Toward a common UTM framework

Drone Enable 2017

Ben Tally
Co-Founder, CIO

GeoNetwork
The Geofence Company

Grounded in Standards

ID and Tracking

Global UAS Registry

GeoFencing

Internet Assigned Numbers Authority

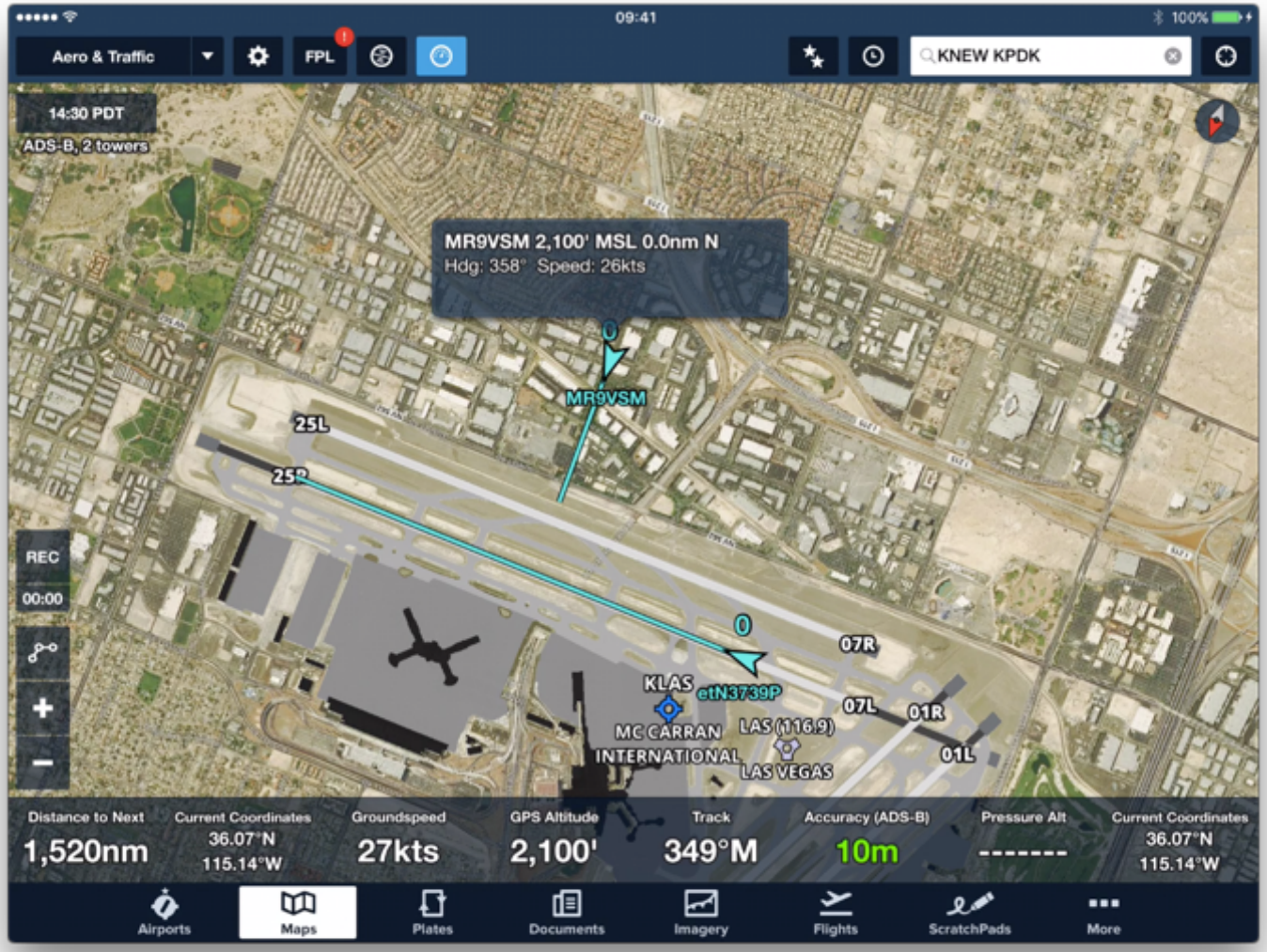
Our discussion today

UAS ID & Tracking

Global UAS Registry

Geofencing

A Familiar Scene



(Video omitted)

Video is of a commercial jet landing as a UAS is approaching the landing strip.

Illustrates the ability to identify UAS in a blended view with manned aircraft using ADS-B.

The following slides discuss this current working soluition.

