DRIP Authentication Formats for Broadcast Remote ID

draft-ietf-drip-auth-03

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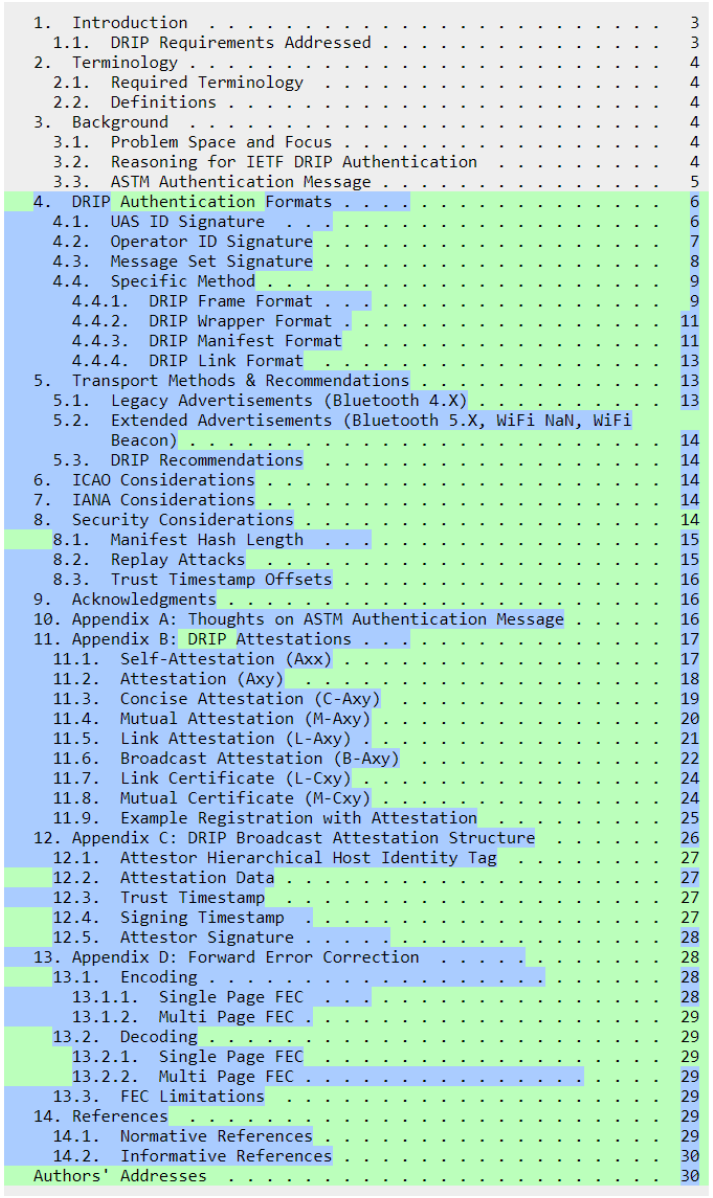
Changes since -01

- General
  - New title
  - Rearranged sections for clarity
  - Removal of specific F3411 reference (F3411-19 to F3411)
- Updated Section 3.3
- Reordering and expanded DRIP Auth. Formats
- Operational Recommendations added
- Appendices updates



Section 3.3 Rework

- The overview of "current" ASTM Authentication Message
  - Massive rework to make clearer but remain abstract
- Updated to F3411-v1.1 changes
  - Authentication Type 5 – Specific Authentication Methods (SAM)
  - Additional Data Length & Additional Data
- New DRIP Constraints section (3.3.2)
  - Sets up specific DRIP based constraints on the Authentication Message
- F3411-v1.1 re-balloting later this year (will become F3411-22?)

F3411-v1.1 Changes

- Authentication Type 5 – SAM
  - Means to add Authentication formats to F3411 after publication
  - Single multiplexing byte (SAM Type) at start of Authentication Data
    - Maintained by ICAO
    - WG will need to submit request for values
- Additional Data Length (ADL) & Additional Data
  - Pseudo-field of data after Authentication Data
  - 16-pages of data = 362-bytes of payload, limited by unsigned byte (255)
  - DRIP uses to carry the FEC

