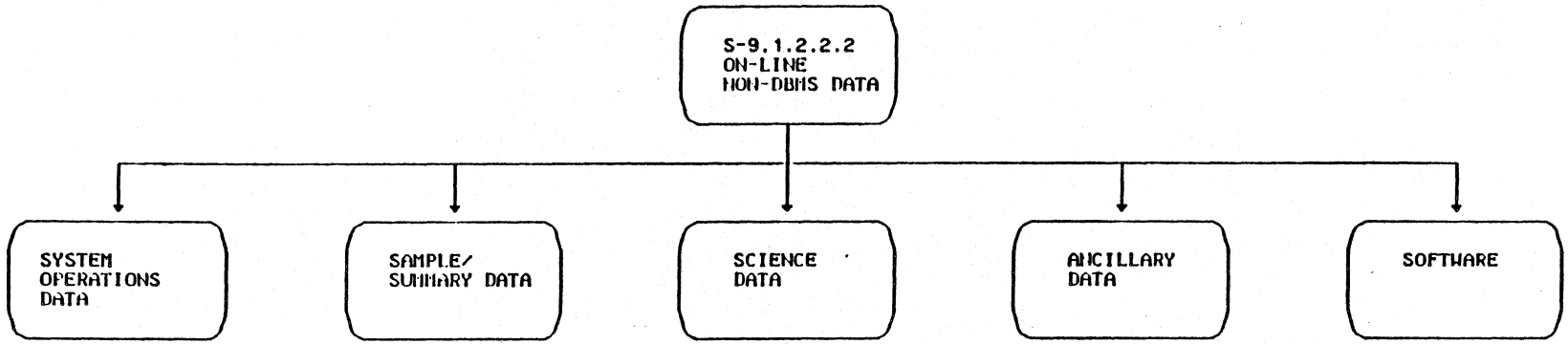
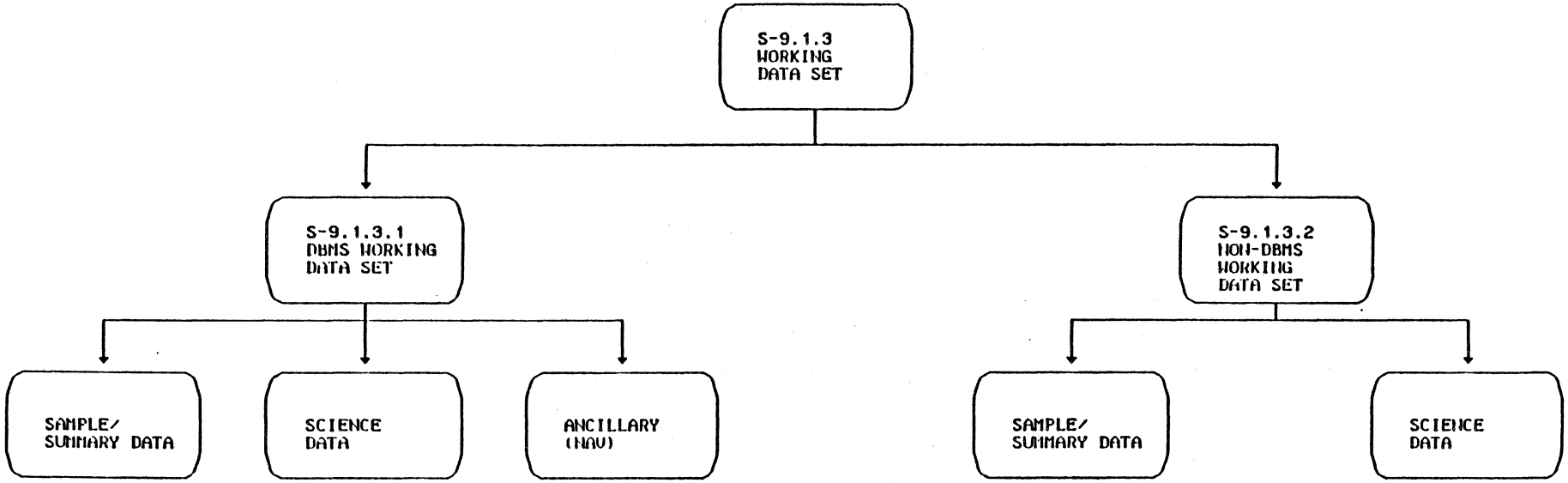
PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS
PDS TAXONOMY OF PLANETARY DATA

ON-LINE NON-DBMS DATA



PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS
PDS TAXONOMY OF PLANETARY DATA