GeoNetwork

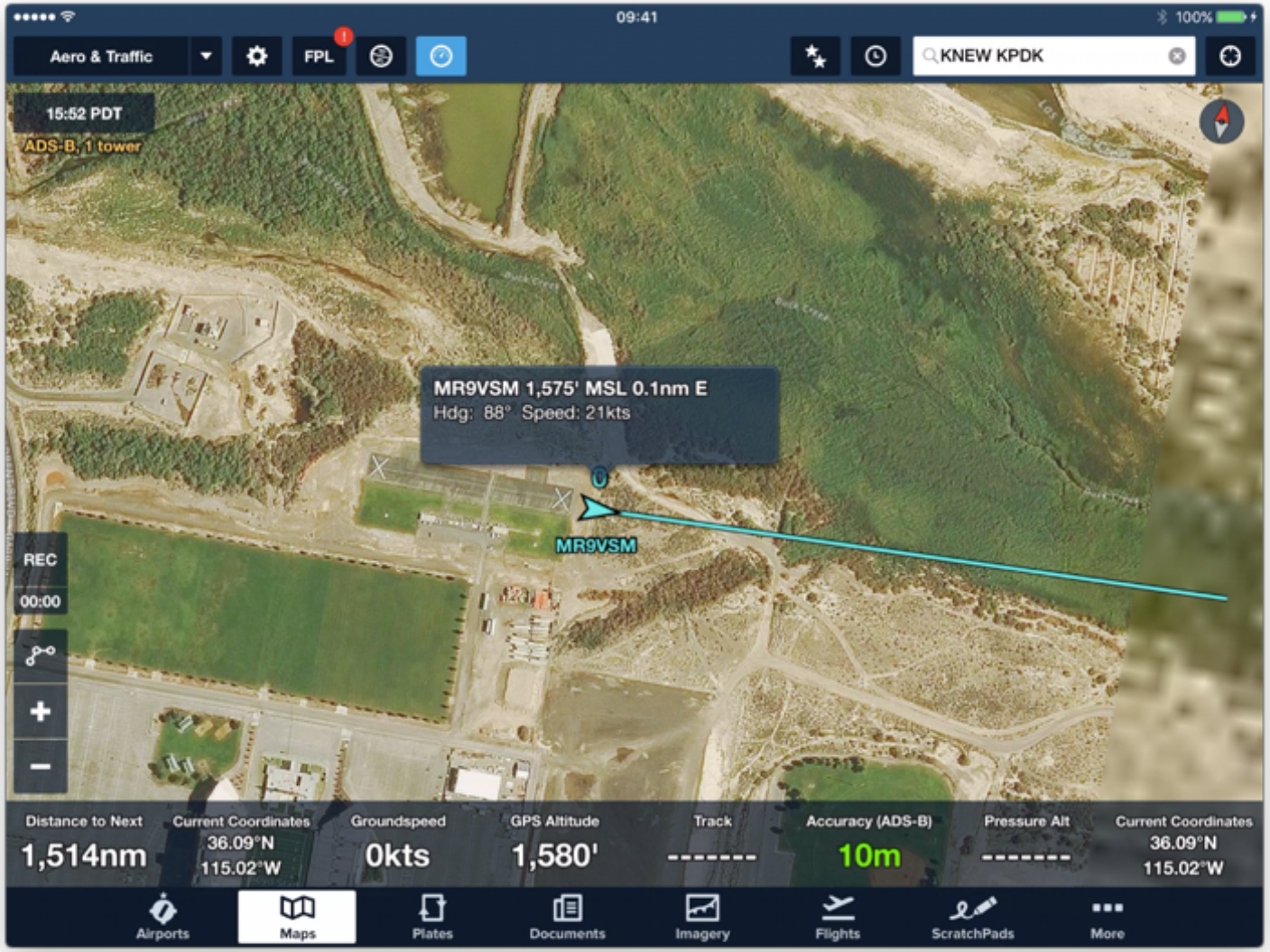
Real Data, Real Environments

Collision Alert

Collision Alert between UAS and airline traffic

GeoNetwork

Complaint Investigation



Local law enforcement
or
citizen

captures UAS ID

GeoNetwork

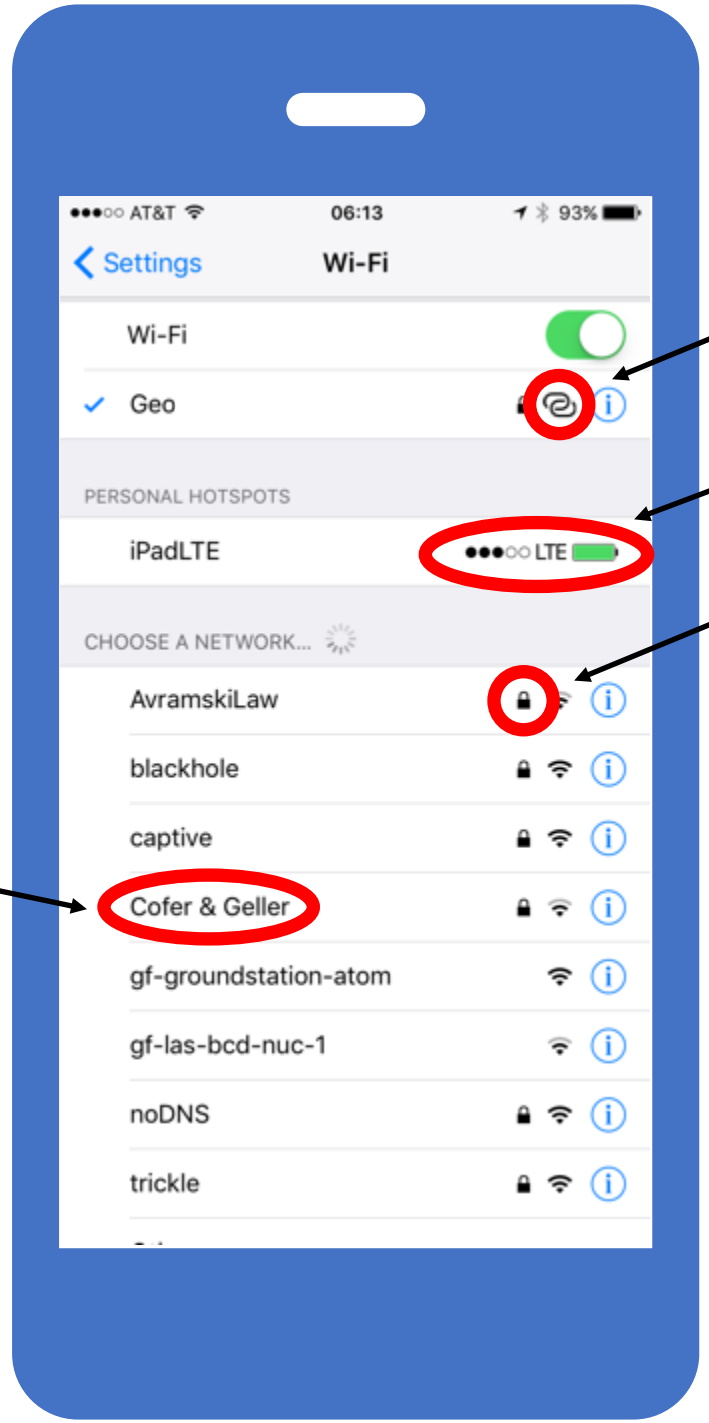
How did we do that?

Each one of you is doing this **right now**.

No additional hardware

No hardware modification

No Internet connection



REMOTE HOTSPOT AVAILABLE

REMOTE DEVICE SIGNAL / BATTERY

ENCRYPTION

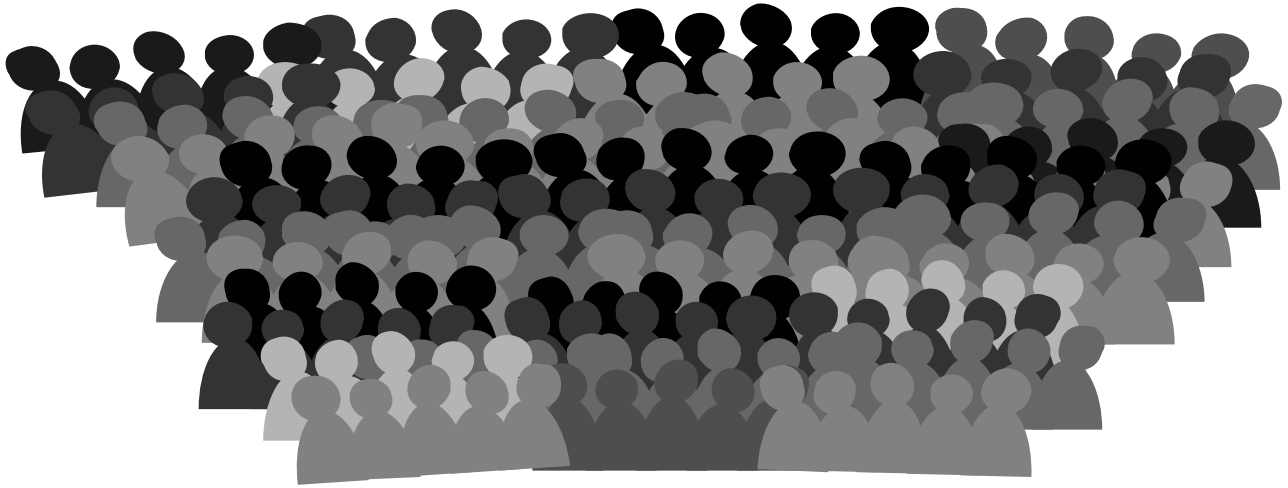
WiFi Access Point Name (SSID)

