# Proximity-1 Timing Services – will be section 5

## Proximity-1 Time Correlation

The following method specifies the time tagging of Proximity-1 transfer frames exchanged between two Proximity-1 transceivers (initiator/responder) upon ingress to and egress from a Proximity transceiver (two-way) depicted in figure 5‑1, Proximity Time Tagging and Time Correlation.

When time tagging is active, a Proximity-1 transceiver shall record the time of the trailing edge of the last bit of the Attached Synchronization Marker (ASM) of every incoming and every outgoing Proximity-1 transfer frame when available.

NOTE – Timing Services require that the transceiver’s MODE is active and is operating in the Data Services sublayer. Timing Services can only occur in full or half duplex operations. Timing services can occur concurrently with other data transfer activities. The recommended time-tagging method is specified in 5.2.

### time TAG capture method

The time tag capture method shall be composed of the following steps:

1. The vehicle controller shall instruct the initiating transceiver (initiator) to build and send a SET CONTROL PARAMETERS directive to the responder to capture it’s time tag measurements. Upon receipt of this instruction/directive, the MAC sublayer of both transceivers shall capture the local time reference and associated frame sequence numbers over the commanded interval.
2. Each transceiver shall package this time correlation data for later transfer to the time correlation process.
3. The time correlation process requires the following information:

* both initiator and responder’s data sets (time tags, sequence counts, direction)
* the relationship of one of the transceiver’s clocks to UTC
* the delays associated with each of the transceiver’s time tagging process
* Time tag formats per transceiver

NOTES

1. Time tag direction is labeled as either egress or ingress.
2. The internal delays may have coding and rate components.
3. Simultaneous collection of time tag data in both directions provides accuracy.



Figure 5‑ : Proximity Time Tagging and Time Correlation

## Transferring time to a Remote Asset

A Proximity-1 transceiver shall provide the capability of distributing time to a remote asset.

NOTE – In order to transfer time to a remote asset (i.e., the responder), the initiator must maintain correlation to the master clock for the Enterprise and its local Proximity clock.

The method for transferring time to a remote asset shall consist of the following steps (See figure 5-2):

1. Prior to the desired transfer of Enterprise time to a remote node, the initiator’s vehicle controller will need to acquire/determine the one way light time between itself and the remote node for the instant that the transfer will be initiated. The vehicle controller will add that amount of time to the Enterprise time for when the transfer will be initiated. This computed time will be formatted as a CCSDS unsegmented time code format (reference [7]).
2. At the desired transfer time, the vehicle controller will command its transceiver to formulate a Time Distribution directive including the predetermined Enterprise time that is to be transmitted over the Proximity link.
3. Upon receipt of the Time Distribution directive the remote unit will now be able to set its clock to the Enterprise time within the mission’s accuracy requirements.

Notes: Time transfer accuracy determination must include the following:

1. The initiator’s time accuracy error must be known.
2. The maximum delay from the vehicle controller’s request until the Time Distribution directive is transmitted.
3. The accuracy of the one way light time computation
4. The delay from the time of receipt of the Time Distribution directive until it is loaded into the remote system master clock.



Figure 5‑ : Proximity Time Distribution

Note to review team that the variable TIME COLLECTION is to be deleted from the specification since it is implementation related.