WORKING DATA SET



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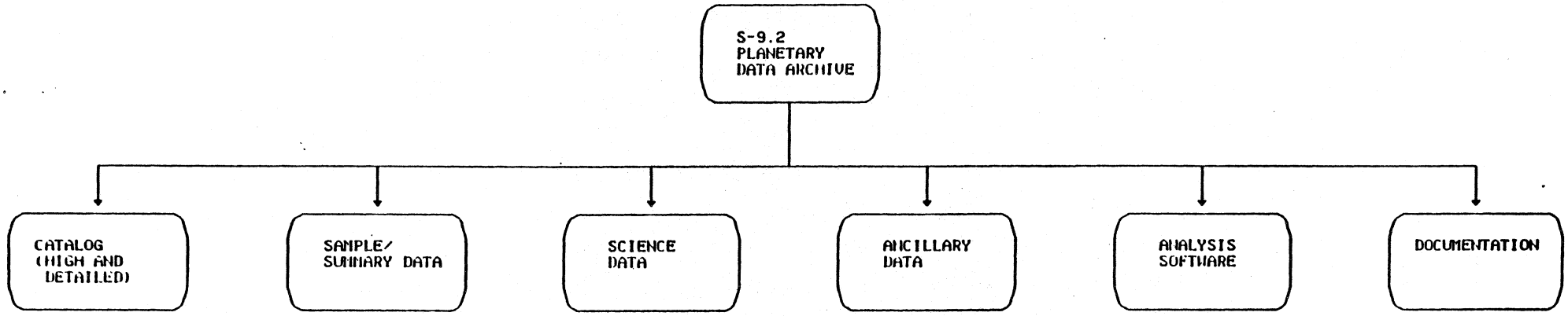
PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS
PDS TAXONOMY OF PLANETARY DATA

PLANETARY DATA ARCHIVE



PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

ENTITY-RELATIONSHIP (DATA MODEL) DIAGRAMS

- DATA MODEL DIAGRAMS ARE CONSTRUCTED FROM THREE GRAPHIC ELEMENTS:

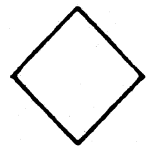
Symbols

1. Rectangles, representing either

   a) an "Entity", class of objects, events, places, persons, or concepts about which the system must collect and store data, or

   b) a store of data (data store) pertaining to a given entity or to a collection of related entities.

2. Diamonds, representing "Relationship", an association defined between occurrences of two of more entities or data stores which result from interactions between entities or from logical dependencies between entities.



3. Relationship lines indicate the existence of a relationship between entities or an association between data stores where that relationship or association has not been explicitly named.

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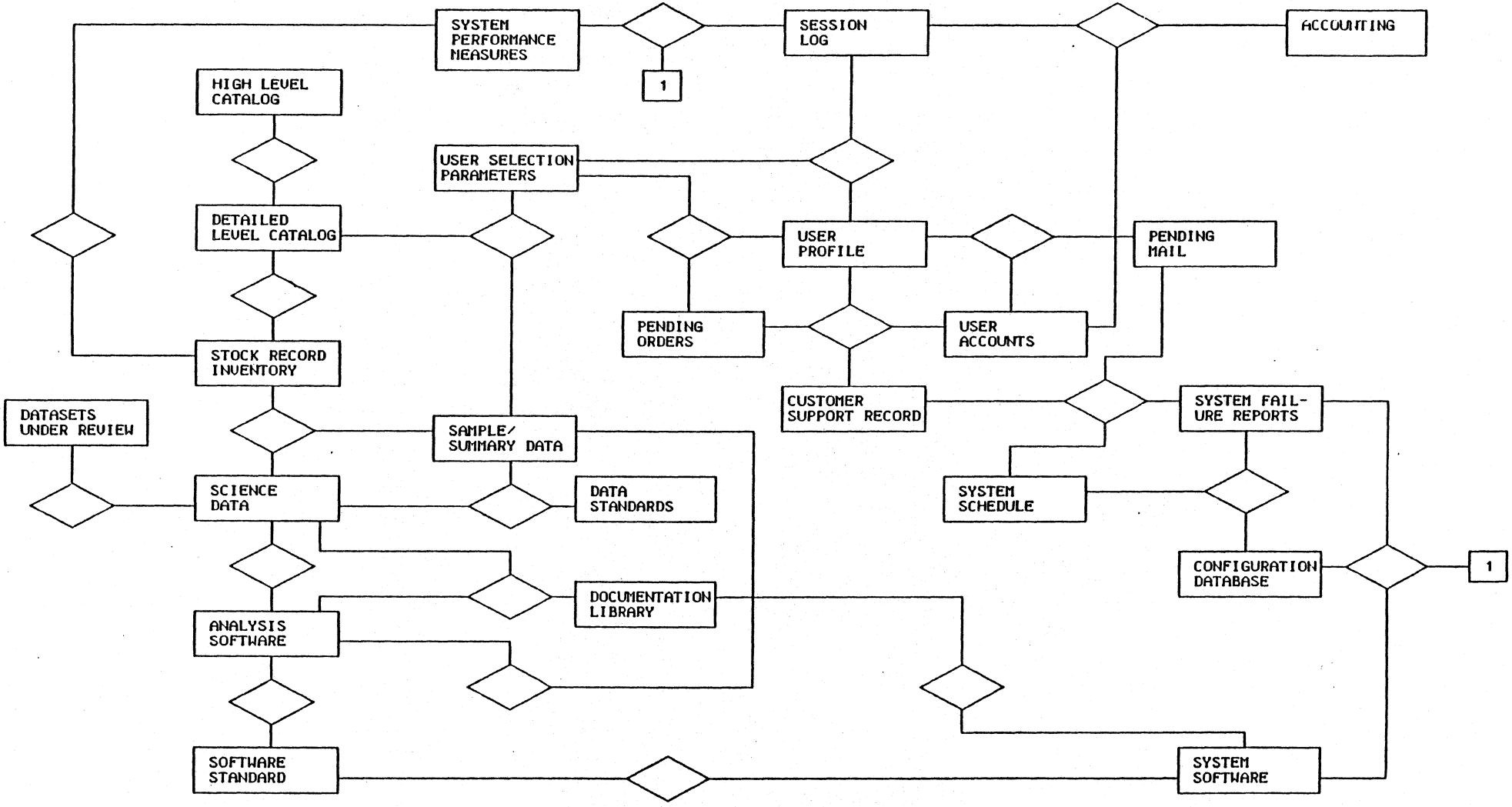
PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS
PDS GLOBAL DATA MODEL