Beacons,

Not Connections.

WiFi Beacons everywhere

5,000 Beacons
every second just in this room

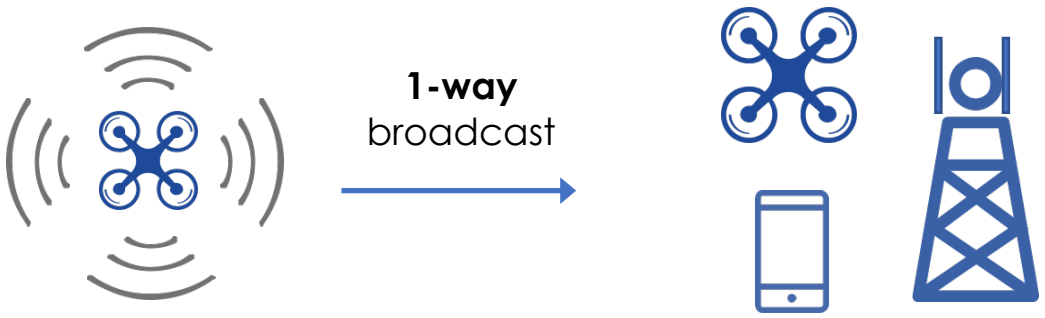


Also every WiFi chip on Earth—

In the billions

A Persistent Beacon on every UAS

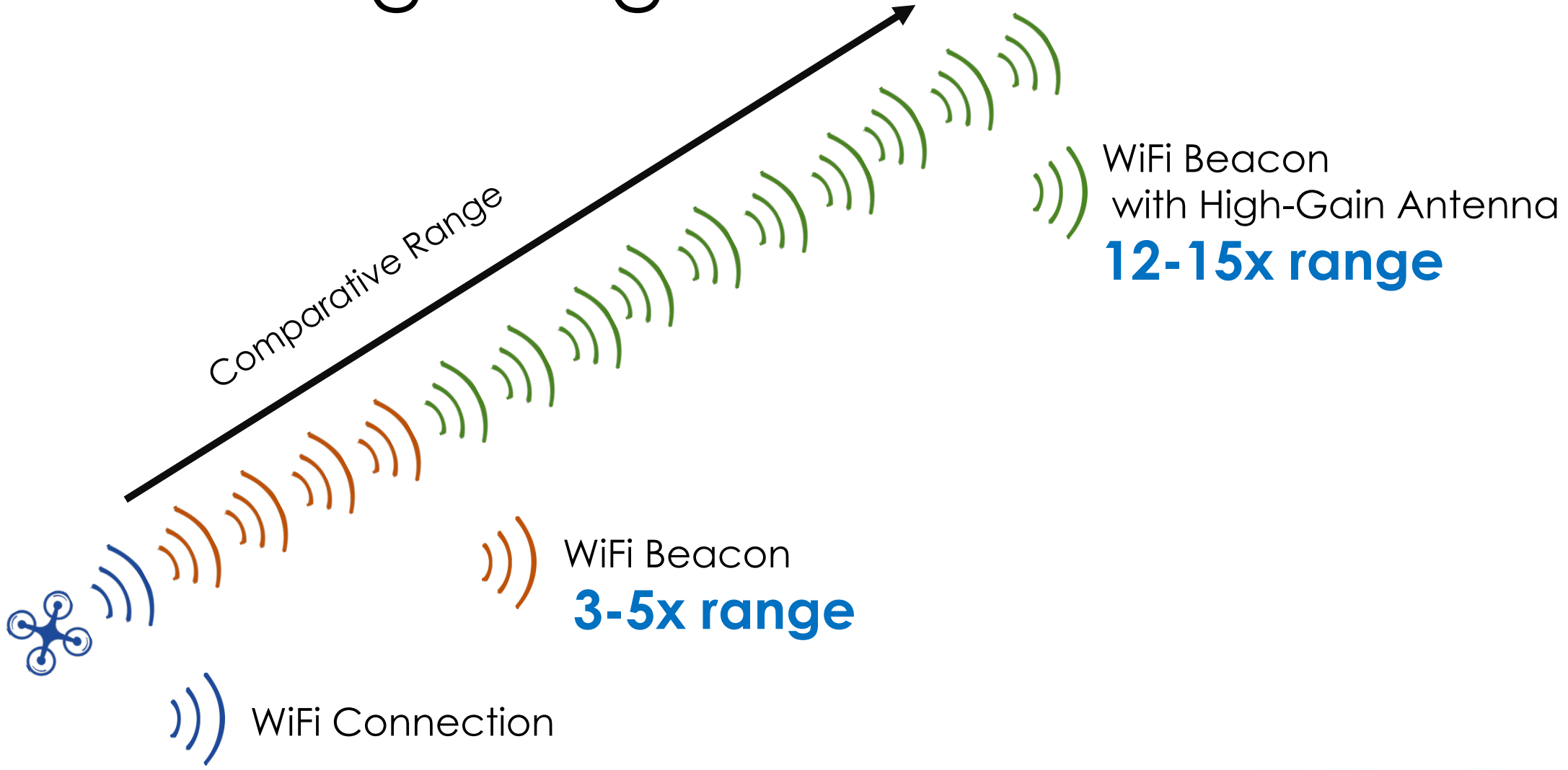
Not a WiFi connection



WiFi chip **always beaconing**

- Download media from UAS
- Stream FPV video
- Connect to a WiFi network
- Connect with Control Unit
- Even disconnected

Beaconing Range



Beacon-Stuffing--a free ride

802.11

Beacon-stuffing inserts a payload to the beacon, such as:

