ATNP WG3
WP 6-14
Revision A

Aeronautical Telecommunication Network Panel (ATNP)
Applications and Upper Layer Work Group (WG3)
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Use of ATSC Traffic Types

ATSC traffic types have been defined to indicated the maximum end-to-end transit delay. The ADSP working groups recently added material to their draft ICAO manual of ATS applications further defining performance levels of ATS applications. ATNP WG3 is requested to review this material from ADSP and provide inputs to ATNP WG2 on what is expected from the internet communication service based on the use of ATSC traffic types.

Ref: Draft ICAO Manual of Air Traffic Service (ATS) Data Link Applications (ADSP)

1. Discussion

Attachment 1 is an excerpt from the introductory section from the ADSP's "ICAO Manual of ATS Data Link Applications." This is the version from the ADSP working group of the whole meeting held in March 1996 and is the version going ADSP/4 for approval. In section 3A.2 they have defined performance levels A through J. Note for that for each performance level a corresponding ATSC traffic type could be defined. The ADSP has defined a mean, 95% and 99% end-to-end transfer delay for each performance level with performance level 'A' being the fastest (0.5 second mean) and 'J' being the slowest (60 second mean). We do not expect the really short values to have any relationship to Package-1 air-ground services. ATNP WG1 is planning on extracting this table as the basis for defining ATSC traffic types and putting it into Sub-Volume 1 of the CNS/ATM-1 Package SARPs as a system level requirement.

Sub-Volume 5 SARPs will need to define what routing policy should be invoked when the user has specified one of these ATSC traffic types. It must also be decided to what extent does Sub-Volume 5 need to specify the routing policy versus it being a local matter. Clearly we need the SARPs to specify the overall routing policy for the airborne routers. Perhaps there is some flexibility on the ground however. In any case the selection of a path by the router will be a 'best effort' to satisfy the transit time associated with the specified traffic type and will not be a solid assurance the packet will be delivered within the desired time. We may assume that each subnetwork will be certified a priori to be suitable to carry a specific traffic type(s) and for Package-1 this will not be required on a dynamic basis. Note however the router may need to use the QoS reported by the subnet on an aircraft-by-aircraft basis to determine the specific version of the subnet installed on a given aircraft (e.g., Satcom 600 bps service vs. Satcom 9600 bps service - VDL Mode 1 vs. Mode 2 vs. Mode 3) since this makes a big difference in which traffic types are supported. If, for example, the user has indicated that the traffic type is 'G' meaning a 12 second end-to-end transfer delay, then the router would be expected to select a path that is supporting traffic type 'G' or better (i.e., 'A' thru 'F') and as a first choice one that is specifically identified as supporting 'G'. But what if the only available subnetwork supports only traffic type 'J' (meaning a mean transfer delay of 60 seconds). The question is does the router apply a strong policy and drop the packet or apply a weak policy and go ahead and deliver the packet. It is suggested that as a minimum a CAA should not be precluded in their ground router from implementing a strong routing policy. However some CAA's may be willing to accept the longer transfer delay depending on the operational environment and procedures they have in place. On the aircraft perhaps a weak policy could be required by the SARPs and still not cause a problem if the ground router is using a strong policy. In this case the aircraft would deliver the downlink but the ground end system's response would never be delivered. The airborne TP4 would eventually time out the connection.

There are a number of other issues impacting WG2 and WG3 efforts. If a router drops a packet because no path exists that can support the specified ATSC traffic type does it indicate this fact to the user of the service? Also is a subnetwork assigned a single authorized traffic type that is the highest level that it actually supports, in terms of transit delay, or is each subnetwork assigned the range of traffic types (e.g., D through J) that are supported?

2. Proposal

WG3 should accept the performance levels from ADSP and endorse the definition of ATSC traffic types corresponding one-for-one with the ADSP list. Specifically, it is proposed that WG3 is ask to endorse the definition of traffic types A through J in Sub-Volume 1 using the 95% probability level defined by ADSP. WG3 is invited to prepare a flimsy to WG1 stating the above position.

WG3 is invited to prepare a flimsy to WG2 stating a position that:

a) an updated list of traffic types (i.e., A through J) should be used consistent with the values provided by ADSP at the 95% probability level (attachment 1);.

b) Subnetworks should be qualified, based on either QoS information provided by the subnetwork, or a priori for the highest ATSC traffic type that can be supported (i.e., shortest transit delay).

c) A given subnetwork should be considered eligible to carry traffic with a specified ATSC traffic type equal to or lower than the traffic type for which the subnetwork is qualified. For example a subnetwork qualified for ATSC traffic type D also can support traffic types E through J.

d) When more than one qualified path exists, routers should apply a local policy where typically the preferred path would be the lowest cost. Where no cost discriminator exits, then the path should be selected based on the closest match to the specified traffic type. For example, where there is no cost discriminator, if one path supports traffic type F and a second supports G and a packet arrives with a traffic type of H indicated, then the path supporting traffic type G would be selected.

e) ATSC traffic should be delivered only over a path authorized to carry ATSC (i.e., strong routing policy results in discarding of packets where no authorized path exists); once this is satisfied the following additional routing policies are to be applied;

   1) airborne routers should invoke a weak routing policy for selecting the specific path for a given ATSC traffic type. In this case, if an path exists that is authorized to carry the specified traffic type, then the rules of c) and d) above apply. In the case where no path exists that is authorized to carry the specified traffic type then the path selected should be based on the closest match to the specified traffic type. For this case packets are not discarded if any path authorized to carry ATSC traffic exists.

   2) states and organizations implementing ground routers may elect to implement either a weak routing policy or optionally a strong routing policy, depending on the operational requirements and constraints for delivery of ATSC in their administrative domain, for selecting an eligible path for the specified ATSC traffic type. In the case where a strong routing policy is used, the path selected must be authorized to carry the specified ATSC traffic type or higher higher class (i.e., shorter transit delay). In the case of a weak routing policy, if an path exists that is authorized to carry the specified traffic type, then the rules of c) and d) above apply. In the case where no path exists that is authorized to carry the specified traffic type then the path selected should be based on the closest match to the specified traffic type. For this case packets are not discarded if any path authorized to carry ATSC traffic exists.

COMMUNICATION SYSTEMS PERFORMANCE REQUIREMENT PARAMETERS

3A.1 General Requirements

3A.1.1 In addition to the requirements specified in the application parts of this document, all data link applications require:

a) the probability of non-receipt of a message will be 10^{-6};

b) the probability that non-receipt of a message will fail to be notified to the originator will be 10^{-9}; and

c) the probability that a message will be mis-directed will be 10^{-7}.

3A.2 Performance Requirements

3A.2.1 The figures in Tables 3A-1 and 3A-2 reflect the various levels of performance that may be selected for the purpose of providing Data Link services. Depending on the level of service to be provided, a given State can determine what the performance needs are in a given domain by factors such as the separation minima being applied, traffic density, or traffic flow.

Performance Levels	Mean End-to-End Transfer Delay (Seconds)	95% End-to-End Transfer Delay (Seconds)	99.996% End-to-End Transfer Delay (Seconds)
A	0.5	0.7	1
B	1	1.5	2.5
C	2	2.5	3.5
D	3	5	8
E	5	8	12.5
F	10	15	22
G	12	20	31.5
H	15	30	51
I	30	55	90
J	60	110	180

Table 3A-1: Transfer Delay Performance Requirements