PDS HIGH LEVEL CATALOG

CATEGORIES:

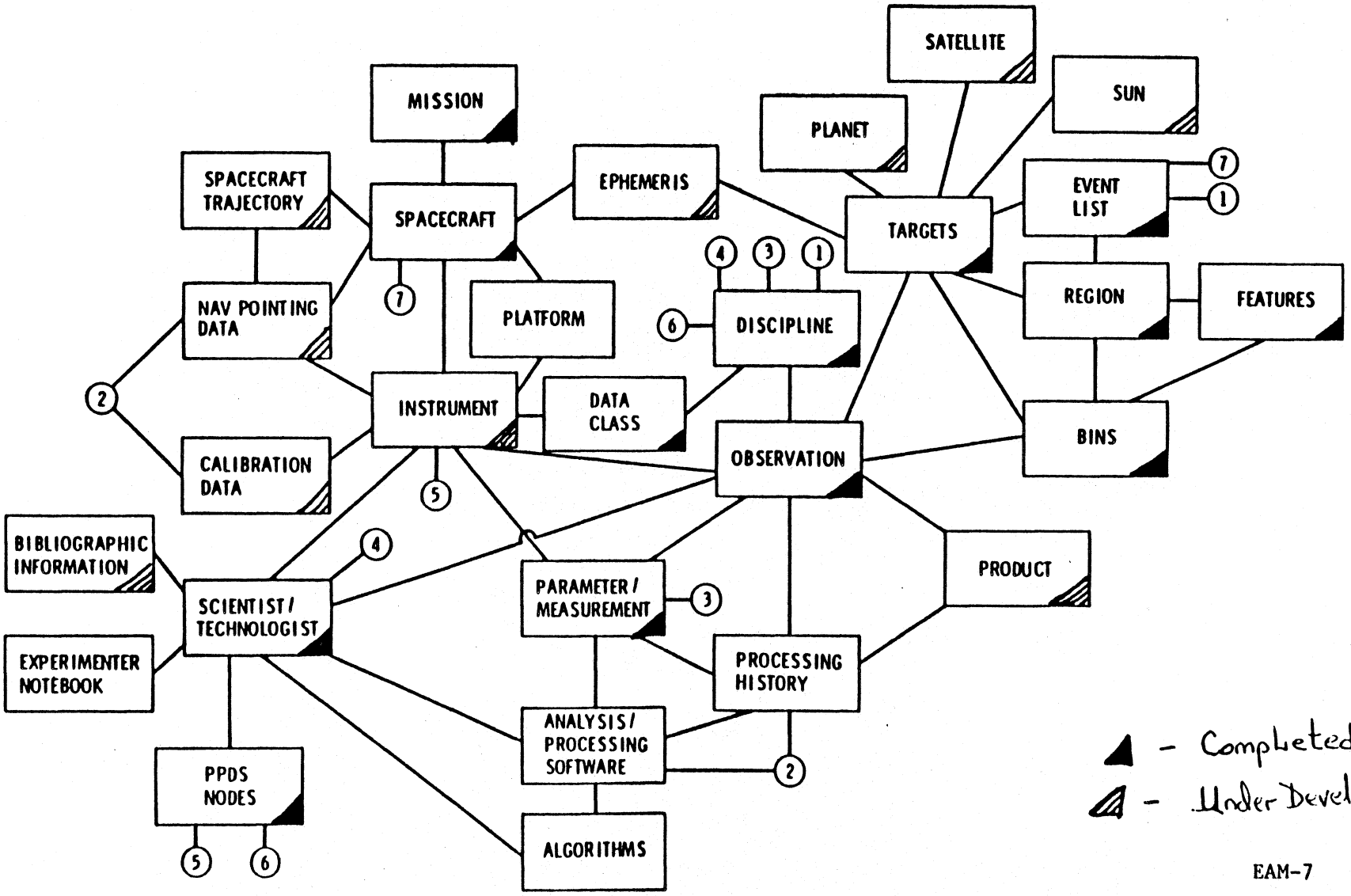
- MISSION
- SPACECRAFT
- PLATFORM
- INSTRUMENT
- OBSERVATION
- PRODUCTS
- PARAMETER/MEASUREMENT
- PROCESSING HISTORY
- ANALYSIS SOFTWARE
- ALGORITHMS

- DISCIPLINE
- DATA CLASSIFICATION
- TARGETS
  - Planet
  - Satellite
  - Sun
- EVENTS
- REGIONS
- FEATURES

- PDS NODES
- INSTITUTIONS
- INVESTIGATORS
- SCIENTIST/TECHNOLOGIST
- RESEARCH STUDIES
- BIBLIOGRAPHIC INFORMATION
- EXPERIMENTER NOTEBOOK