- ID
- Location
- UAS capabilities and state

Protocol

ADS-B

Implemented as beacon

- Using ADS-B protocol

Working solution today

- **But NOT recommended**
- **UAS bring new realities**

Protocol

ADS-B
+
MBSB

Proposed new protocol

- Multi-Band Spatial Broadcast (MBSB)
- Efficiently encoded to communicate UAS capabilities & state

MBSB supports UAS capabilities

Launch Location

Low Battery

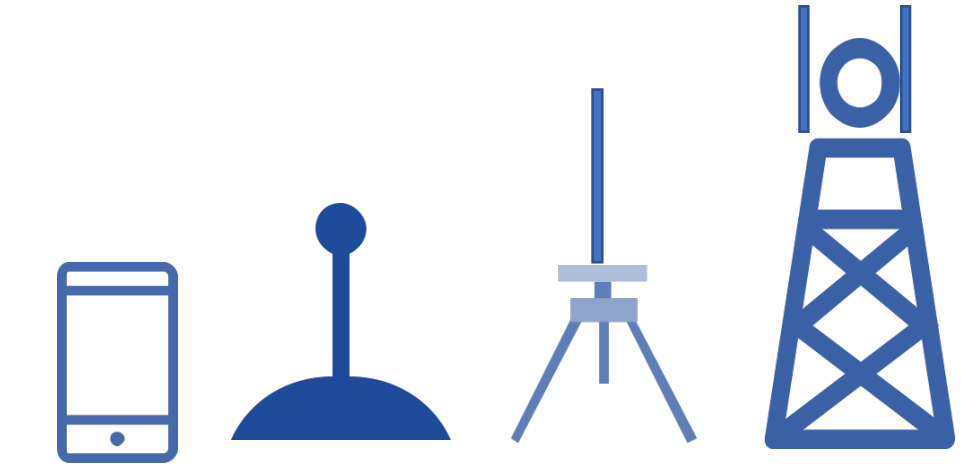
Lost Link

Returning To Home

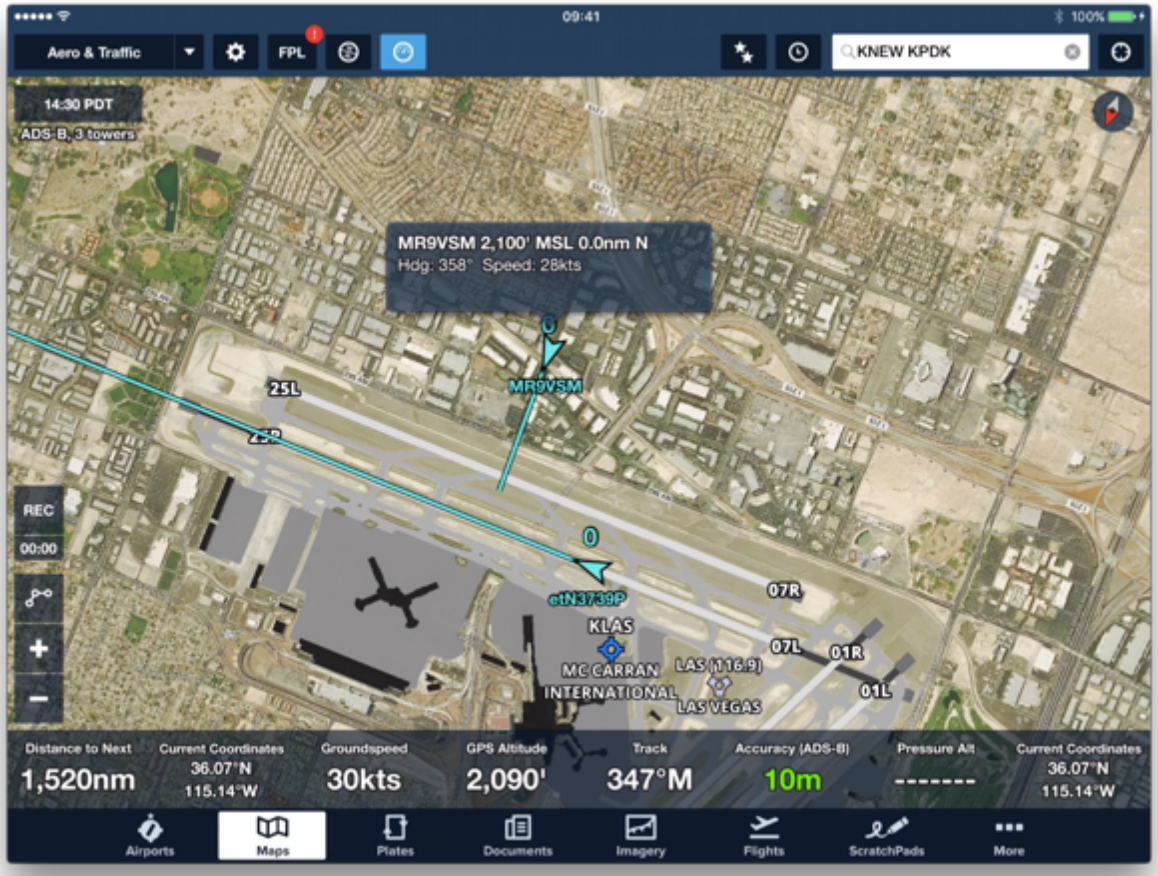
Recording

and more…

Receivers


Mobile phone
Small Omni Antenna
Large Omni Antenna
Tower
Citizens
Law Enforcement & Security
CAAs

Readiness



Working implementations

- ADS-B
- MBSB
- Concurrently beaconing

Adopted solution

- Counter-UAS vendor use for Friendly Force Application

Readiness

Low Friction for OEMs

- No new hardware
- Low Size, Weight and Performance (SWaP)