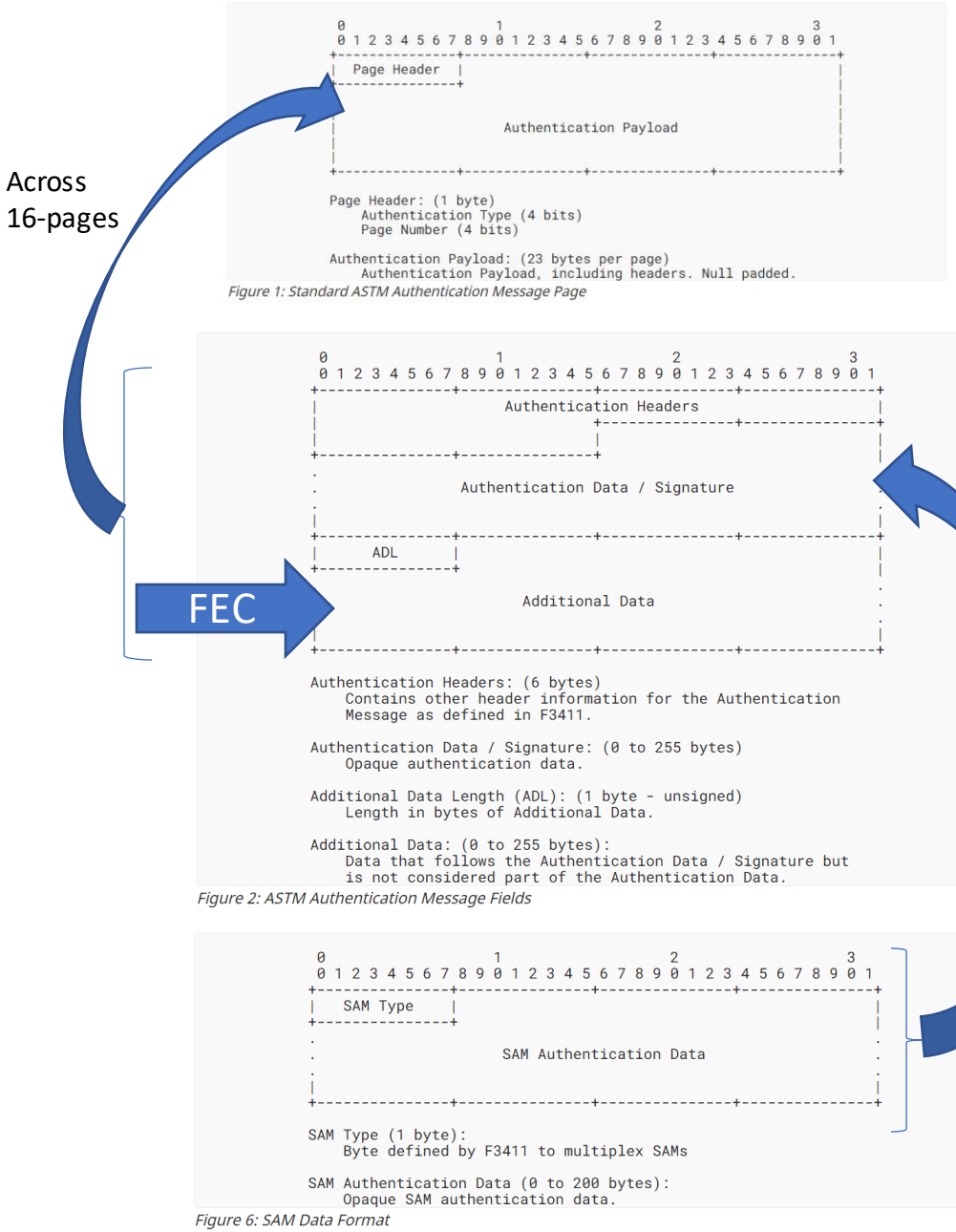


Figure 1: Standard ASTM Authentication Message Page

Figure 2: ASTM Authentication Message Fields

Figure 6: SAM Data Format

Forward Error Correction

- Updated to use the Additional Data "field" of F3411-v1.1 Authentication
- With F3411-v1.1, under BT4 we have all 16 pages to work with (minus those needed for actual auth data – itself limited to 9 pages)
- FEC should be page aligned
  - Was page aligned before F3411-v1.1 changes
  - Null bytes added after ADL (to get aligned) and is included in the ADL count
- Need text on Multi-page FEC – Reed Solomon?
- Previous discussion privately on doing FEC for more-than-auth
  - FEC across all messages being sent, not just the Authentication Message
  - This needs to be added soon if we want to include it

Broadcast Attestation Structure (BAS)

- Generalized format to be used in DRIP Auth. (except Link)
- Change: Removed signing timestamp
  - Pros: more space for attestation data
  - Cons: not in direct alignment with drip-registries Attestation formats

Whenever this structure is used the UA is self-attesting its DET – very important as it confirms possession of key asserted by Broadcast Attestation – more on this later.