- NAV POINTING DATA
- SPACECRAFT TRAJECTORY
- CALIBRATION DATA
- EPHEMERIS DATA

JPL TOP LEVEL OF PDS CATALOG DATA MODEL



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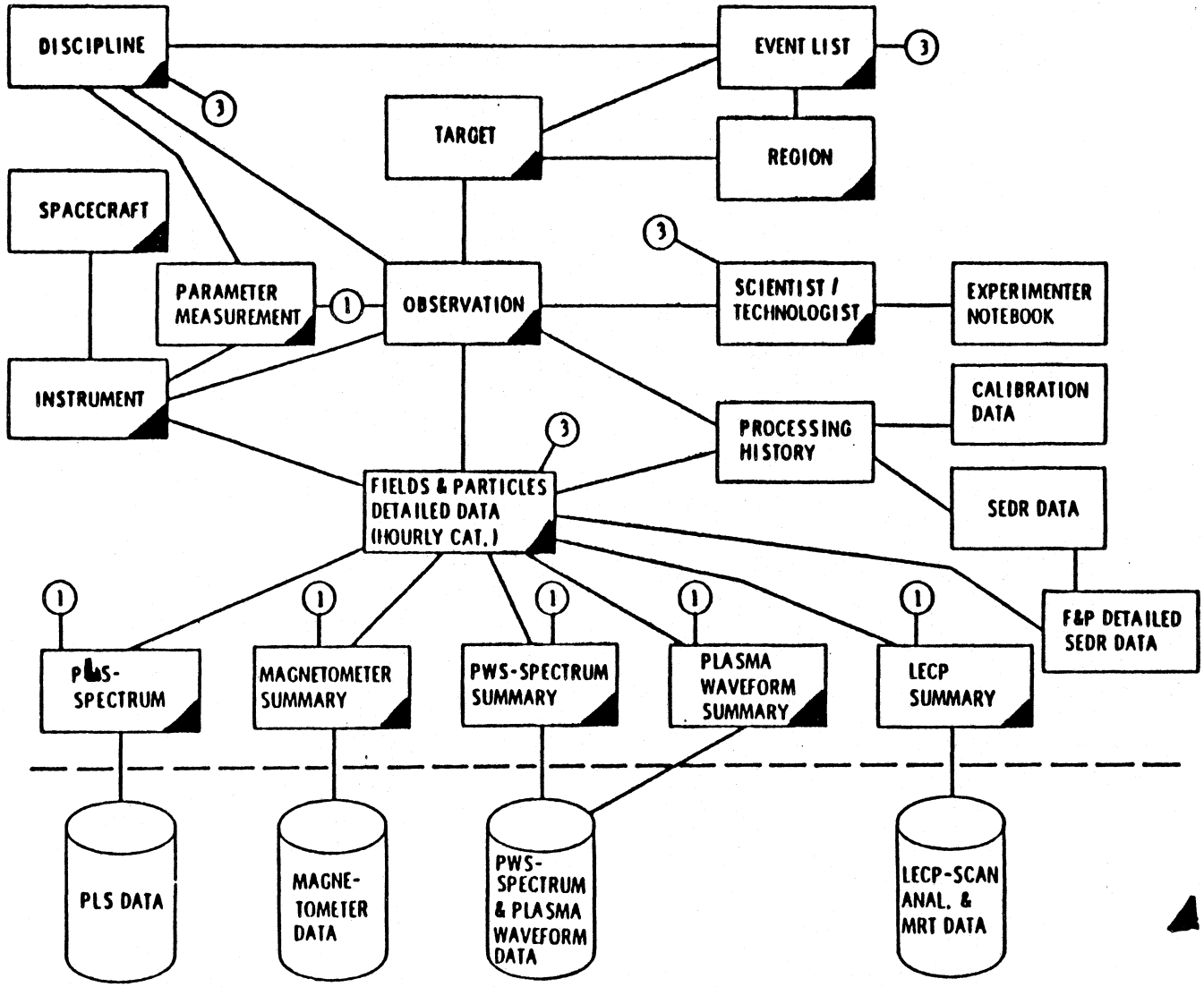
LOWER LEVEL OF PDS CATALOG DATA MODEL
(FIELDS & PARTICLES)