18 km

Initial Testing

- Range up to 18km
- With high gain receiver

GeoNetwork

ID & Tracking

- ✓ Standards-based
- ✓ Working models ready
- ✓ Extensible

…for a future still forming

Our discussion today

UAS ID & Tracking

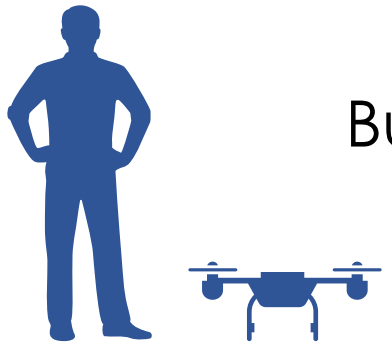
Global UAS Registry

Geofencing

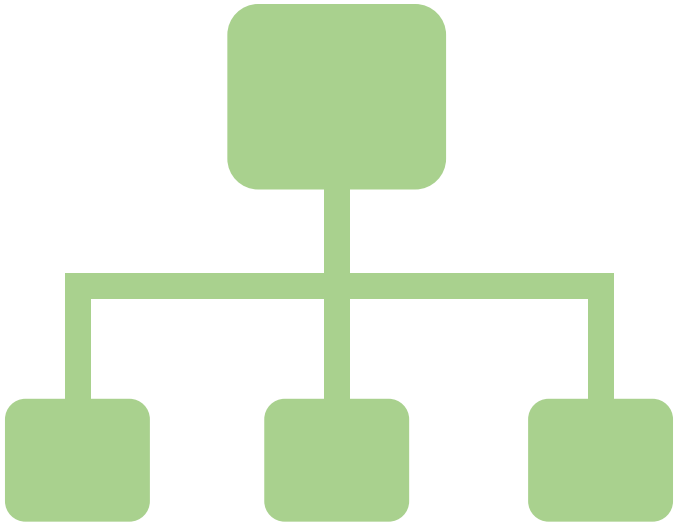
The start of our challenge

Registration Required.

But where?



What is Domain Name Service (DNS)?



The “telephone directory” of the Internet

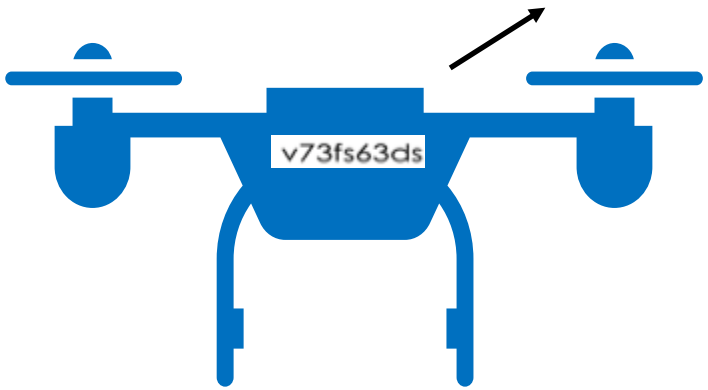
- Binds names, IP addresses and services
- Technology and global processes already in place

The UAS ID and DNS

Proposed ID would look a lot like a web address.

And basic query would be that easy.

v73fs63ds.380.uas.directory



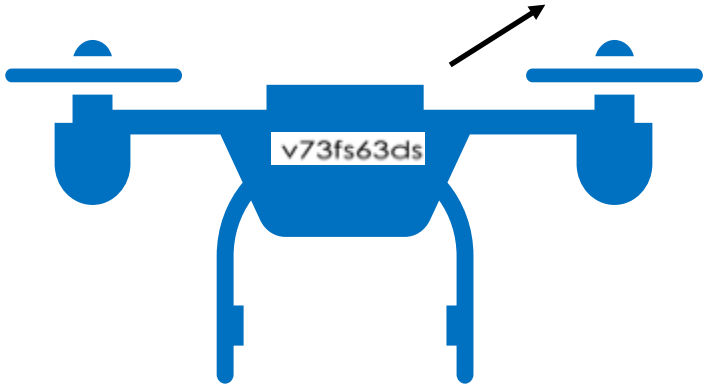
The unique ID number for the UAS (airframe or control unit) provided by manufacturer

The UAS ID and DNS

UAS REGISTRAR

ISO code for State managing registration

v73fs63ds.380.uas.directory



The UAS ID and DNS

UAS REGISTRAR

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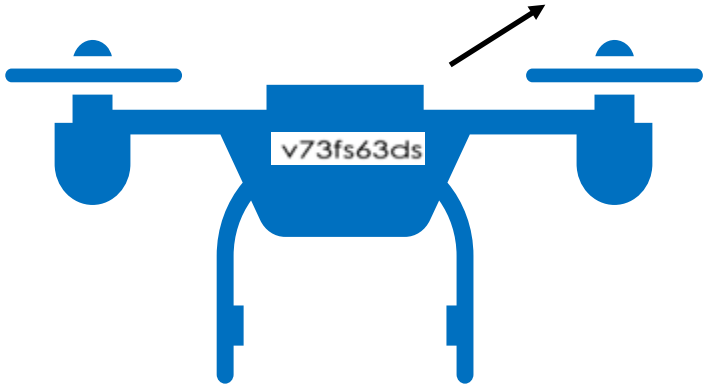
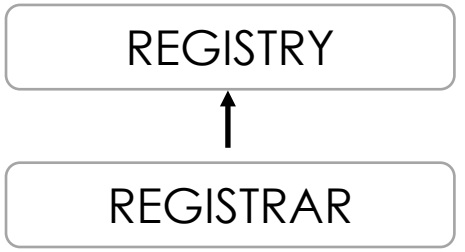


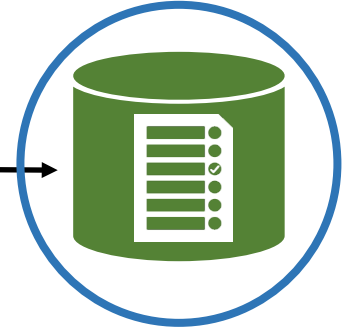
The domain name for the new Global UAS Registry

