

GUVI Data Processing POC

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Overview

- Data products
- Top-level design
- Timing and sizing
- Issues
- Assumptions
- Platforms

GUVI Data Product Definitions

- Raw Telemetry: Unprocessed digital telemetry
- Level 0: Unprocessed instrument data at full resolution that has been separated by instrument or subsystem
- Level 1A: Unprocessed instrument data at full resolution, time referenced and annotated with ancillary information including radiometric and geometric parameters.
- Level 1B: Level 1A data processed to sensor units (e.g. Rayleighs/color).
- Level 1C: Level 1B radiance data mapped on a uniform, earth-referenced grid.
- Level 2: Derived geophysical variables at the resolution of retrieval.
- Level 3: Derived geophysical variables mapped on a uniform, earth-referenced, space-time grid.
- Survey: Summary or low fidelity data used for quicklook or data mining.

Data Product Sizing Estimates

Level 0 Data:	~90 MBytes/day
Level 1A Data:	~160 MBytes/day
Level 1C Data Products*:	
Disk:	~270 MBytes/day
Limb:	~20 MBytes/day
Spectrograph:	~20 MBytes/day
Level 2 Data Products:	
Disk:	~8 MBytes/day
Limb:	~10 MBytes/day
Overlays:	~5 MBytes/day
Survey Products:	~30 MBytes/day

* = Instrument is either in imaging or spectrograph mode

Data Product Timing Estimates

- GUVI Data Product Generation w/out DIT calculations:
 - Level 1 and Level 2 = approximately 5 1/2 hours utilizing one CPU for 24 hours of GUVI data
 - Level 1 and Level 2 = approximately 2 1/2 hours utilizing four CPUs for 24 hours of GUVI data

Data Product Timing Estimates - continued

- With DIT calculations written in IDL:
 - Level 1 and Level 2 = approximately 20 hours utilizing 1 CPU for 24 hours of data @100km
 - Level 1 and Level 2 = approximately 10 hours utilizing 4 CPUs for 24 hours of data @100km
- With DIT calculations written in Ada:
 - Level 1 and Level 2 = approximately 9 hours utilizing 1 CPU for 24 hours of data @100km
 - Level 1 and Level 2 = approximately 4 hours utilizing 4 CPUs for 24 hours of data @100km

Routine Level 1C Data Products

- Disk data
- Limb data
- Spectrograph data
- Auroral boundaries

Routine Level 2 Data Products

- TEC, nightside disk
- EDP, nightside limb
- O/N₂ ratio, dayside disk
- O NDP, dayside limb
- O₂ NDP, dayside limb
- N₂ NDP, dayside limb
- Temperature profile, dayside limb

Routine Level 2 Data Products - continued

- Q_{euv}
- Q_p
- Q_e
- $\langle E_p \rangle$
- $\langle E_e \rangle$
- E-Region EDP, auroral

Survey Products

- Summary products
- Geophysical parameters
- Instrument mode records
- Sensor data records (Level 1)
- Key parameter files (Level 2)
- Level 3 and Level 4 data products

Catalog

- Contain the following:
 - Time range of the product
 - Product version number
 - URL to the product
 - Instrument mode
- Support of Mission Data Center catalog