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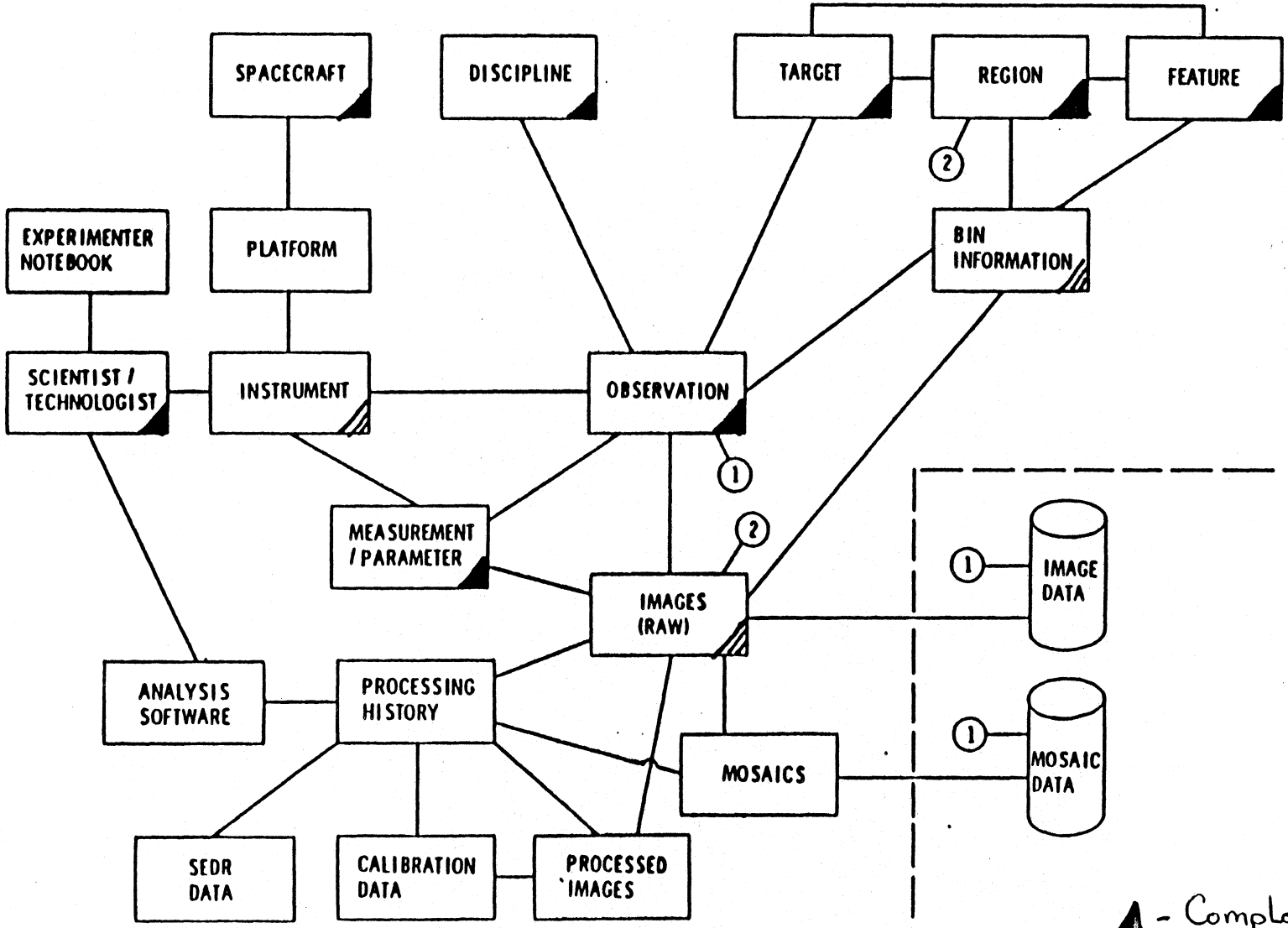
JPL LOW LEVEL PDS CATALOG DATA MODEL
(PLANETARY IMAGE)



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PDS SYSTEM REQUIREMENTS REVIEW
DATA MANAGEMENT REQUIREMENTS

PDS VERSION 1.0 DATASET PRIORITIES

NODE		HI CAT	LO CAT	BR IMP		SCI IMP	
VGR1-FLUXGATE-MAGNETOMETER	FP	C	C	C	2	I	1
VGR1-PLASMA-DATA	FP	C	C	C	2	I	1
VGR1-PLASMA-WAVE-DATA	FP	C	C	C	2	I	1
VGR2-LOW-ENERGY-CHGD-PARTICLES	FP	C	C	C	2	I	1
PIONEER 10/11 DATASETS	FP	C	C	C	1	N	0
VGR ADDITIONAL JUP/SAT DATA	FP	I	I	I	0	N	0
JUPITER-SATELLITE-EPHEMERIS	NAV	N	N	N	0	N	0
PLANET-EPHERMERIS	NAV	N	N	N	0	N	0
SATURN-SATELLITE-EPHEMERIS	NAV	N	N	N	0	N	0
SELD-PLANETARY-PHYSICAL-CNSTS	NAV	I	-	-	-	-	-
VGR1-TRAJECTORY-(LAUNCH-SAT)	NAV	N	N	N	0	N	0
VGR2-TRAJECTORY-(LAUNCH-NEP)	NAV	N	N	N	0	N	0
NAV SOFTWARE	NAV	N	N	-	-	-	-
MAR6/7-IRR-DATA	RAD	I	N	N	0	N	0
MAR6/7-IRS-DATA	RAD	I	N	N	0	N	0
MAR9-IRIS-DATA	RAD	N	N	N	0	N	0
V-IRTM-DATA	RAD	I	I	N	0	I	1
V-IRTM-HELP FILES	RAD	I	-	-	-	-	-
VGR2-PPS-RING-OCCN-SAT	RING	C	I	N	0	C	1
VGR2-UVS-OCCN-SAT	RING	C	I	N	0	C	1
P11-IPP-RING-SAT	RING	I	I	N	0	N	0
SATURN-RING-ATLAS-5KM	RING	I	I	N	0	N	0
VGR-ISS-RING-JUP	RING	I	I	N	0	I	1
VGR-ISS-RING-SAT	RING	C	I	N	0	C	1
VGR1-RSS-RING-OCCN-SAT	RING	C	I	N	0	C	1
EARTH-BASED-RADAR-DATA	RPIF-J	I	N	N	0	N	0
EARTH-BASED-SCAT-DATA	RPIF-J	I	N	N	0	N	0
MAR9-PICTURE-CATALOG-SEDR	RPIF-J	C	C	-	-	-	-
V-SEDR	RPIF-J	C	I	-	-	-	-
IMAGING-GENERAL-CATALOG	RPIF-J	C	C	-	-	-	-
IMAGES-GENERAL-EDR							
V-PICTURE-CATALOG	RPIF-W	C	C	-	-	-	-
VSM-IMAGES	RPIF-W	-	-	N	0	C	I
VL-METEOROLOGY-DATA	ATMOS	N	N	N	0	N	0
V-MAWD	ATMOS	I	N	N	0	I	1
V-MAWD-HELP-FILES	ATMOS	I	-	-	-	-	-
MAR9-UVS-DATA	ATMOS	I	I	N	0	N	0
MAR9-IRR-DATA	ATMOS	I	I	N	0	N	0
MARS-CLOUD-DATABASE	ATMOS	N	N				
VL-GENERAL-DATA	VL	N	N	N	0	N	0

