MODIS DATA STUDY

TEAM PRESENTATION

August 31, 1990

AGENDA

1. Current Plans for MODIS Level-0 Data Completeness and Transmission-Error Handling
2. MODIS Level-1 Processing Context and Data Flow Diagrams
3. Platform Ancillary Data Nomenclature

CURRENT PLANS FOR MODIS LEVEL-0 DATA COMPLETENESS AND TRANSMISSION-ERROR HANDLING

[PRELIMINARY]

1. BACKGROUND

The MODIS-N and MODIS-T instruments will assemble their science data into source packet segments compatible with the Path Packet Service described in CCSDS 701.0-B-1 (updates 701.00-R-3), Standard on Advanced Orbiting Systems. Each of the MODIS instruments are classified as high-rate instruments, as their data rate exceeds 100 kbps. The MODIS instruments will be connected directly to the Transfer Frame Generator (TFG) by means of a 50 mbps point-to-point coaxial connection. The MODIS data will be packetized into CCSDS Version-1 source packets, which allows for packet segmentation performed within the MODIS instruments.

We expect the MODIS instruments to generate one (or a predefined small number of) "virtual" source packets per scan. The source packets will be created in the MODIS instruments. The MODIS source packets are expected to be internally segmented into packet segments, each with a length of approximately 8,000 bits. The MODIS-T and MODIS-N instruments will generate on the order of 500 and 1,000 packet segments, respectively, per scan.

One complete MODIS packet segment, along with perhaps 15% additional data overhead for header and Reed-Solomon error correction, will be placed into a dedicated transfer frame for transmission over the TDRS space-to-ground data link.

2. DATA COMPLETENESS AND TRANSMISSION-ERROR HANDLING

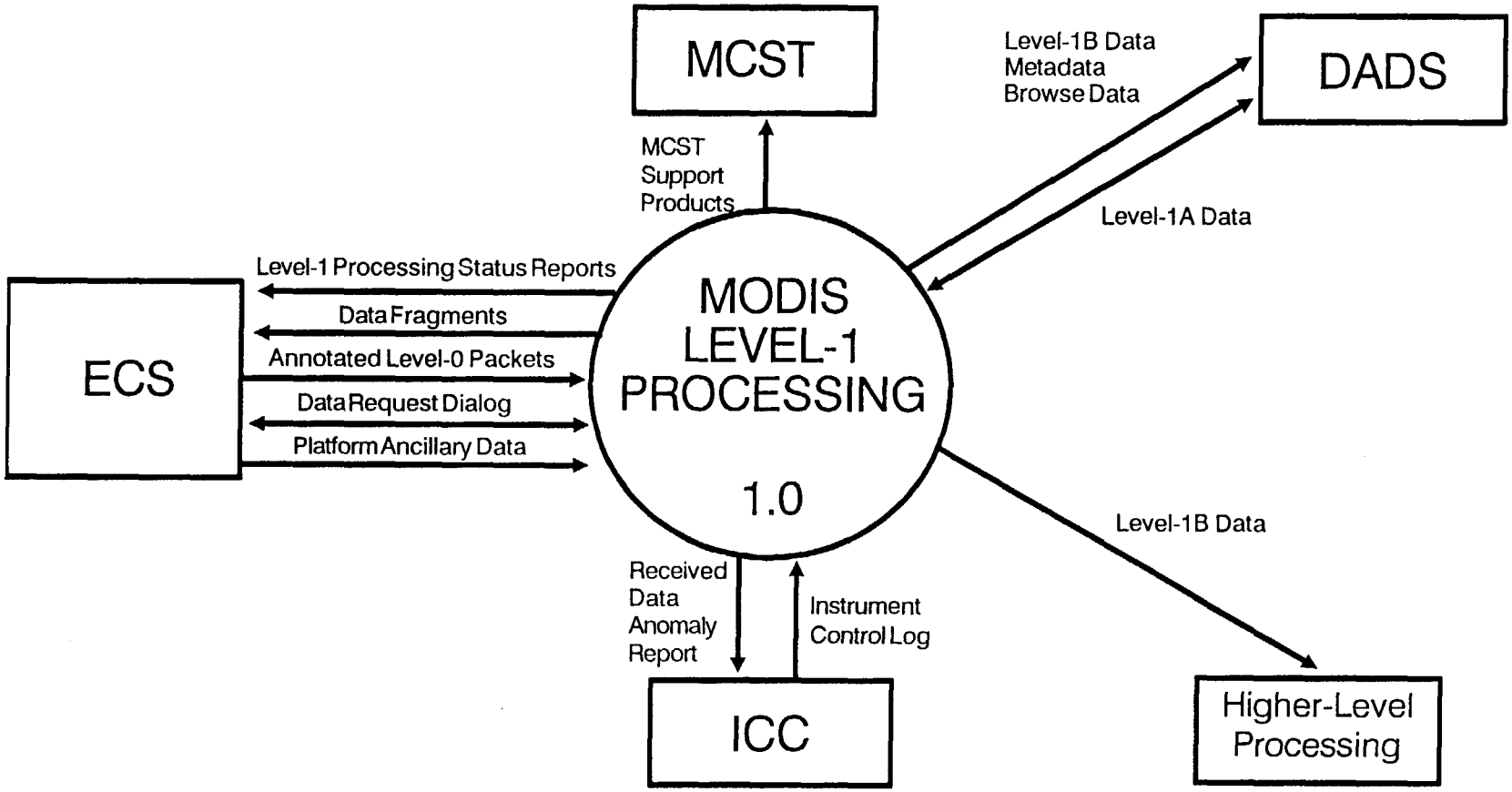
Loss of MODIS data is expected to occur in quanta of packet segments, which we expect to be traceable in a one-time manner to a predetermined set of locations in a scan cube of data. The data will be band interleaved, so that a single packet segment of MODIS data will contain all bands for a single pixel, then all bands for a second pixel, and so on until a packet segment is filled. The order of pixels within a packet segment will be along-track, as this is the manner in which the detector array and scan concept is expected to operate. For the case of MODIS-T, spectral radiances in digital count form spanning on the order of 20 pixels will fit in a single segment. Therefore, a transfer frame/packet segment will often contain data from two adjacent cross-track detector array positions.