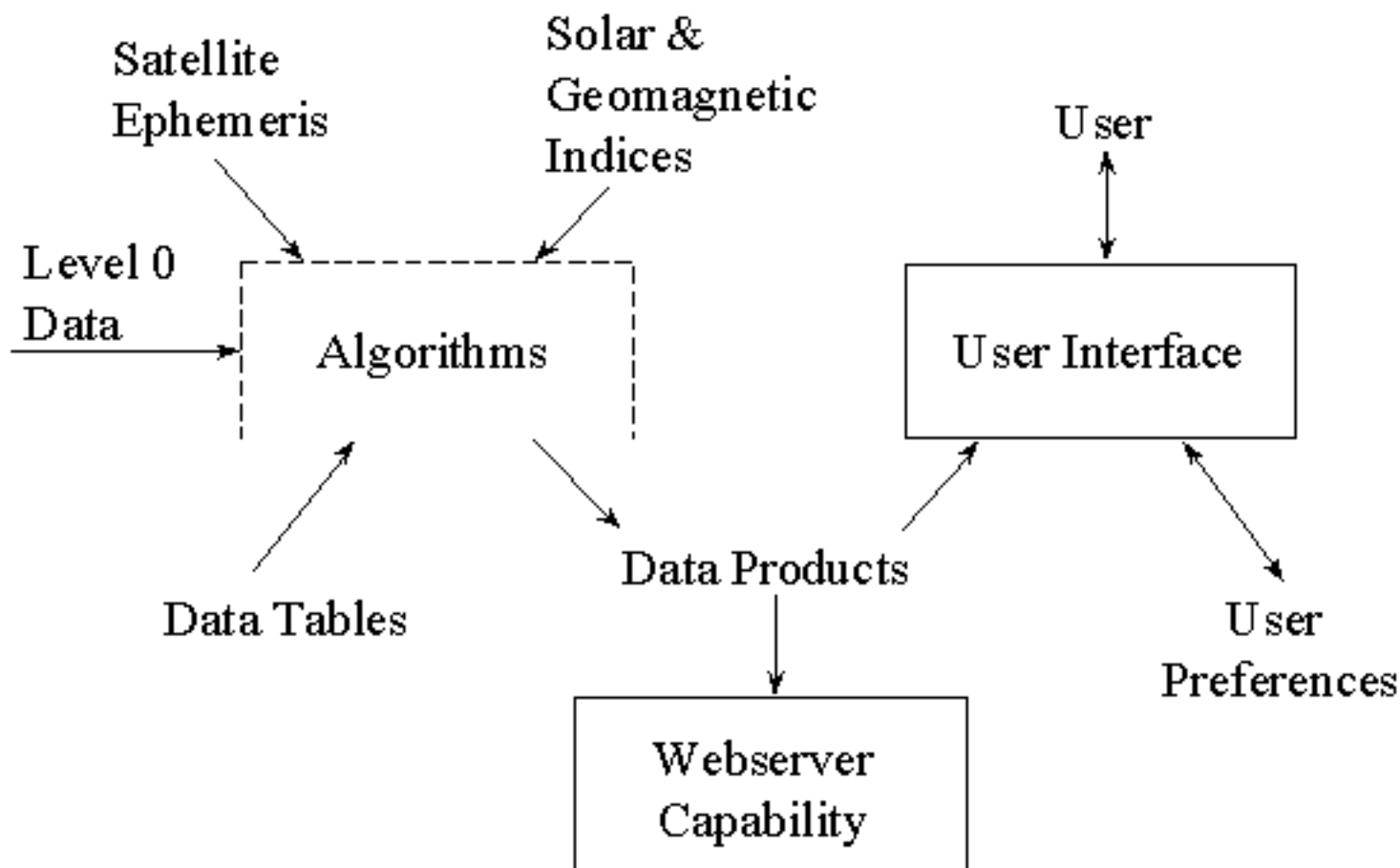
Planning Tools

- Predicted timelines
- As flown timelines
- Predicted orbit information
 - Augmented Kepler Element sets
 - Propagated orbit files
- TIMED contact schedule
- Coordination with other instruments/sites
 - TIMED/GUVI w/in LOS of site
 - Site w/in LOS of TIMED/GUVI
 - Mode of another instrument