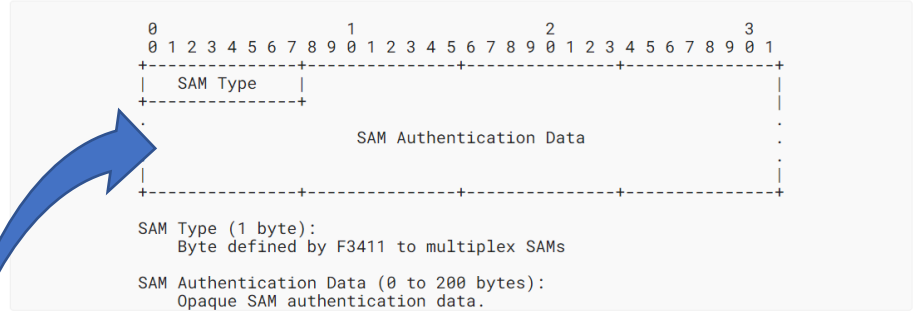


Figure 6: SAM Data Format

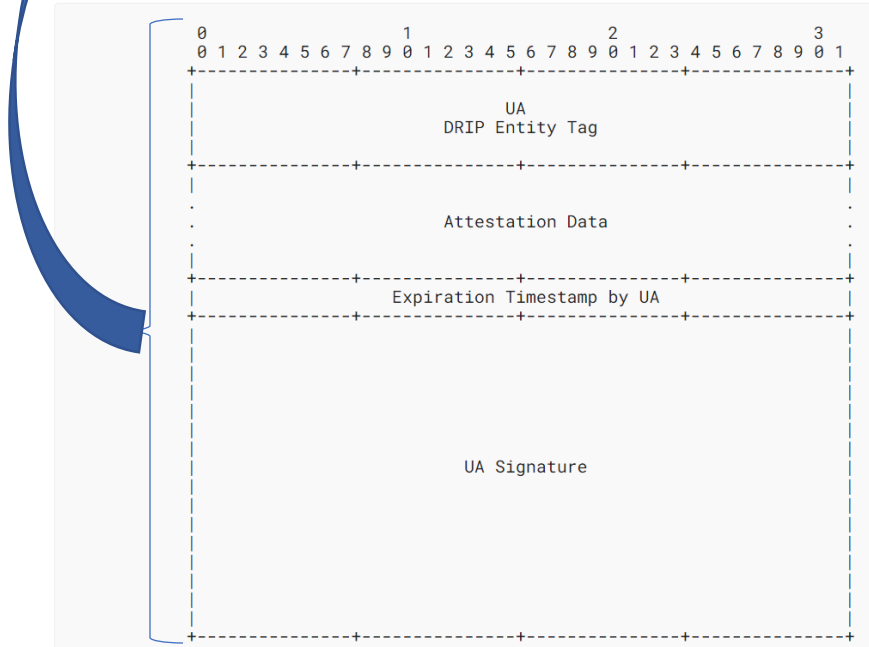


Figure 3: Broadcast Attestation Structure

DRIP Link

- HDA on UA Broadcast Attestation
- Other Broadcast Attestations can be produced from registry process – do we send them?
- Added Link Type to multiplex
  - Already spilling into a new page, so no waste of adding single byte
  - Future proofing
- Example in Appendix B