We expect that transmission losses might occur over the end-to-end EOS-Platform/TDRSS/CDOS/NASCOM system. Under these conditions, certain transfer frames and their associated packet segments would be irretrievably lost. Such losses may be random or systematic. In constructing a scan cube of MODIS data, we may elect to fill the locations of such missing data with sentinel values. Even with Reed-Solomon error correction, some uncorrectable errors will occur. Under these conditions, the transfer frame itself will be received, but an unknown number of incorrect bits will exist within the packet segment. We expect to retain this data throughout Level-1 processing, leaving the decision as to whether or not to process the contaminated data to Level-2 or higher up to the data users, their specific requirements, and their screening algorithms.

To facilitate the use of MODIS Level-1 data, we expect to generate a pair of bit vectors for each MODIS source packet. The length of each vector will be the number of segments into which the source packet is broken. The first vector will denote **Received/Lost**. The second vector will denote **Correct/Contaminated.**

For each scan, either a second pair of bit vectors, or a single one-byte vector, will be generated. The vector length will correspond to the number of across-track scan positions in the scan (e.g., perhaps 1,077 total for MODIS-T, of which 1,007 are nominally on-Earth). Under this scenario, each lost or contaminated transfer frame will set one bit in the former vector pair. This set bit will then map, under a time-invariant projection, into one or two pixel planes (normal to across-track, and oriented in the spectral and along-track directions). Within higher-level (Level-2 and above) processing, a set bit or byte will activate the appropriate processing path: (1) skip fill data; (2) skip contaminated data; or (3) use contaminated data after careful screening. For the latter case, it is possible that the desired bands are error-free.