UAS Registration

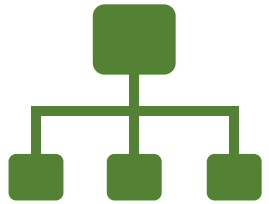
CAA

UAS
REGISTRAR

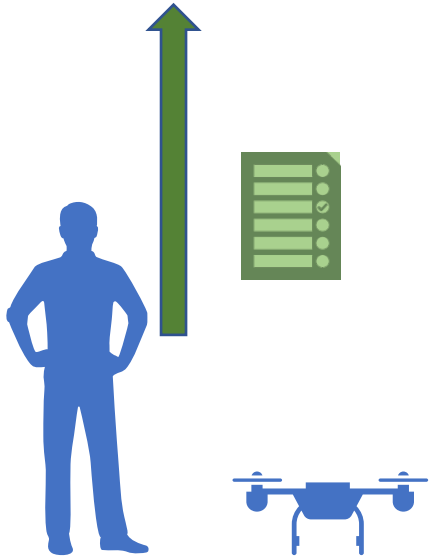




DNS

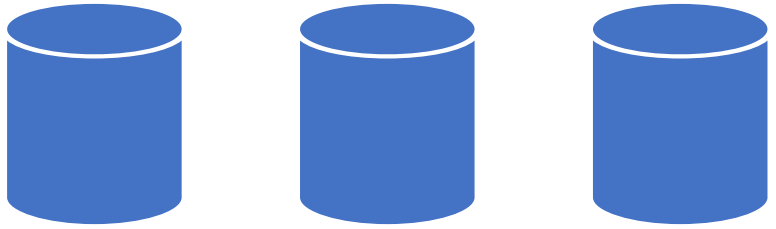


Sovereignty of
Personal Information



Register
- State defined process

ANSPs



UAS Registration

CAA

UAS
REGISTRAR

Sovereignty of
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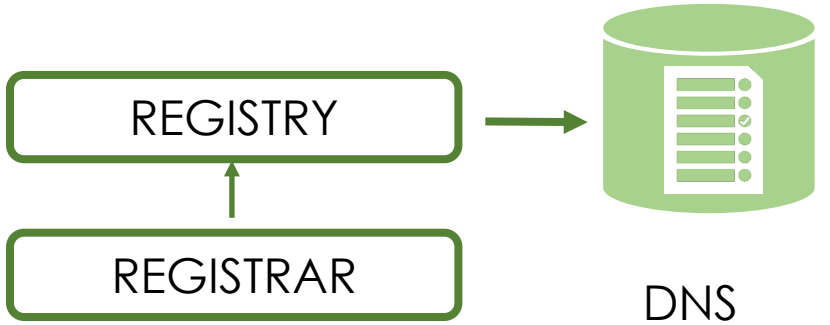
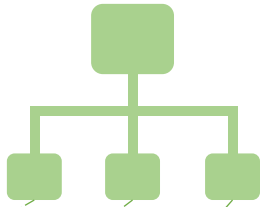
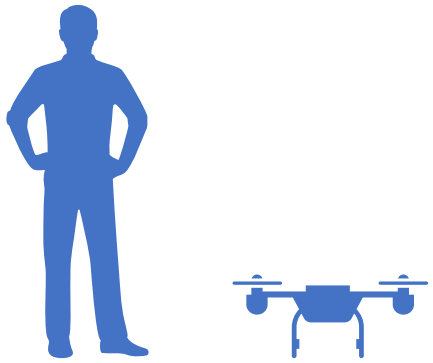
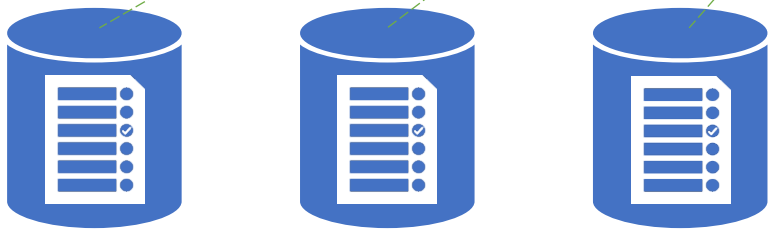


DNS





ANSPs



Global UAS Registry

- ✓ Standards-based
- ✓ Working model ready
  - Scalable infrastructure
  - Existing global processes
- ✓ Extensible

…for a future still forming

Our discussion today

ID & Tracking

Global UAS Registry

Geofencing

Smarter Geofences

“No Fly” zones are not enough

We need smarter geofences.

Smarter Geofences

Smart Geofences both enable *and* restrict

Altitude restrictions

Recording restrictions

Maximum Weight

Minimum Battery Endurance

Time or Day Restrictions

LTE

LTE Connection Required

And all other UAS capabilities

Smarter Geofences: Authorizations

UAS 1

- Geofence rules onboard
- Has **no authorization**
- **Avoids** restricted airspace

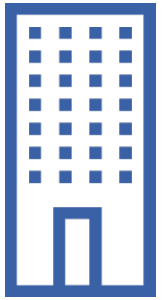
UAS 2

- Geofence rules onboard
- **Authorization onboard**
- **Enters** restricted airspace

- Continuously **beacons authorization**

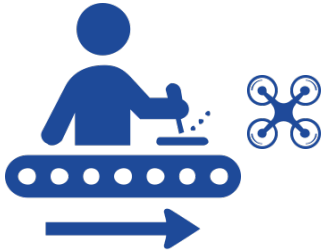
A simple look the ecosystem today

I define airspace & rules



CAA

I create UAS capabilities



UAS Manufacturer

I follow the rules

UAS Pilot

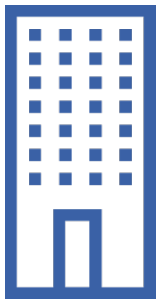
I trust UTM is under control

Civil Society

GeoNetwork

Pressures are emerging

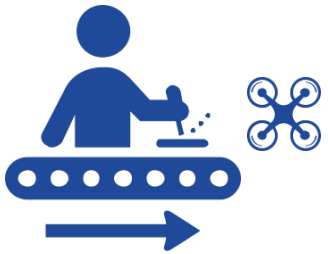
I define airspace & rules



CAA

Managing this new complexity takes time.

I create UAS capabilities



UAS Manufacturer

So many conflicts. This is getting complex.

I follow the rules

UAS Pilot

I can only follow the rules I understand.

