RTCA Special Committee 186, Working Group 5

ADS-B UAT MOPS

Meeting #11

UAT MOPS Appendix J: Reference Upper-Layer Report Format Draft 3

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SUMMARY

The purpose of this Appendix is to define a reference implementation of those layers above the physical layer for byte-wise transmission of messages that may be received by a UAT, as well as ownship message transmissions. In this 3rd draft, the text has been formatted according to the MOPS Style Guide, and revisions from comments at Meeting #10 have been incorporated.

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Appendix J

Reference Upper-Layer Report Format

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J.1 Background

The purpose of this appendix is to provide a reference report format for the UAT equipment. This appendix does not specify a physical layer interface, but instead defines a reference implementation of those layers above the physical layer for byte-wise transmission of messages over a serial interface. This reference interface provides for reporting of received ADS-B and TIS-B traffic, ADS-B ownship position, and FIS-B uplinks.

J.2 Scope

The report function is implemented as a "pipeline" for communication of messages received via the UAT equipment. Traffic report management and buffering methods may be used as permitted (see subparagraph 2.2.10.2), but are not discussed further in this Appendix. This preserves the role of the UAT as a data communication medium, rather than as a traffic management entity.

The Time of Applicability (TOA) and Time of Message Receipt (TOMR) fields are added to the traffic report by the receiving UAT. Determining the TOA value necessitates that the receiving UAT look inside each message at the NIC and NAC fields to determine whether the message was transmitted with 1 Hz or 200 milliseconds time registration. TOA has resolution of fractional seconds, and sufficient span to resolve the time reference for the received message. Absolute time is not necessary, if one assumes that the end system has access to its own absolute time reference.

The TOMR value is the high-accuracy time measurement within the current second, which is used by an external application for range measurement and validation.

Note that the UAT receiver cannot on its own authority shorten the received Uplink payload below its maximum length of 432 bytes, as it has no knowledge of the uplink Application Data packing format.

J.3 Serial Data Format Description

Table J-1 shows one possible definition of a report format.

Table J-1: Report Format

# of Bytes	Content
1	ASCII STX (Sart of Text) byte (02_{16})
1	Packet Type (defined in Table J-2 below)
1	Time of Applicability (units of 1/10 seconds since UTC midnight modulo 25.6 seconds)
3	Time of Message Receipt (hundreds of nanoseconds after UTC tick)
Variable	Message Payload (see Table J-2 below)
1	Checksum (see Note 4)
1	ASCII ETX (end of text) byte (03_{16}).

Notes:

1. *Fields are listed in order of transmission.*

2. *Multi-byte fields are transmitted MS byte first.*

3. *In cases where the STX or ETX byte appears in the data stream, that byte should be preceded by a DLE (data link escape) byte (1016). The DLE byte can appear in the data by sending two consecutive DLE bytes. This allows a for variable length packets without requiring an explicit Length field.*

4. *Checksum is the exclusive-OR of all bytes exclusive of the STX, Checksum, and ETX.*

Table J-2: Report Packet Types

Packet Type #	Packet Type	Content
0	Status	Periodic status report of UAT performance (Note 1)
1	Traffic Message (received) (Note 2)	18 or 34 bytes, as defined in Table 2.2.4.3.
2	Ownship ADS-B Message	18 or 34 bytes, as defined in Table 2.2.4.3.
3	Uplink Message	432 bytes of payload data, defined in Table 2.2.3.2.2.
4	Uplink Header	Bytes 1 through 8 of Uplink payload data, defined in Table 2.2.3.2.2 (Note 3)

Notes:

1. *Items that may be included in the Status message include: GPS time in seconds since midnight (full resolution), number of ADS-B and Uplink synchronization patterns detected, number of ADS-B and Uplink messages FEC decoded successfully, number of ADS-B and Uplink messages that could not be FEC decoded, and the number of reports discarded in the previous second due to report bandwidth starvation.*

2. *Traffic messages include both ADS-B and TIS-B.*

3. *End system may use Packet Type 4 instead of Packet Type 3, if end system has no need for full content of Uplink Application Data. This can be via either an equipment option, a configuration parameter, or a run-time request. For example, the Uplink Header report contains the field necessary for airborne processing of received TIS-B reports.*