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PDS System Requirements Review

Operational Characteristics and Requirements

Jonathan E. Paul

Operational Characteristics and Requirements

Development Constraints

- Pilot PDS Legacy
- Existing Hardware
  - VAX Computer System
  - Britton Lee IDM
  - SPAN
- Existing Software
  - VMS Operating System
  - Freeform Catalog System
- Decision to Maximize Use of Packages
- Minimum Development Resources (time and manpower)
- Distributed Development Across Discipline/Data Nodes

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PDS System Requirements Review

Operational Characteristics and Requirements

Hardware Configuration Items

- Host Computer: VAX 11-780
  - — Processor/ memory: 16 MB
  - — Disk Storage: 900 MB
  - — Communication Facilities: 64 Asynchronous Ports, 2 Synchronous, Ethernet
  - — Other Peripherals: 1 Magnetic Tape, Plotter, Local VT-100
- Britton Lee
  - — Processor/memory: 2 MB
  - — Disk storage: 600 MB
  - — Host Interface: Ethernet or IEEE parallel interface
  - — Other Peripherals: 8 Asynchronous Ports
- SPAN
  - — JPL, MSFC, GSFC, LANL, Stanford U., Washington U, U. Iowa, USGS, UCLA, Etc.

Operational Characteristics and Requirements

Software Configuration Items

- High level interface package (TAE)
- Data Base System Menu Handler (Freeform)
- Graphics/Analysis tool (XIDL)
- Operating System (VMS)
- Networking (DECNet)
- Node developed software
  - Graphics presentation
  - Image Presentation and Processing
  - Data Manipulation/Browse/Data Conversion
  - Data Preparation (Standard Formats)
- Electronic Transfer Programs
- Electronic Mail

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PDS System Requirements Review

Operational Characteristics and Requirements

Performance Requirements

- Eight (8) Simultaneous Interactive Users With Performance Factor Not Exceeding 1.5 of Unloaded System
- Five (5) Second Response Time to All Commands (May be "Please Stand by" Response)
- Data Retrieval Performance 50,000 Bytes Per Second
- Communications Bandwidth Exceeding 10,000 Bytes Per Second

Operational Characteristics and Requirements

Quality Factors

- Reliability: MTBF Shall Be 1000 Hours For Critical Elements
- Maintainability: MTTR Shall Be 4 Hours (8-5, M-F), 16 Hours (Other Times)
- Availability: .98

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PDS System Requirements Review

Operational Characteristics and Requirements

Expandibility Requirements

- The PDS shall employ an architecture and design shall allow future system expansion in the following areas:
  - Support of 32 Discipline/Data Nodes
  - Support of On line Science Data under DBMS to 10 GB per Node
  - Support of Optical Disk Storage Capacity to 200 GB per Node
  - Support of Processing Power to 4 MIPS per Node
  - Support of Up to 32 Connections per Node
  - Support of New Networks

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PDS System Requirements Review

Software Management and Development Standards

P. A. Jansma

July 29, 1986

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PDS System Requirements Review

Software Management and Development Standards

- Work on the PDS project began before the official adoption of the new JPL institutional Software Management Standard (500-152) in March 1986.
- Document names and deliverables have been changed to comply with the standards for Class 1 Projects with two exceptions.
  - The PDS System Specificiation Document is the equivalent of a System Requirements Document.
  - The PDS Operations Plan is an additional document not required by 500-152 but deemed necessary for the project.
  - A Software Management Plan and Software Management Review (SMR) have been added.
- Standards for specific document formats are being borrowed from DOD-STD-2167 and refined for PDS use since the corresponding JPL standards have not yet been established. (500-161 through 500-167)
- Software standards need to be adopted on a project-wide basis.

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PDS System Requirements Review

Software Management and Development Standards (cont')

	DOCUMENT NAME	JPL DOCUMENT NUMBER
1.	PDS Project Plan	D-3492
2.	PDS User Requirements Document	D-3493
3.	PDS Software Management Plan	D-3487
4.	PDS Data Management Plan	D-3510
5.	PDS Configuration Management Plan	D-3488
6.	PDS Product Assurance Plan	D-3489
7.	PDS System Specification	D-3454
8.	PDS Functional Design Document	D-3496
9.	PDS Logical Global Data Model Document	D-3511
10.	PDS Conceptual and Physical Global Data Model Document	D-3512
11.	PDS System Integration and Test Plan	D-3494
12.	PDS Acceptance Test Plan	D-3495
13.	PDS Software Specification Document	D-3497
14.	PDS Software Interface Specifications	D-3498
15.	PDS User's Guide	D-3500
16.	PDS Release Description Document	D-3499
17.	PDS Transfer Agreement	D-3501
18.	PDS Operations Plan	D-3502

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PDS System Requirements Review

PDS Reviews and Tests

- System Functional Requirements Review (FRR)
- Software Management Plan Review (SMR)
- Preliminary Design Review (PDR)
- Critical Design Review (CDR)
- Software Acceptance Test
- System Delivery Review (SDR)