MODIS LEVEL-1 PROCESSING
CONTEXT DIAGRAM



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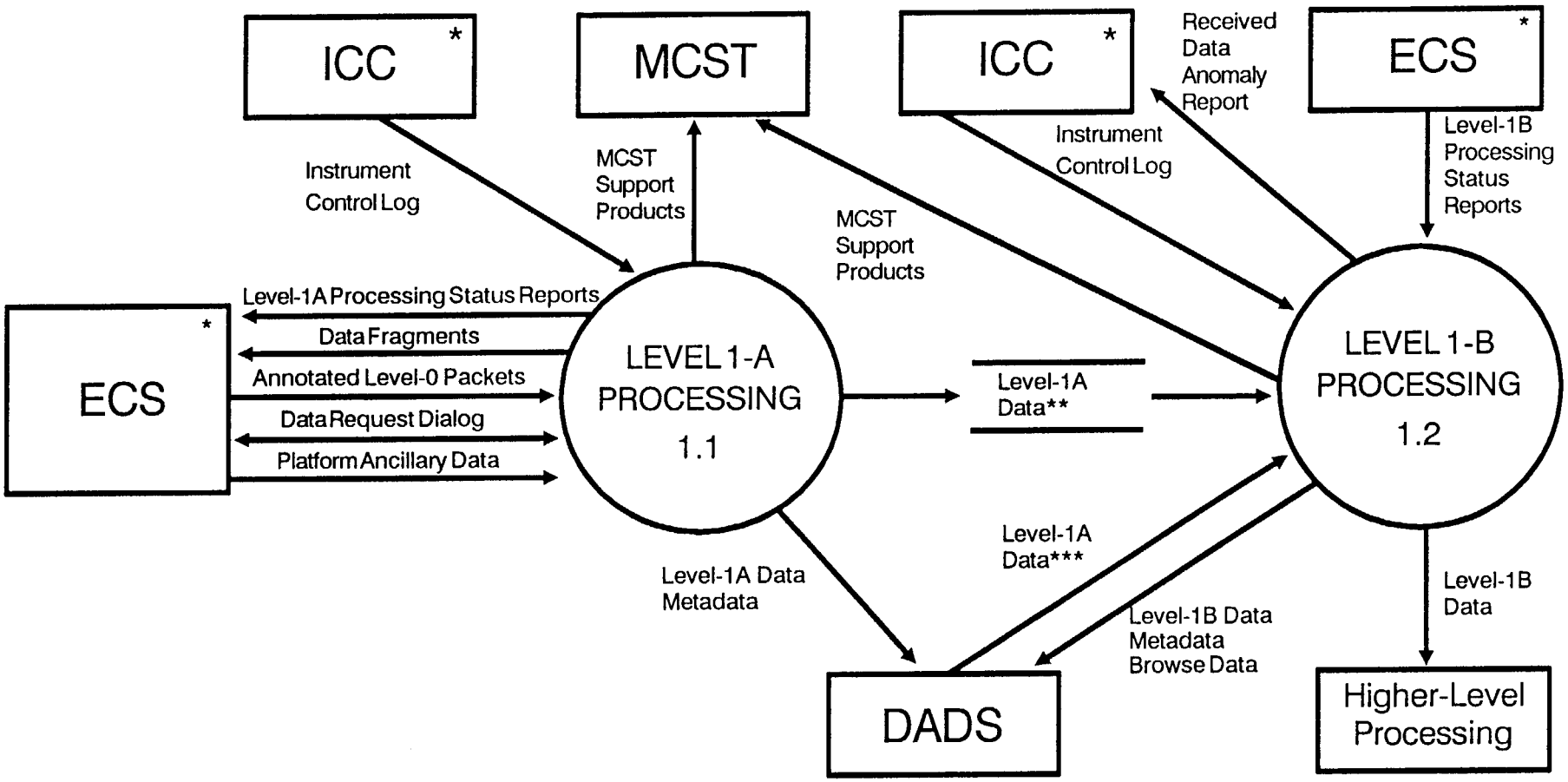
MODIS LEVEL-1 PROCESSING
DATA FLOW DIAGRAM (FUNCTION 1.0)



*A single asterisk indicates that an item has been repeated on the same diagram. Items are repeated for readability.
**Following Level-1A (re)processing only.
***Reprocessing Level-1B (and higher) only.