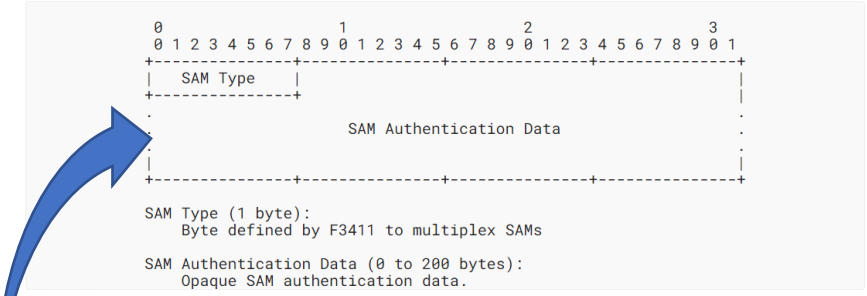


Figure 6: SAM Data Format

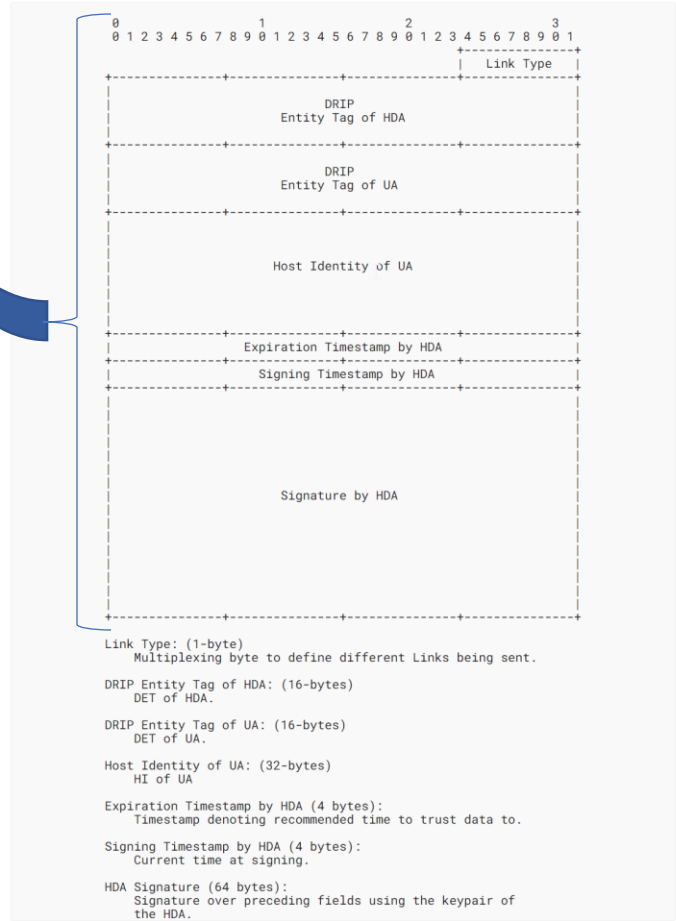


Figure 7: Example DRIP HDA-UA Broadcast Attestation

DRIP Manifest

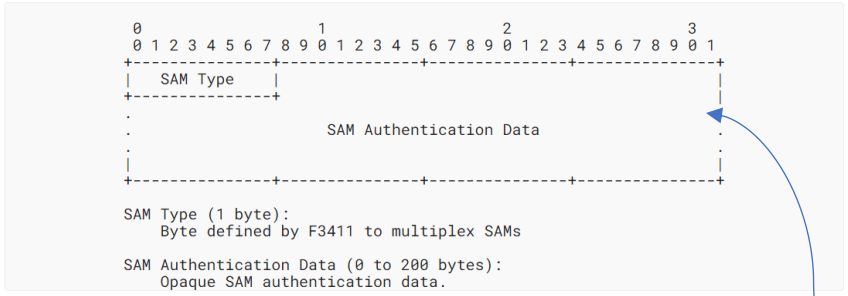


Figure 6: SAM Data Format

- Hash length: 8 to 12
  - Number of hashes lowered to 9 total (7 message hashes)