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PDS System Requirements Review

Resource Requirements and Allocation

J. T. Renfrow

July 29, 1986

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PDS SRR — Resource Requirements and Allocation

Topics To Be Covered

- Resource Requirements and Constraints
- Resources To Be Allocated
- PDS Funds Allocation – Budget
- PDS Time Allocation – Schedule
- PDS Personnel Allocation – Staffing Plan
- PDS Hardware
- PDS Software
- PDS Facilities

Resource Requirements and Constraints

- PDS Version One should be operational by the end of FY87.
- Total PDS funding should remain under $3.3M for FY87. This includes all resources for technology evaluation and funding for the integrated science testbeds, in addition to the building of PDS Version One.
- PDS Version One should maximize the use of preexisting software and hardware resources.
- Programming team will be drawn from the matrix of technology evalution, data management, system engineering, operations and implementation, and integrated science testbeds.

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PDS SRR — Resource Requirements and Allocation

Resources To Be Allocated

- Money
- Time
- People
- Hardware
- Software
- Facilities

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PDS SRR — Resource Requirements and Allocation

PDS Funds Allocation – Budget

	FY86		FY87	
	EI	EL	EI	EL
PDS Management	100	100	110	145
PDS Reserve	75		75	(75)
PDS Science	830	200	900	280
PDS System Engineering	250	230		295
PDS Data Management	275	75	315	200
PDS Operations and Implementation	50	370		580
PDS Technology	166		250	
PDS Standards	50		150	
Ancillary Tasks		225		300
TOTALS	1,796	1200	1800	1800

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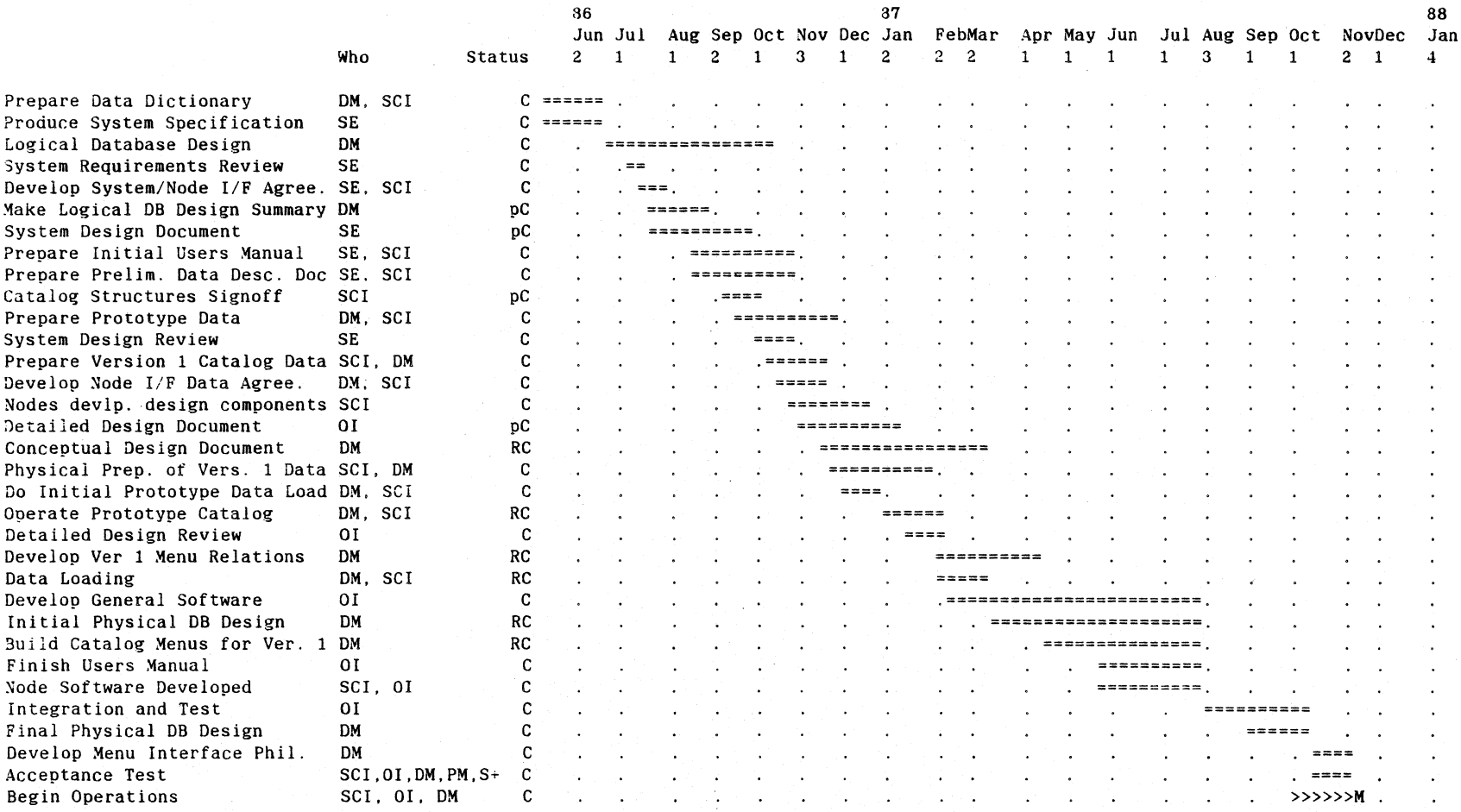
PDS SRR — Resource Requirements and Allocation

PDS Time Allocation – Schedule



PDS SRR — Resource Requirements and Allocation

PDS Personnel Allocation – Staffing Plan

- PDS Management
  - PDS Project Manager (1.0)
  - PDS Project System Engineer (.5)
  - PDS Administrative Assistant (1.0)
  - Travel and Minor Services and Equipment
- PDS Reserve – $75K (Code EI) + ($75) (Anticipated Carry Over from Code EL)

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PDS SRR — Resource Requirements and Allocation

PDS Personnel Allocation – Staffing Plan (Cont.)