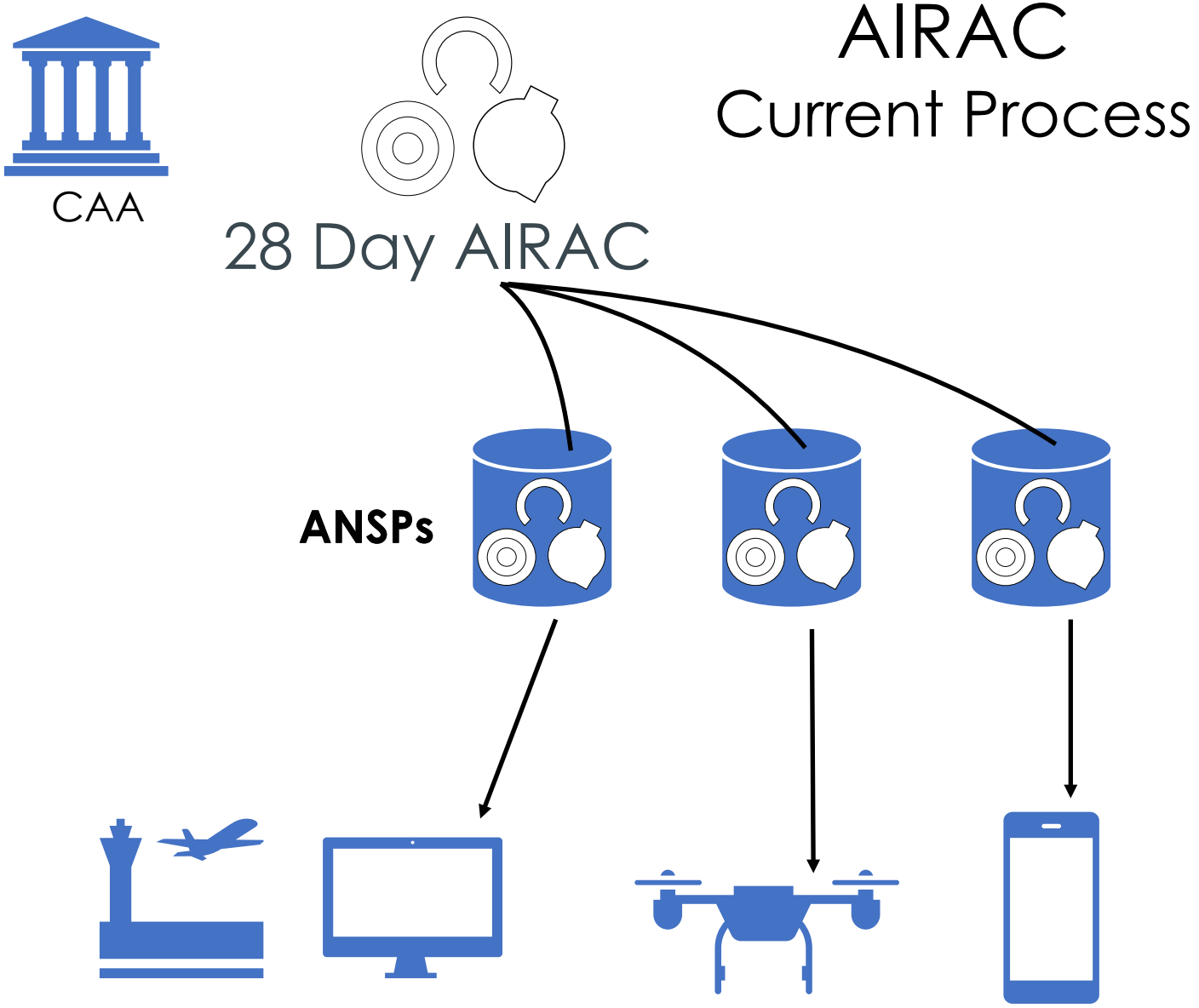
I trust UTM is under control

Civil Society

What about the rights of my community? We need more rules!