- Added text to define how to hash messages
  - When Auth. Message, concatenate all pages together into one blob
- Variable Window
  - Needs more text

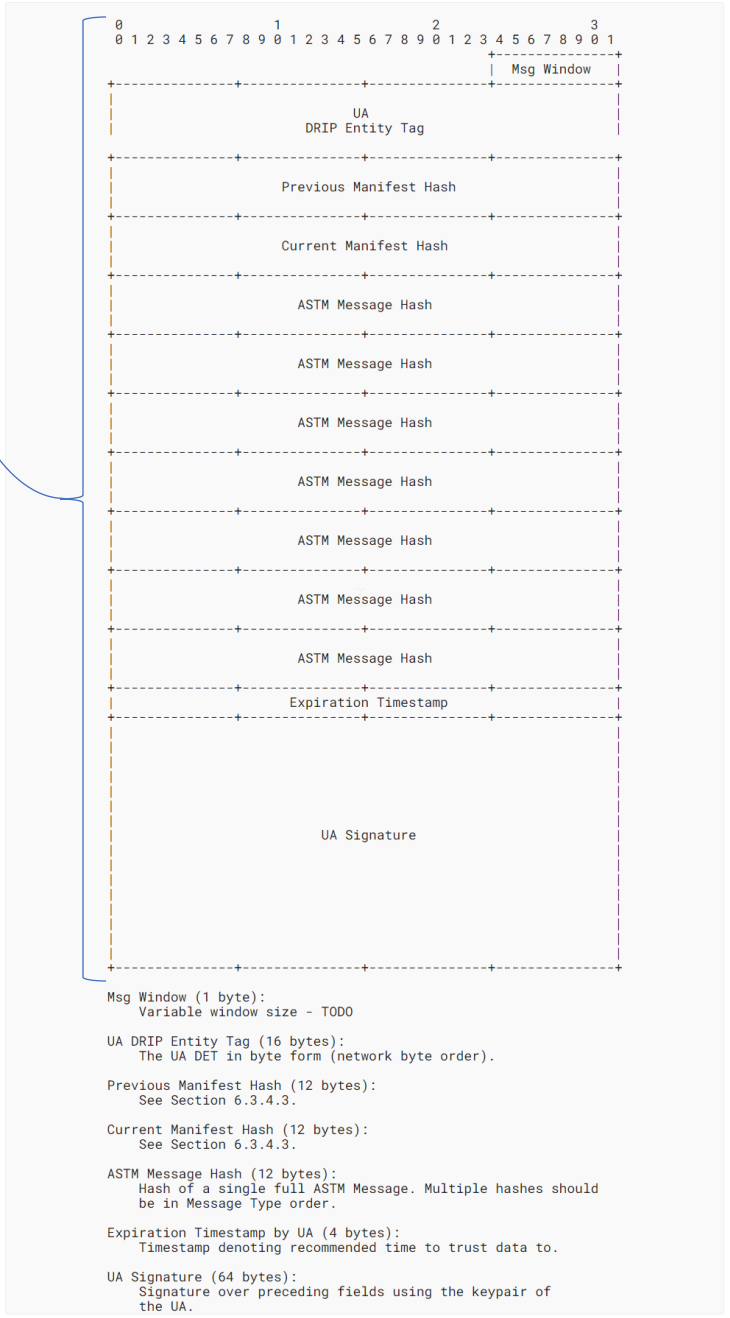
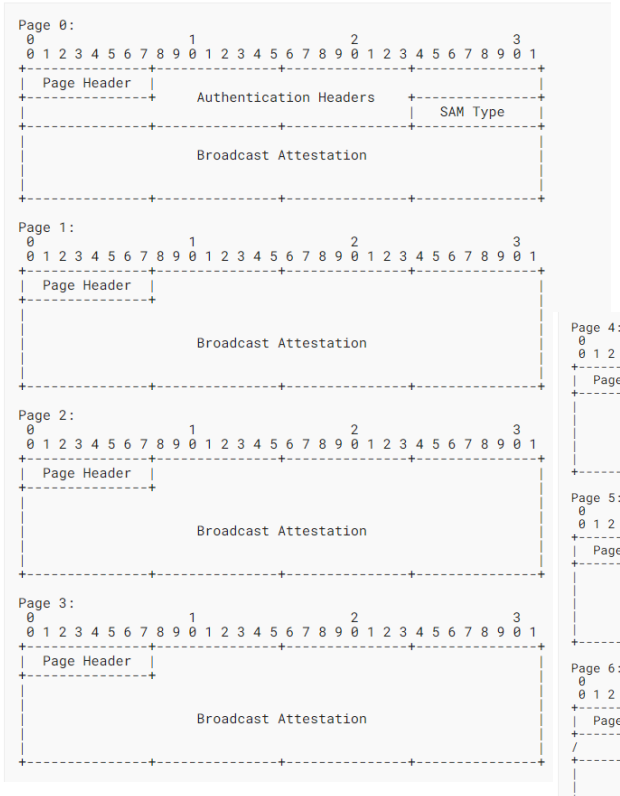
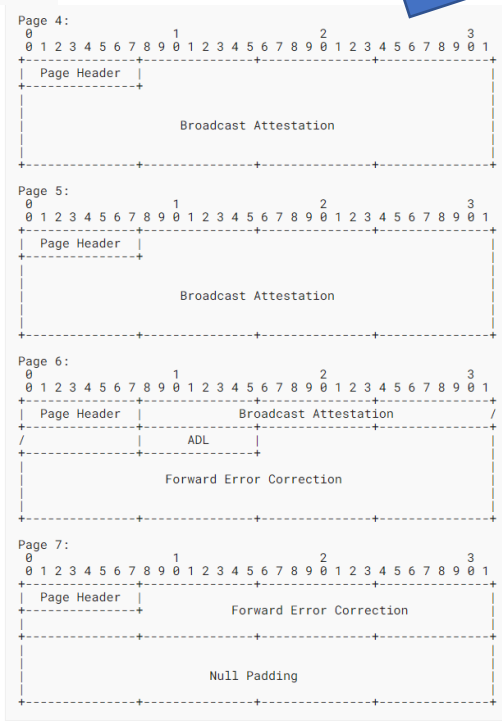