Software Reuse

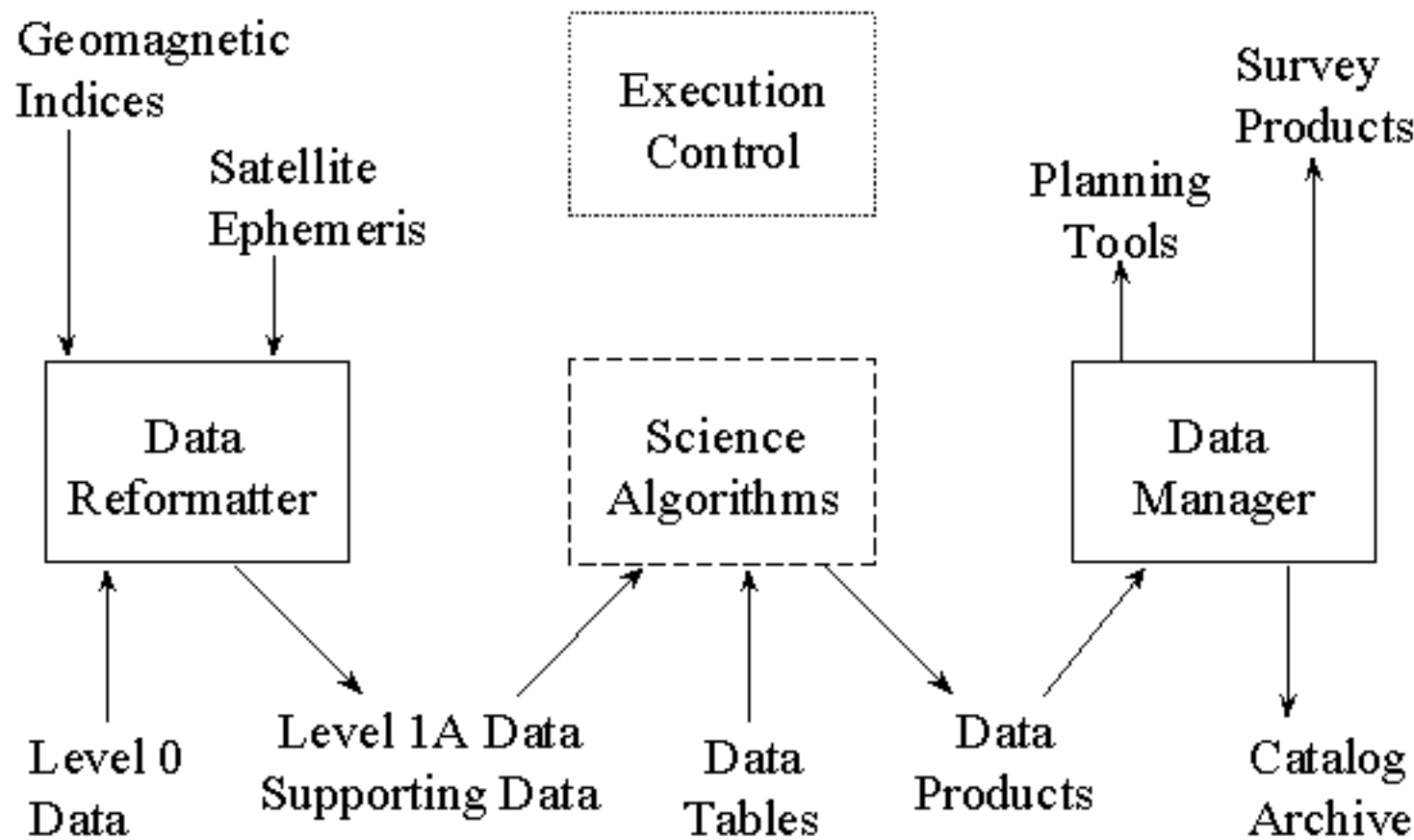
- GUVI patterned after SSUSI
- GUVI Data Processing POC reuse SSUSI GDAS software
- Reusable software components are indicated with a dashed line -