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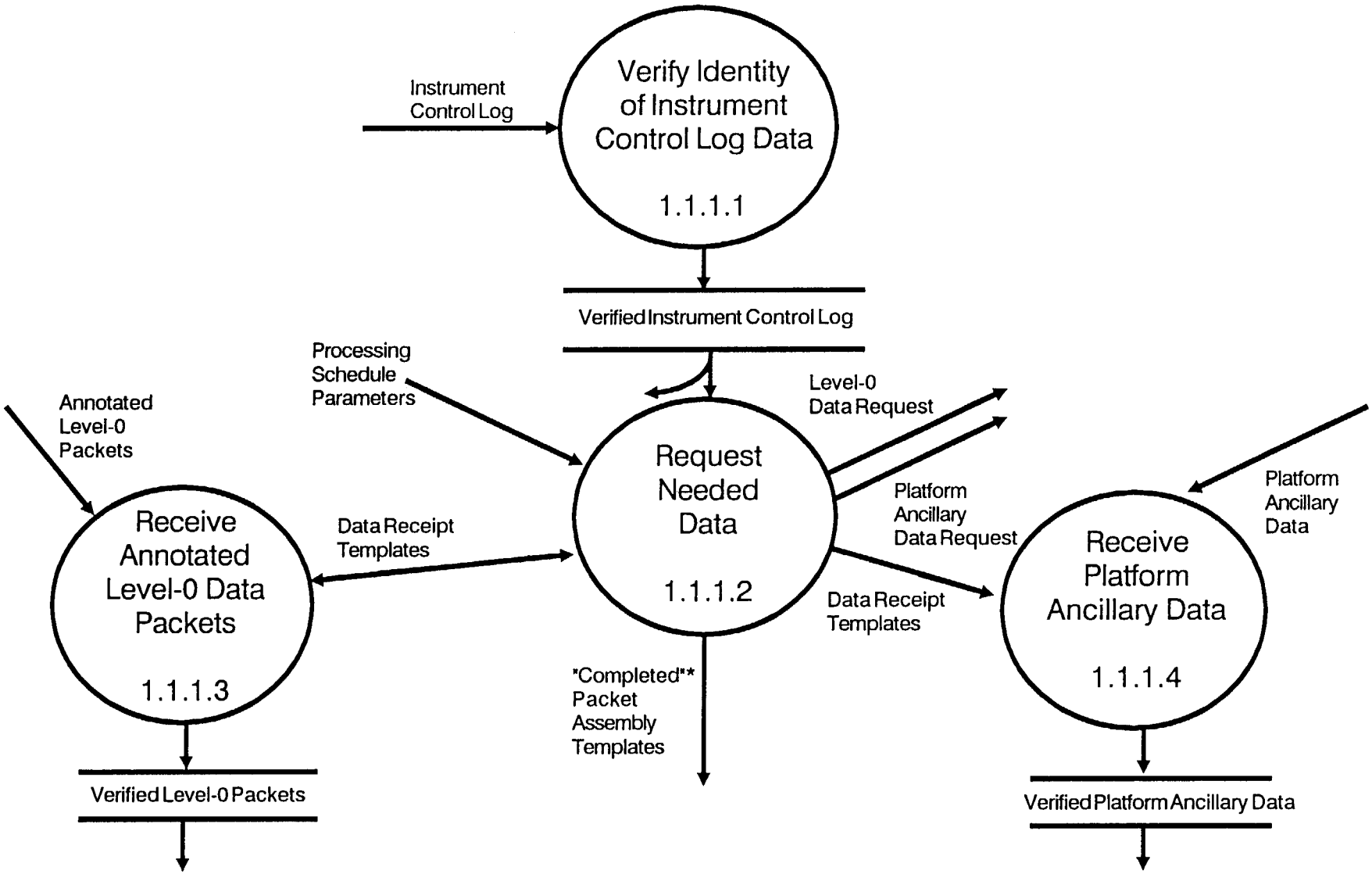
RECEIVE DATA
DATA FLOW DIAGRAM (FUNCTION 1.1.1)



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*The definition of "completeness" may be flexible and a function of elapsed time from observation.

Platform Ancillary Data Nomenclature (August 30, 1990)[1]

Platform Ancillary Data	= Standard Platform-Generated Ancillary Data + Instrument Telemetry
Standard Platform-Generated Ancillary Data	= Platform Ephemeris + Other Platform-Generated Ancillary Data
Platform Ephemeris	= Platform Position + Platform Velocity + Platform Attitude + Platform Time
Instrument Telemetry	= Instrument Housekeeping Telemetry + Instrument Engineering Telemetry
Instrument Housekeeping Telemetry	= Temperature + Power Relay On/Off Status + Instrument Input Voltage + Instrument Input Current
Instrument Engineering Telemetry	= Calibration Data + Instrument Specific Data + Other Instrument Specific Hardware Performance/Status Information

[1]Traceable to the General Instrument Interface Specification for the EOS Observatory. GE Astro Space, 1/15/90