Figure 9: Example DRIP Manifest

DRIP Link + Manifest => Trust!



Transmit DRIP Link (left) and hash combined pages of DRIP Link placing into DRIP Manifest (right)...



Hash a Location Message and place into DRIP Manifest....

Sign and send DRIP Manifest – thus validating key ownership assertion!

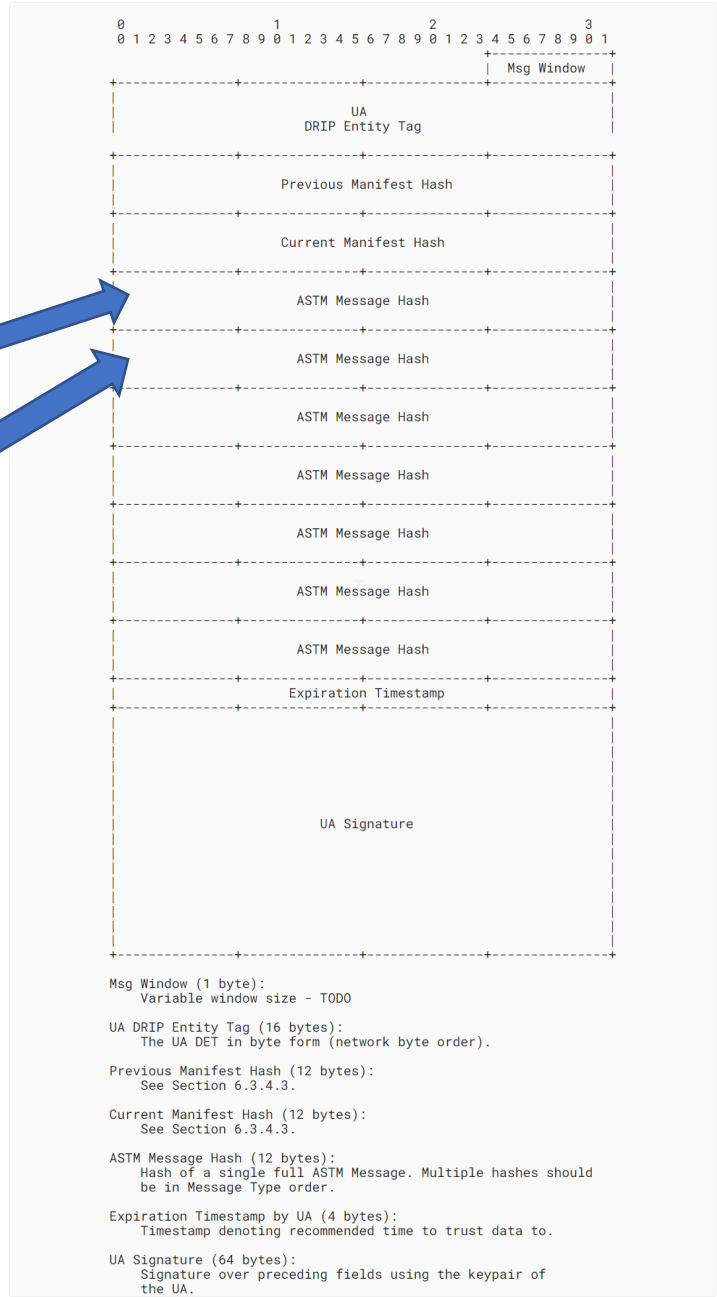


Figure 9: Example DRIP Manifest

DRIP Frame

- More explicit formatting using BAS
- Added byte for multiplexing
  - Future proofing
- Perhaps rename
  - DRIP [UA] Attestation?

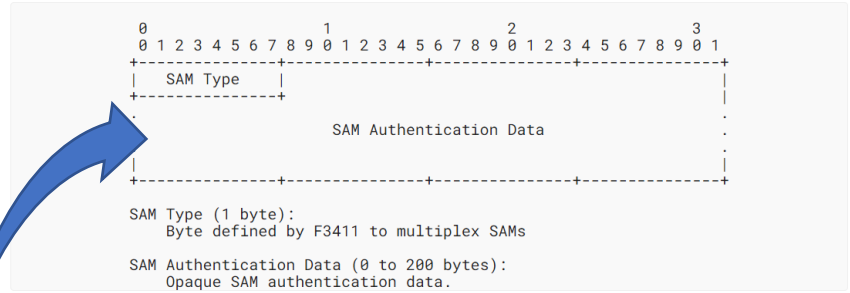


Figure 6: SAM Data Format

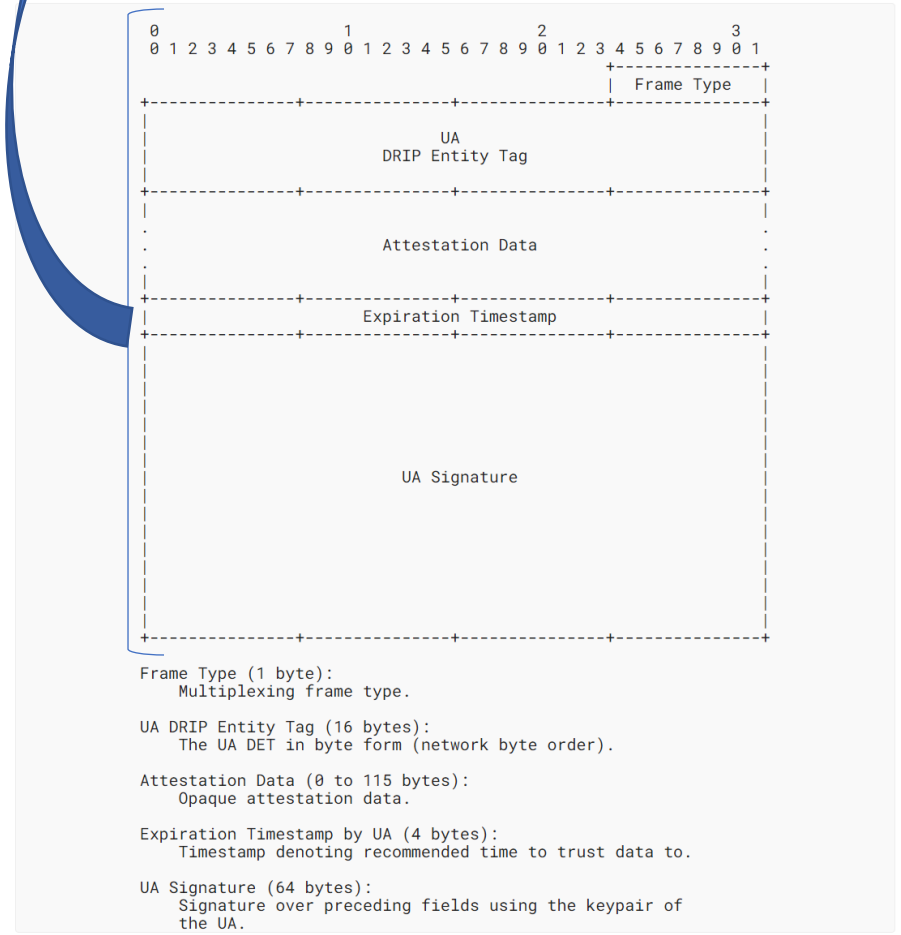


Figure 10: Example DRIP Frame

DRIP Auth. Recommendations / Requirements

- MUST send Link with HDA on UA Broadcast Attestation
- MUST send Manifest with hash of Link & dynamic data (like Location Message)

This is what gives us value: Link asserts a given key is owned by UA and is part of its registry (HDA) + Manifest confirms the key ownership assertion in Link