- PDS Science
  - Science Manager (.5)
  - JPL Scientists (.6)
  - JPL Science Support (2.0)
  - Six Science Testbed Nodes ($100K each)
  - Possibly additional Britton Lee Data Base Machines for the Nodes
  - Mission Interface (1.0)
  - Travel and Minor Services and Equipment

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PDS SRR — Resource Requirements and Allocation

PDS Personnel Allocation – Staffing Plan (Cont.)

- PDS System Engineering
  - Staff (3.0)
  - Travel and Minor Services and Equipment
- PDS Data Management
  - Staff (5.0)
  - Travel and Minor Services and Equipment
- PDS Operations and Implementation
  - Staff (5.0)
  - Maintenance ($80K)
  - Equipment ($100K)

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PDS SRR — Resource Requirements and Allocation

PDS Personnel Allocation – Staffing Plan (Cont.)

- PDS Technology
  - — Manager (.5)
  - — Optical Storage (1.0)
  - — Communications (.5)
  - — Travel and Equipment
- PDS Standards
  - — Staff (1.0)
  - — Travel and Minor Services and Equipment

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PDS Hardware

- DEC VAX 11/780
- Network of Apollo Computers
- Britton Lee Database Machine
- Mass Storage and Transfer Devices
- Terminals (Dumb, Image, and Graphics) and Microcomputers
- Printers (High Speed and Laser)
- Communications Hardware

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PDS SRR — Resource Requirements and Allocation

PDS Software

- System Software – Operating systems, utilities, and system monitors
- Database Machine Software – Host language interface, independent query processor
- Compilers – C and FORTRAN77
- Development Environment – Still in the process of being specified
- System/Software Engineering – PSL/PSA, Text Generator, Excelerator

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PDS SRR — Resource Requirements and Allocation

PDS Software (Cont.)

- User Interface Software – For example, TAE and Freeform
- Presentation Software – For example, Graphics IDL, special image display software
- Storage Software – Device Drivers and file system software for various optical disk systems
- Communications software – DECNET, Kermit, XModem, (TCP/IP)
- Applications Software – Developed both at the Central Node (JPL) and at the remote Integrated Science Testbeds

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PDS SRR — Resource Requirements and Allocation

PDS Facilities

- Computer Equipment Room
- Computer Peripherals Room
- User Work Area
- Data Management Team Area
- Development Team Area
- Remote Nodes

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PDS System Requirements Review

Open Issues and Concerns

J. T. Renfrow

July 29, 1986

Open Issues and Concerns

- The current scope of the complete statement of the functional capability for Version 1.0 does not match the resources (schedule and dollars) available. Unresolved issues include the following:
  - Central node only vs. central node and distributed nodes
  - Scope of manipulate data functions (currently very ambitious)
    - Display image
    - Data conversion
    - Display graph
  - Scope of prepare data functions (currently requires a considerable software development and Q.A. effort)
    - Check/sample data content
    - Validate software
  - Support for data distribution by discipline/data nodes
    - Logistics problems and quality control
  - Degree of standardization for Version 1.0
    - User interface at the discipline/data nodes
    - Software development standards
    - Approach to use of Britton-Lee at UCLA and LASP

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PDS System Requirements Review

Open Issues and Concerns (cont')

- Scope problems (cont')
  - Node personnel are already overextended and are not contractually committed to PDS system software development.
    - Catalog and data dictionary support
    - Data set restoration and reformatting
    - Data loading
    - Review boards for Q.A. and C.M.
    - PDS system software development
    - Access software for data sets
    - Technology R&D Support
  - The use of existing software packages (e.g., TAE, XIDL, FREEFORM, etc.) still requires familiarization time, adaptation, interface software and integration testing.
  - Distributed development of functional capability increases coordination effort and integration time.
  - Manual implementations still require written procedures, integration testing, and manpower support for operations.

Open Issues and Concerns (cont')

- Scope problems (cont')
  - Non-integrated functions still require explicit definition of the interface, some coordination, and documentation.
- A final detailed prioritization of functionality is needed.
- A strong commitment of personnel at both the central node and the discipline/data nodes to established priorities is needed.

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PDS System Requirements Review

Open Issues and Concerns (cont'd)

- Standards are not available yet and could become a critical path block/problem.
  - Formats for data preparation
  - Guidelines for software development
  - Formats for project documentation
- A substantial quality assurance (Q.A.) effort is required but funds may not be available to support this.
  - Catalog and science data integrity
  - Software development practices and documentation
- The scope and extent of configuration management actually required by the project still needs to be determined. This is complicated by the difficulty of providing configuration management in a distributed environment with undedicated hardware.
- Heavy loading on the JPLPDS VAX during the development phase must be controlled. (Resource conflicts exist between PDS, RPIF-JPL and Rings). The development team needs top priority.