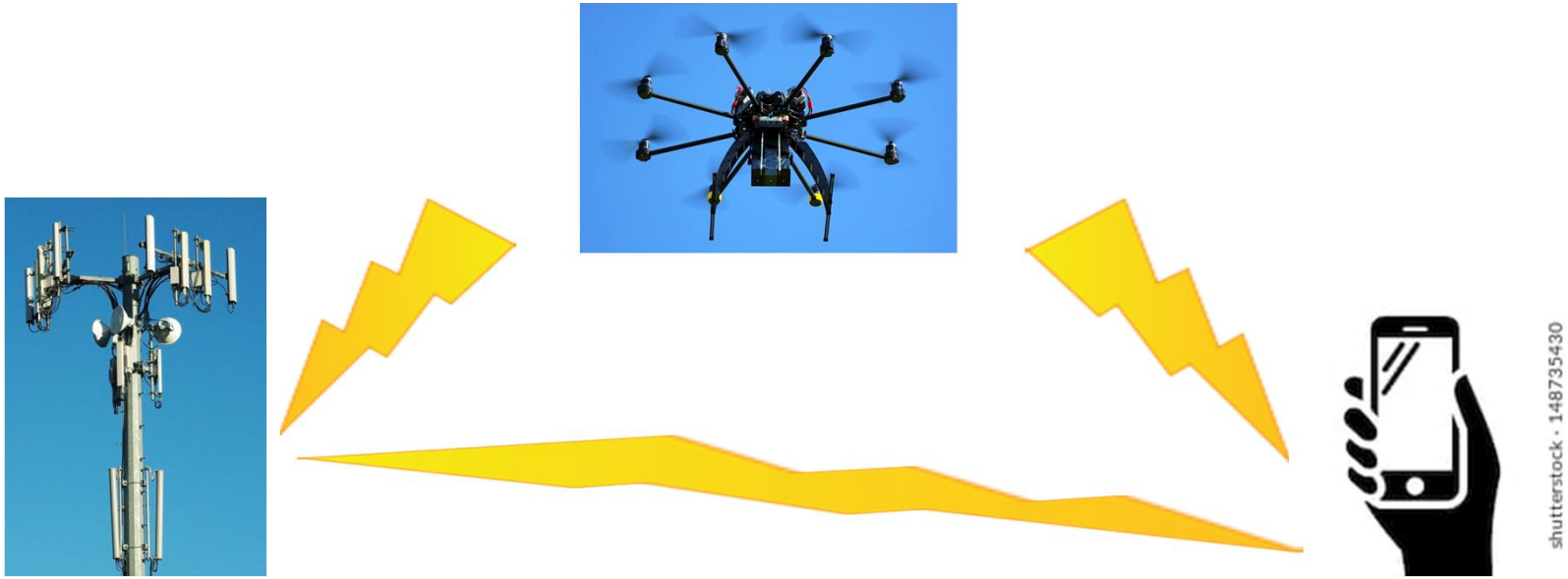

Drone Remote Identification Protocol (DRIP)

2020 NOV 18

updates on our UAS RID & UTM interactions beyond IETF

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Recent interactions beyond IETF

Å ASTM

- ï **F38 met 1st week of November: update to F3411 still on hold until FAA publishes final rule**
- ï **F38.02 UAS RID WG met NOV 13: friendly to our requests but *all* mods are in backlog**

Å ICAO Trust Framework Study Group (TFSG)

- ï **Trust Reciprocity Operational Needs (TRON) working group welcomed our inputs, substantially revised overview docs accordingly, is integrating our use cases etc.**
- ï **Bob M. may have more to say about & Global Resilient Aviation Interoperable Network (GRAIN) & Digital Identity (DI) working groups**

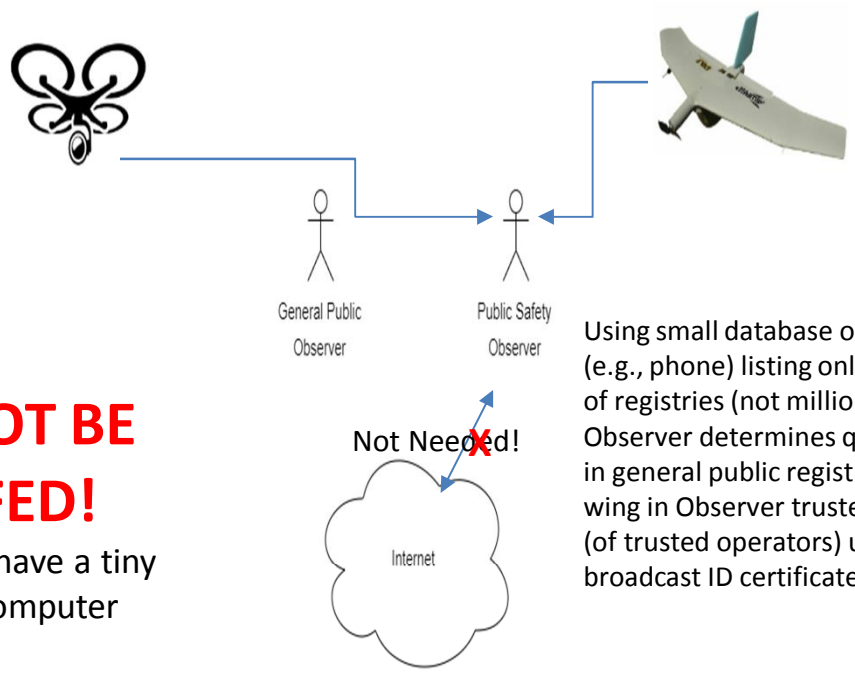
Å US federal agencies esp. FAA

- ï **All (inc. agencies other than FAA) await December final rule publication, nervous about potential switch from Network RID to Broadcast RID as baseline**
- ï **Much interest in trustworthy "blue force tracking" / "Identification Friend or Foe (IFF)"**
- ï **Thus much interest in resilience against spoofing, as provided by DRIP**
- ï **1st shown to FAA in UTM Pilot Project 2 demos at NY UAS Test Site concluded NOV 05: multi-vendor USS interop w/Discovery & Synch. Service (DSS), >10 UAS, Net-RID & B-RID**
  - Å BT4, BT5, WiFi NAN: API availability, RF range, reliability remain concerns (data taken for analysis)
  - Å FAA correlation query database key is UA reg. #, but FAA NPRM says UAS RID should not use it
- ï **Quickly, 4 slides excerpted from what we showed other agencies in demos NOV 10…**