DP POC Top-Level Design

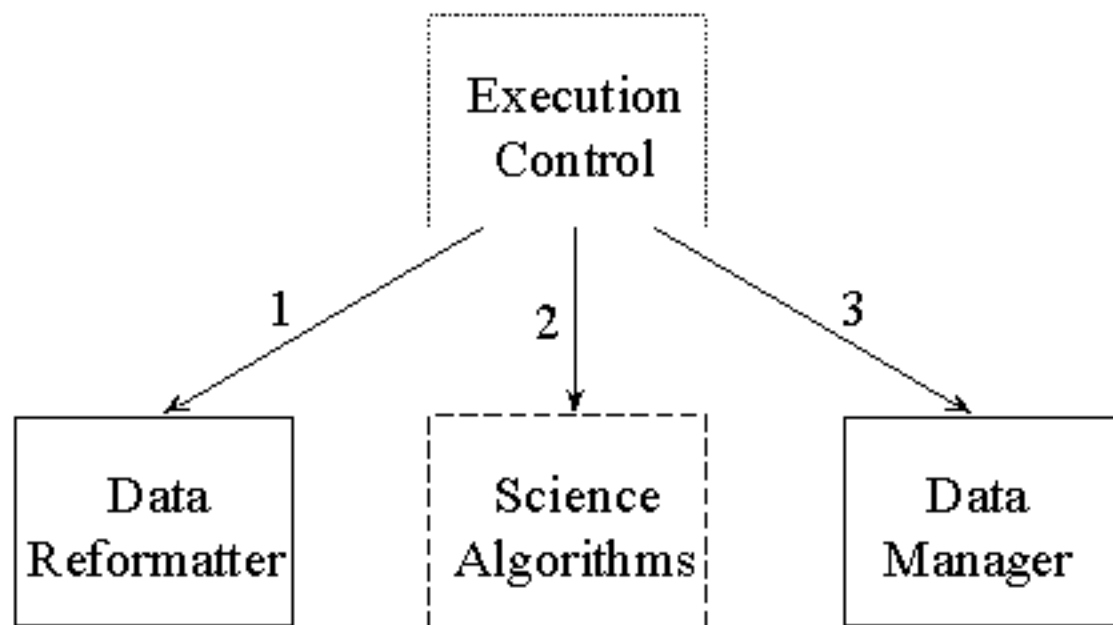


--- Reusable

Algorithms Top-Level Design



Execution Control Flow



--- Reusable Extraneous?

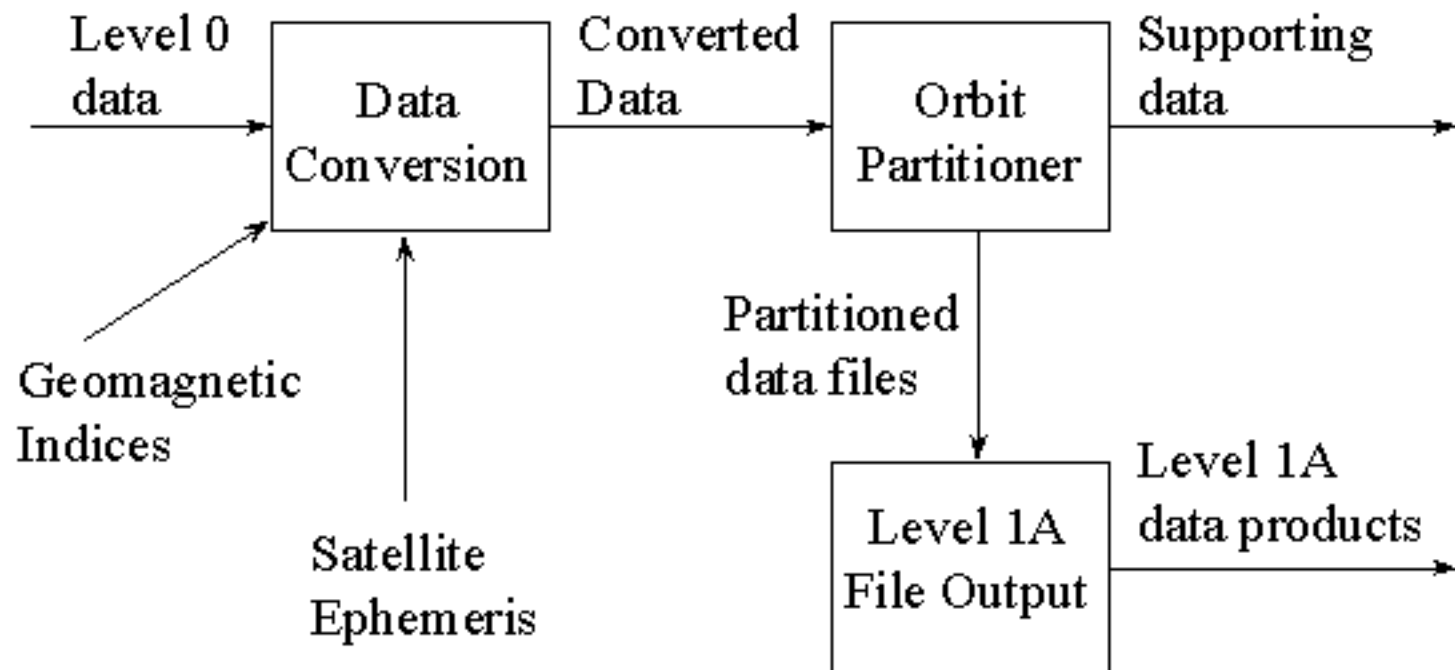
Execution Control

- Invokes Data Reformatter if Level 0 data available to be processed
- Invokes Science Algorithm if Level 1A data available to be processed
- Invokes Data Manager if Level 1C and 2 data available to be processed