- Recommends sending other Link messages for other entities
  - Root/RAA, RAA/HDA [, HDA/Operator, Operator/UA]

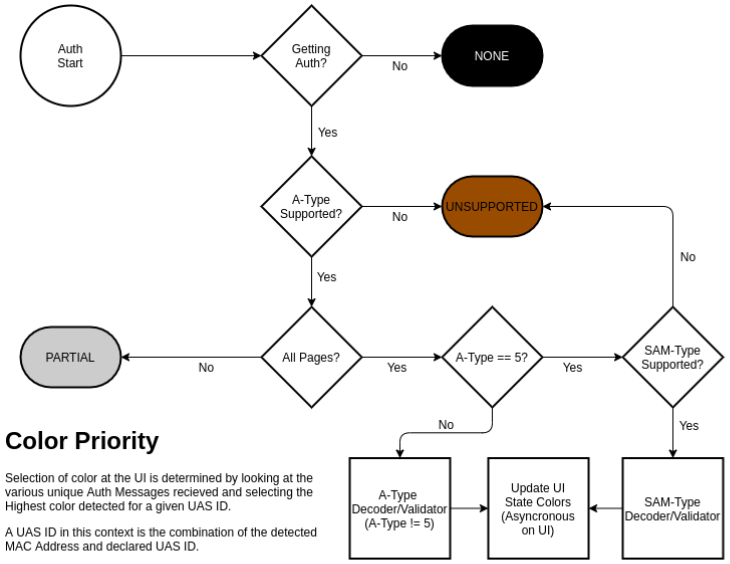
Operational Recommendations

- Text on how to manage transmission of DRIP messages
  - Up to implementation but best practice given
  - Link every 3s, Manifest directly after a "set" of messages
    - Set is Basic ID, Location, DRIP Link Auth., System [, Operator ID in EU]
  - Overall hard to quantify but good that its mentioned – brings awareness to implementor
- Wrapper special case
  - For map displays to easily mark trusted "dots" in a track
  - Points out that optimization of sending data only in Wrapper cannot be done – makes messages "non-existant" to non-DRIP aware receivers

Appendices

- Old Appendix A replaced with place-holder for Authentication Coloring Schemes
  - State diagram for recommended receiver authentication states and coloring
- Appendix on Attestations moved to drip-registries
- Appendices moved into main document
  - Forward Error Correction (now Section 4)
  - Broadcast Attestation Structure (now Section 5)
- New Appendix for examples

Authentication State/Coloring



Color Priority

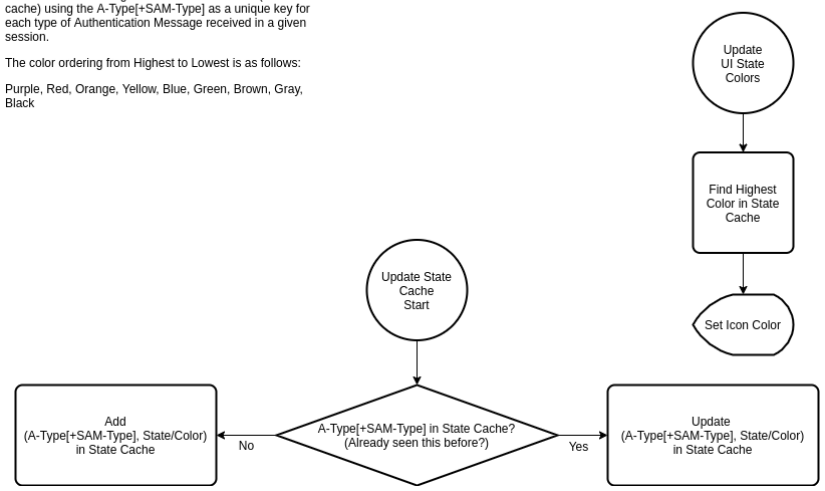
Selection of color at the UI is determined by looking at the various unique Auth Messages recieved and selecting the Highest color detected for a given UAS ID.