Trustworthy Multipurpose Remote Identification & Tracking (TM-RID)

- Leverages proven Internet standards, infrastructure & business models to enhance capabilities & security of ASTM F3411 Broadcast & Network RID
  - ✓ **F3411 is easily spoofed – TM-RID is not**
  - ✓ Uses compact public key crypto to verify UTM entity identities, authenticate UA location claims, etc.
  - ✓ Enables observer to verify ID is in a known registry (e.g. of trusted operators), even w/o Internet connectivity
  - ✓ Enables authorized observers (public safety, air defense) to look up more extensive information & instantly establish Observer to Pilot secure comms when IP connectivity is available
- Complements existing standards (ASTM, ANSI/CTA, ICAO, CAAs)
- Supports a variety of applications related to UAS RID (e.g. V2X, DAA, C2)
- Enables further UAS RID enhancements
  - Verify UA location by integrating track information sources other than operator self-reports (e.g. crowdsourced gateway Broadcast -> Network location reports for SDSP multilateration)
  - Verify platform information claims by integrating other sensors (e.g. smartphone cameras)
- Internet Engineering Task Force (IETF) Drone Remote Identification Protocol (DRIP) Working Group (WG) has adopted several drafts from CLUE team as work items & advanced one to WG Last Call
- International Civil Aviation Organization (ICAO) Aviation Trust Framework Study Group (IATF/TFSG) is adopting our trustworthy identifier as one of its standard address formats
- **Makes UAS RID & other UTM information immediately actionable!**
- **Successfully demonstrated at NY UAS Test Site!**

TM-RID Operator Trust Classification w/o Internet



CANNOT BE SPOOFED!

unless you have a tiny quantum computer

Using small database on device (e.g., phone) listing only thousands of registries (not millions of UAS), Observer determines quadcopter is in general public registry & fixed wing in Observer trusted registry (of trusted operators) using UA broadcast ID certificate.

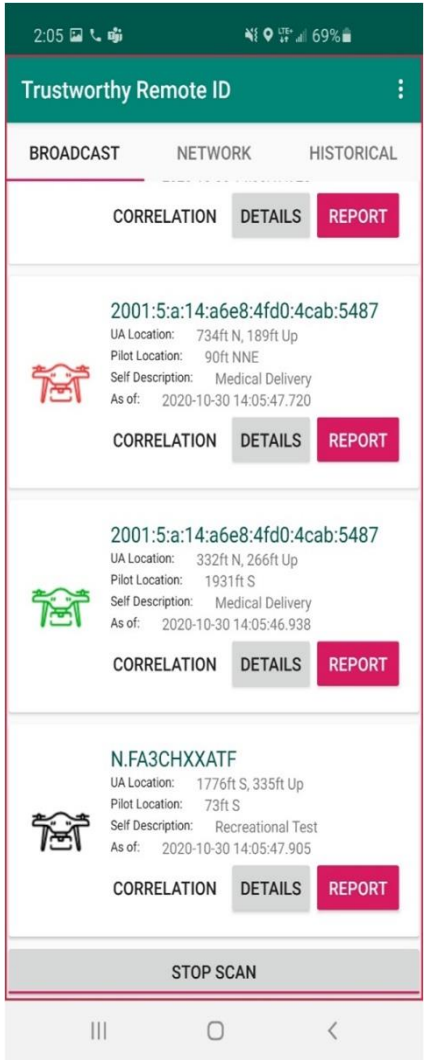
Demo Scenario: Force Protection

UAS Operators

- Alice: Clueless but innocent, w/ baseline ASTM transmitter, not participating in UTM
- Bob: Trusted, w/ TM-RID transmitter
- Carol: Malicious, w/ spoofing transmitter

Observers

- Doug: Public Safety, w/ TM-RID app
- Eve: General Public, w/ baseline ASTM app



Narrative

- Constraint published in UTM
- Alice blunders in
- Carol spoofs as Alice to cover her approach
- Neither Observer can disambiguate; Alice has only baseline ASTM
- Doug orders Alice to land; she complies
- Injury occurs, Bobôs UAS dispatched w/ med kit
- Carol spoofs as Bob to cover her attack run
- Eve canôt disambiguate; has only baseline ASTM
- Doug *can* disambiguate; Bob & Doug both have TM-RID
  - ✓ Authenticates Bobôs UAS
  - ✓ Reports Carolôs spoofing to C-sUAS C2 system

Way Forward

- Registries!!!
- Prototype CS-RID: feed Broadcast RID into Network RID, UTM, etc.
- Leverage TM-RID (DRIP) to enable cyber-resilient ID-oriented V2X networking for critical applications such as Detect And Avoid (DAA)
  - connect mission payload computer, flight controller, GCS, C4ISR networks, etc.
  - virtualization w/separation kernel, *e.g.* formally verified seL4 microkernel
  - remote attestation, secure boot, hardware root of trust
- Address trustworthiness of intermittently networked autonomous UAS