Execution Control Issues

- C++ compiler selection will determine if this module is needed; could have a single executable that calls everybody

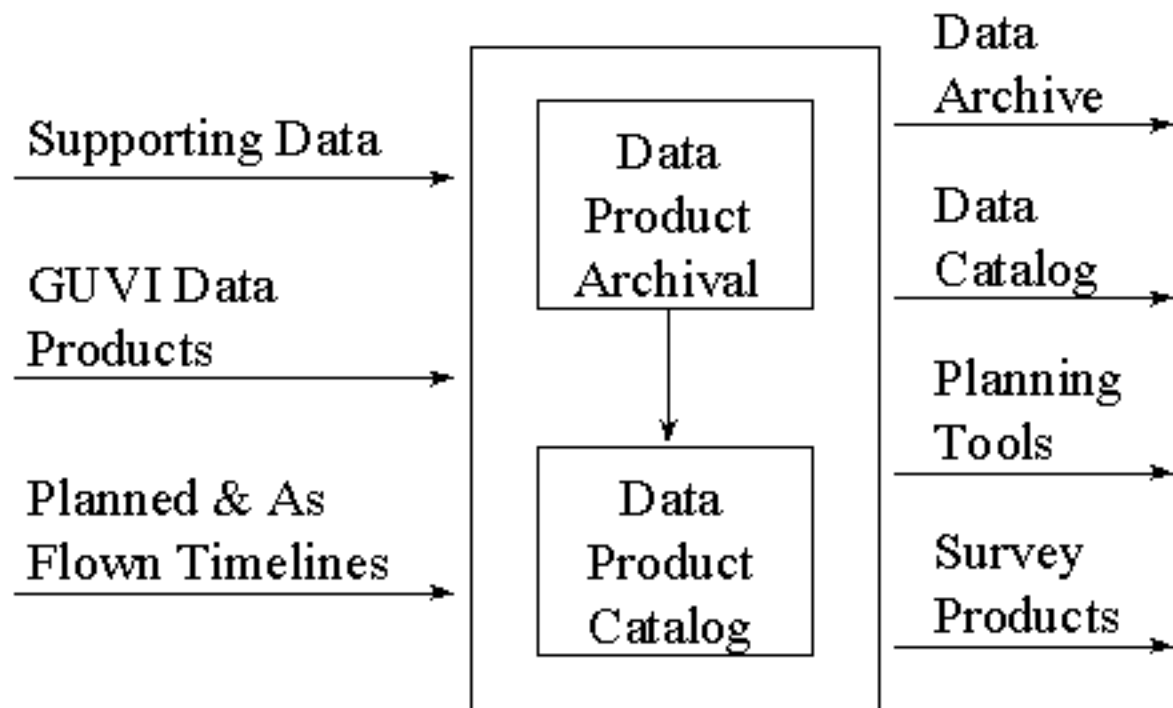
Data Reformatter



Data Reformatter

- Obtain Level 0 data from MDC
- Partition Level 0 data into full orbits
- Obtain satellite ephemeris data from MDC
- Partition satellite ephemeris data into full orbits
- Obtain geomagnetic indices from MDC
- Partition geomagnetic indices into full orbits
- Convert Level 0 data to Level 1A format
- Create Level 1A data product

Data Manager



Data Manager

- GUVI & MDC data product archival
- GUVI & MDC catalog
- Generate survey products
- Generate planning tools
- Process notification of receipt of old data and invoke processing to regenerate data product(s)
- Output planned and as flown timelines to the MDC