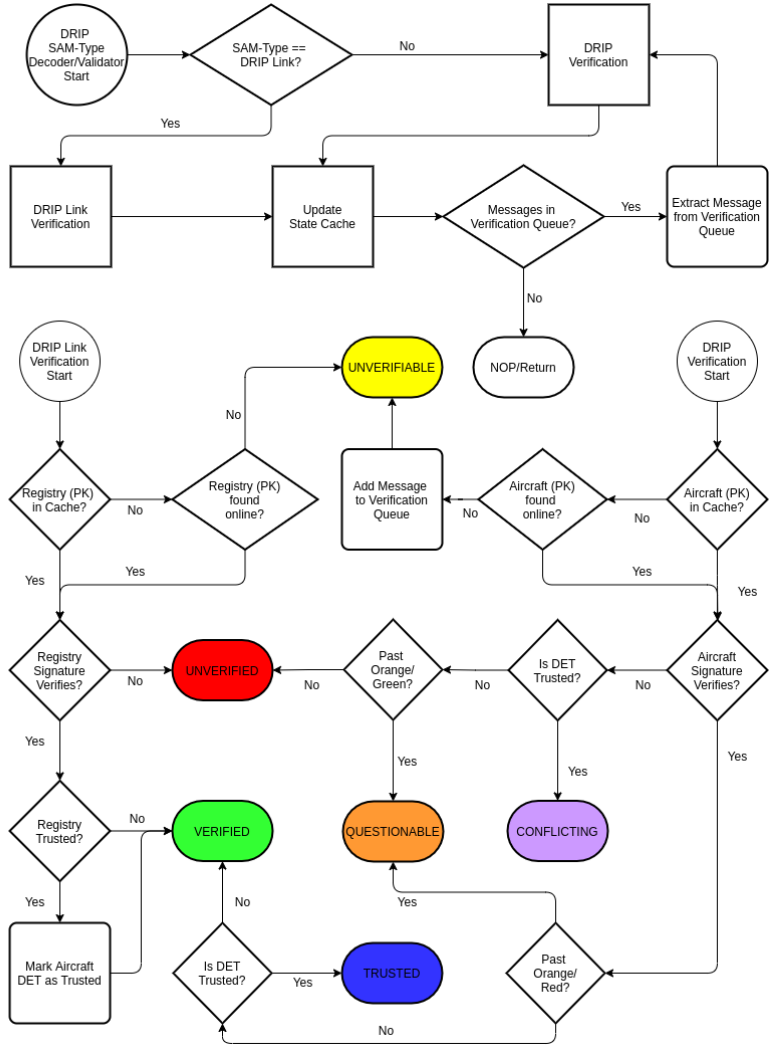
A UAS ID in this context is the combination of the detected MAC Address and declared UAS ID.

Authentication Messages are stored in a cache (state cache) using the A-Type[+SAM-Type] as a unique key for each type of Authentication Message received in a given session.

The color ordering from Highest to Lowest is as follows:

Purple, Red, Orange, Yellow, Blue, Green, Brown, Gray, Black





TODOs

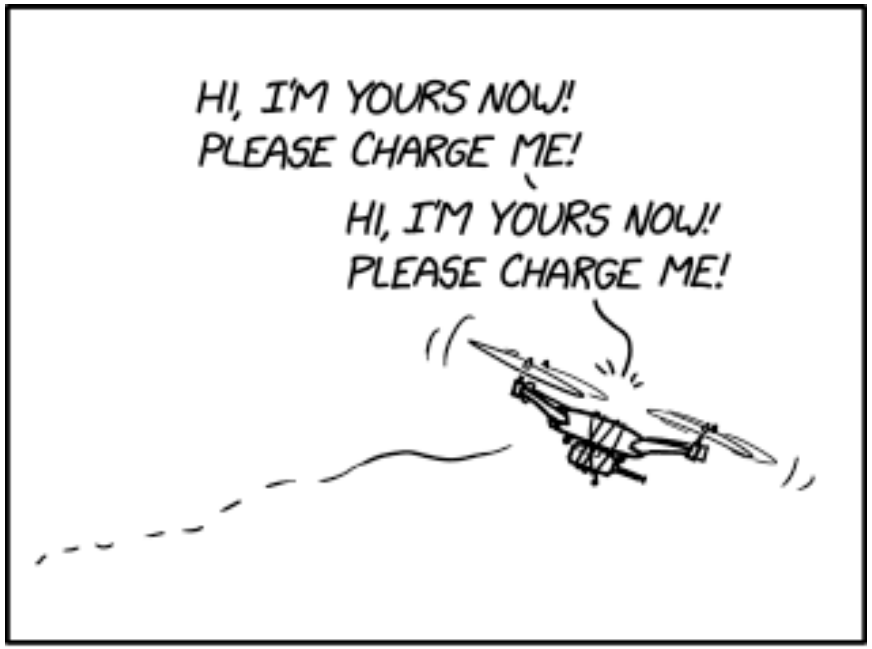
- Bob M. pointed out signing of short (<56-byte) messages
  - He will review this, may need to add "context" to signing data to pad
- FEC – Multi-page Reed Solomon, page alignment? more-than-auth?
- Better text on Manifest Variable Window
- Operational Recommendations
  - Bob M. provided bulk of text, will need to be reviewed and iterated over at least once
- IANA Considerations – for new multiplexing bytes of Frame/Link
- Appendix A – need diagram and explanation text
- Appendix B – add hex examples
- Flow diagram – suggestion from Med.
- WGLC?

Next Steps

- Release a new version (-04) that fixes the pending issues listed in last slide (Mid December 21)
- Request early IOTDIR and SECDIR reviews based in that version (give 4 weeks to get the reviews)
- Release a new version that addresses the various reviews (Jan-Feb 22)
- Based on how these items are progressing, we will decide if we will issue the WGLC before or after IETF#113.

Discussion

Questions, Comments, Concerns?



Remember to only adopt domesticated drones that specifically request it. It's illegal to collect wild ones under the Migratory Drone Treaty Act.
https://xkcd.com/2499/