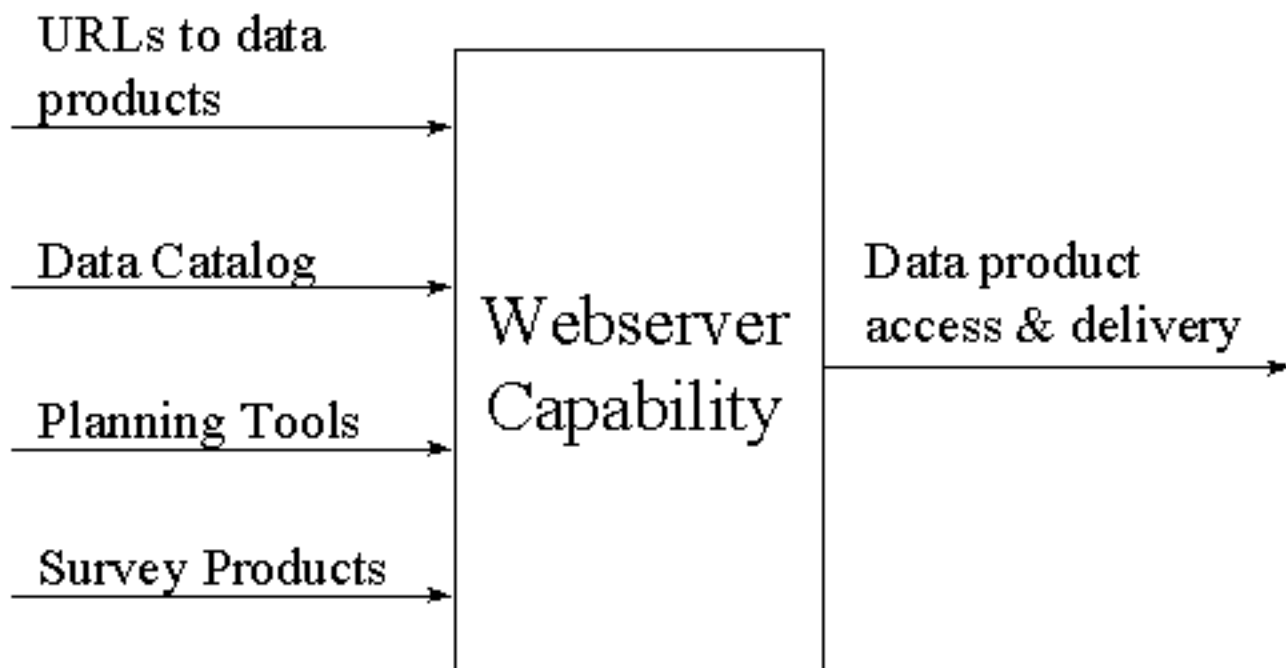
Science Algorithms

- Presented by Scott Evans from CPI

Algorithms Platforms

- Hardware
 - Sun Ultra 4000 with 4 CPUs
- Software
 - Data Reformatter: C++
 - Science Algorithms: Ada
 - Data Manager: IDL, Java, C++

Webserver Capability



Webserver Capability

- Provides a WorldWideWeb capability
- Delivery of GUVI data products via the web
- Provides access to:
 - Catalog
 - Data archive
 - Planning tools
 - Survey products
 - Predicted and as flown timelines
 - TIMED information and data

Web Interface

- Instrument/facility information area
 - General information about instrument
 - General information about data
- Data product description/query area
 - Used to locate data products
 - Display of survey products
 - Automatic product distribution
- Data product archive area
 - Where data products are made available

Data Product Archive Area

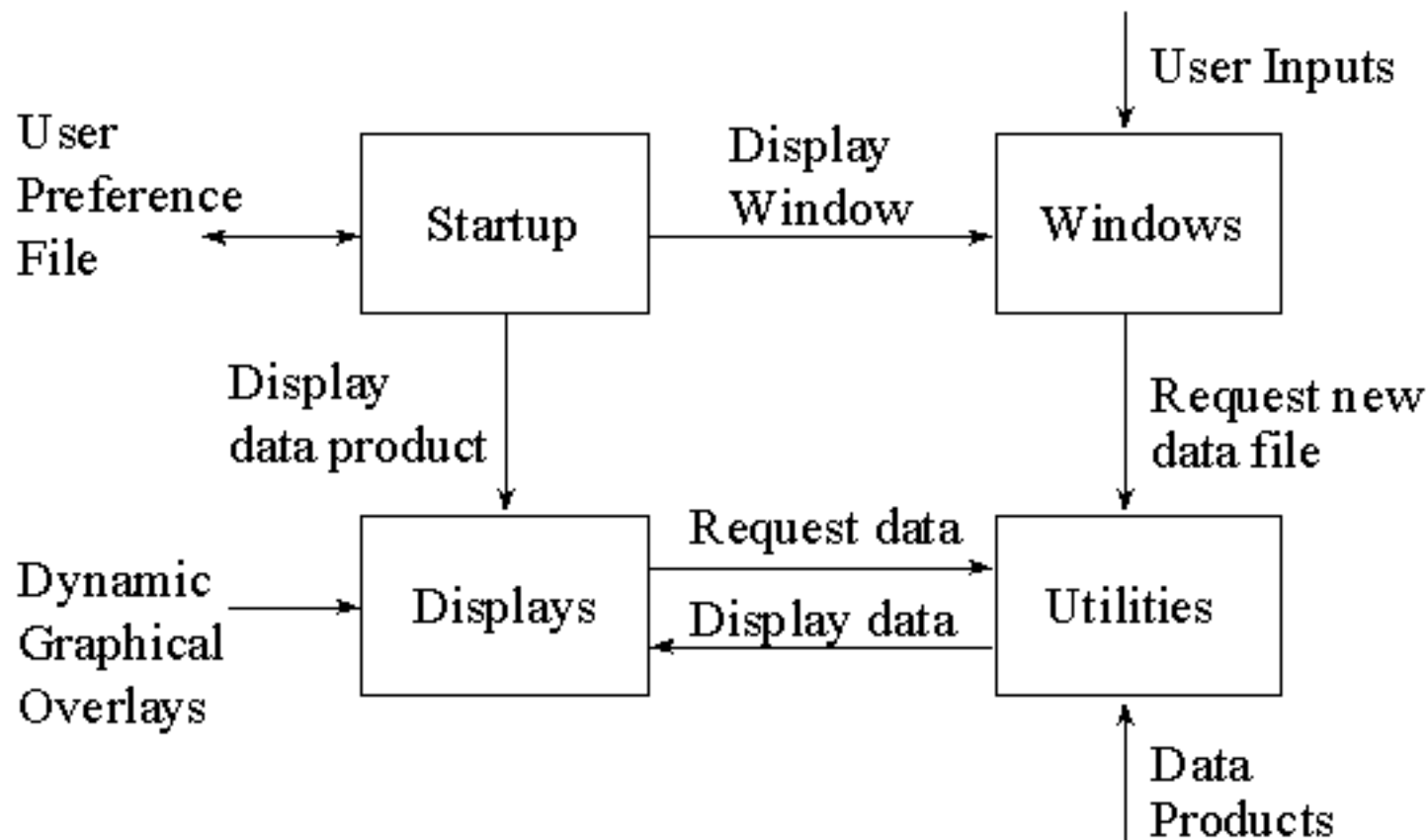
Data product (directory)

Data file with data and version in filename

Webserver Capability Platforms

- Hardware
 - Sun Ultra
- Software
 - Java, Java Scripts, Java Applets, HTML or PERL

User Interface Top-Level Design



Startup

- Reads user preferences file
- Writes user preferences file
- Displays preferences and default startup configuration
- Invokes appropriate data product display

Window

- Defines menubar options, i.e. “File”, “Edit”, “View”, etc.
- Accepts user menubar input
- Accepts user data file request
- Displays title
- Displays legend

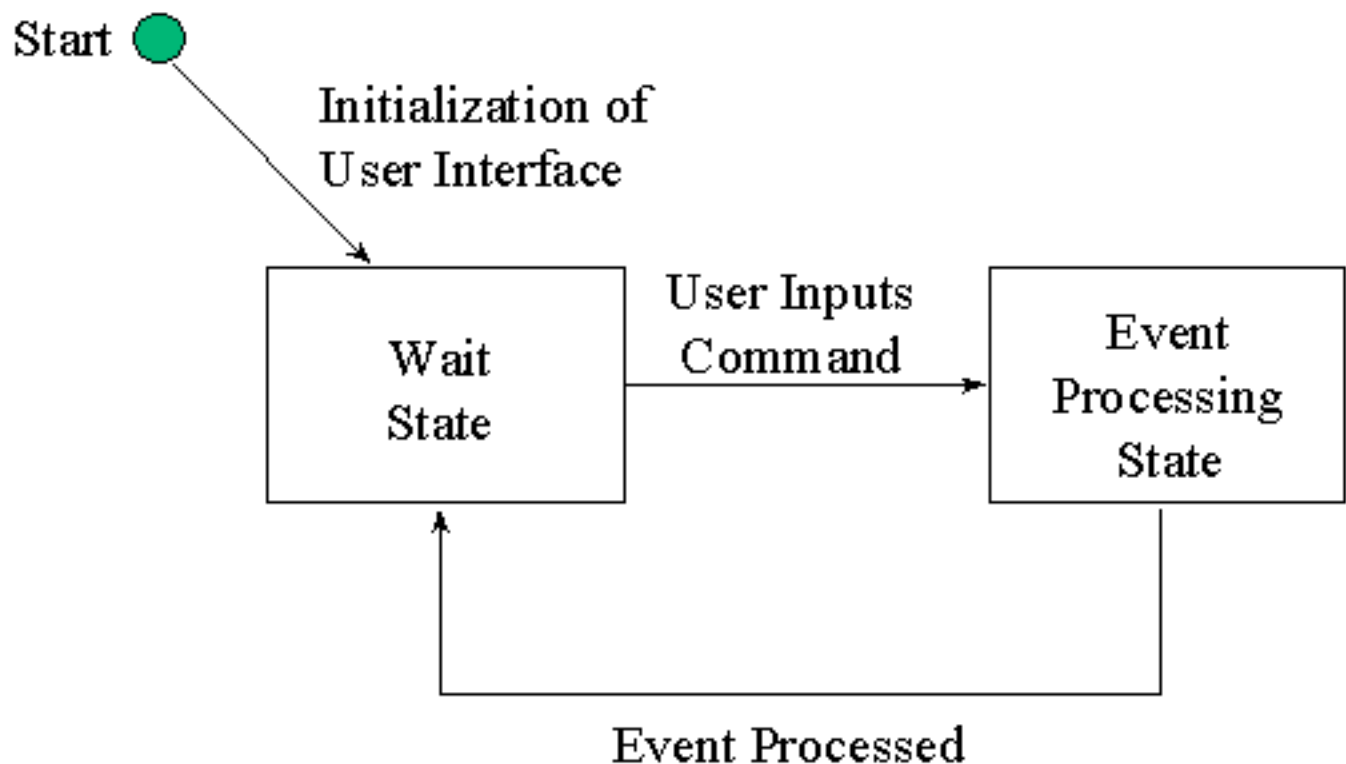
Displays

- Defines screen layouts
- Defines graphic areas
- Graphically displays GUVI data products
- Displays user selectable dynamic graphical overlays
- Displays user selectable static graphical overlays

Utilities

- “Standard toolbox” of IDL tools
 - Data file readers
 - Ephemeris readers
 - Coordinate transformations
 - Dynamic graphic overlay file readers

User Interface State Transition Diagram



User Interface Displays

Type	Description	Data Displayed	Display Options
Global Perspective	Level 1, Level 2 or Level 3 and associated data displayed on a global map projection	Day: O/N_2 and Q_{eUV} (non-graphical) Night: TEC Auroral: $Q_e, E_{0,e}, Q_p, E_{0,p}$, Uncertainties	map projection perspective selection graphical overlays image processing tool multiple windows
Density Profile(s) (Line Plots)	Electron and neutral density profiles at selected lat/long positions	Day: Temperature, Limb NDPs (O, O_2, N_2) Night: Limb EDP Auroral: E-Layer EDP, Auroral boundaries	multiple windows
Flt. Grid	Level 1 intensities for one entire orbit displayed as along track versus cross track	Average Intensities and Uncertainties	image processing tool multiple windows
Spectrograph Mode Display	Level 1 intensities for one entire orbit displayed as along track vs. wavelength	Counts	image processing tool multiple windows

User Interface

- The following will be refined iteratively via a series of prototypes:
 - Survey Products
 - Planning tools
 - User interface for display of data products

User Interface Platforms

- Hardware
 - Co-I PCs
- Software
 - IDL 5.0

User Interface Assumptions

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