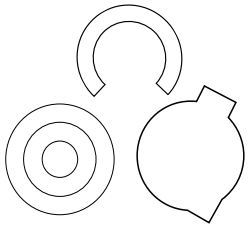
GeoNetwork

AIRAC
Current Process

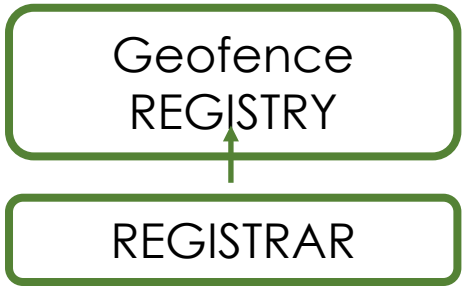


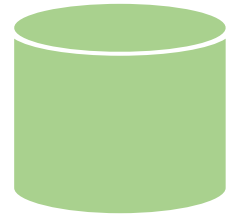
AIRAC
Proposed Process

CAA

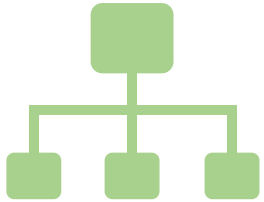


28 Day AIRAC



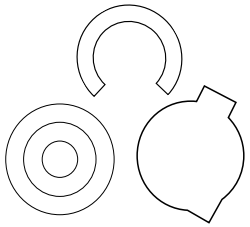


DNS



ANSPs

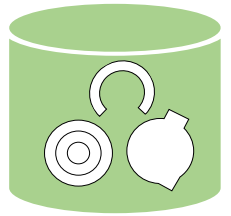
CAA



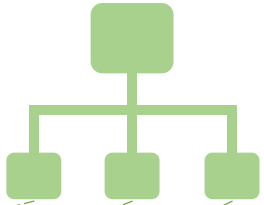
28 Day AIRAC

Geofence REGISTRY

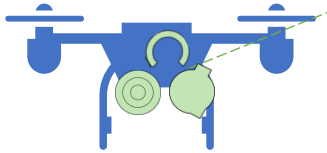
REGISTRAR

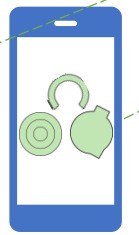


DNS



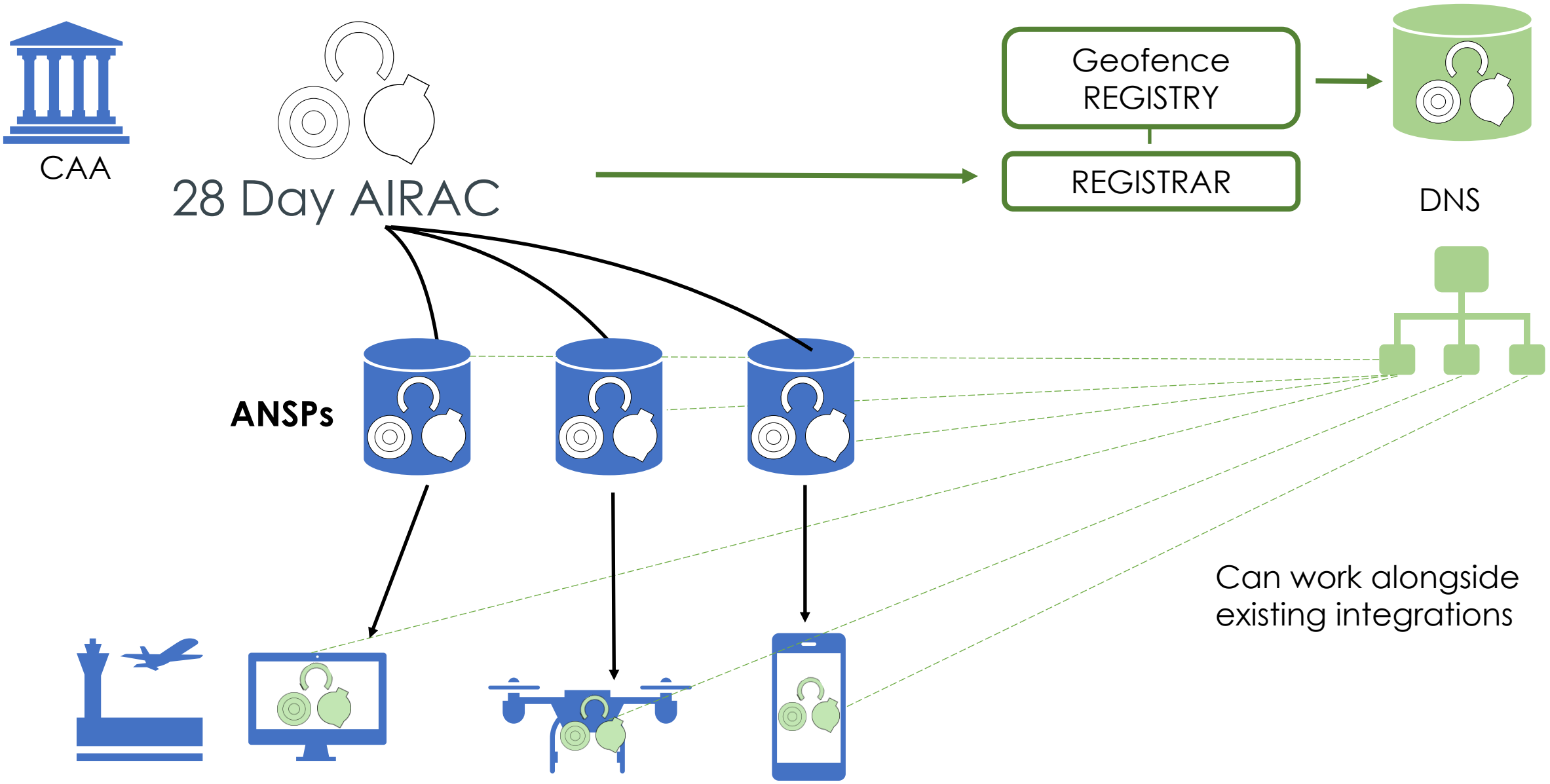
ANSPs





Communication **directly** to UAS

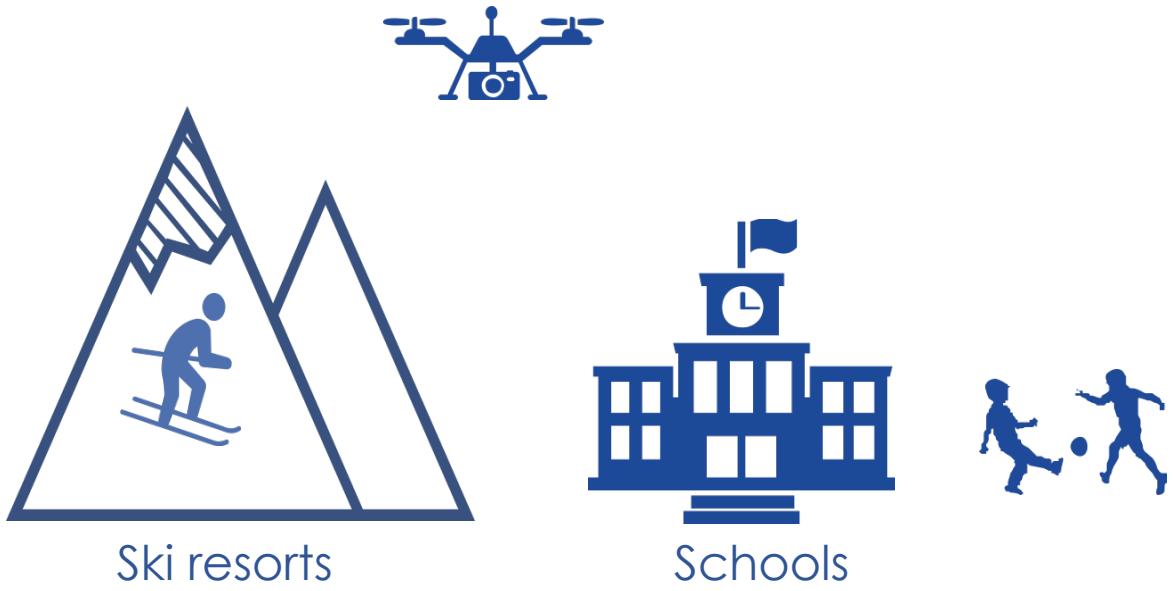
And supporting devices


CAA
28 Day AIRAC
Geofence
REGISTRY
REGISTRAR
DNS
ANSPs
Can work alongside
existing integrations

Thinking smaller

UAS change the dynamics
of rules-making

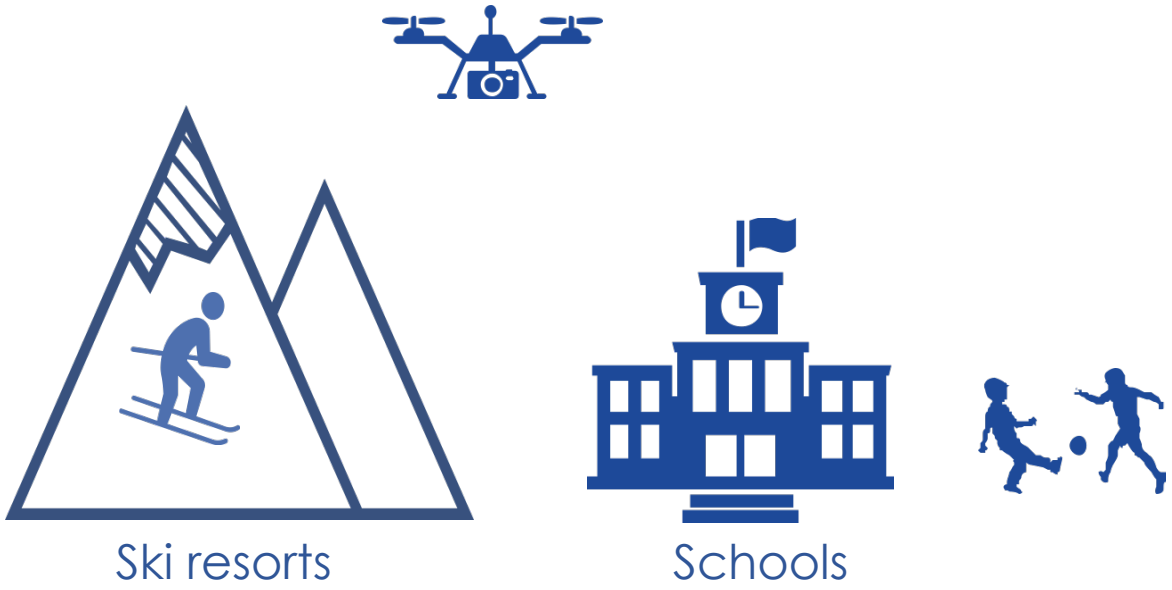
Why micro-airspace?



Local knowledge and accountability

…many decisions over **safety** and **security** will need to be made **at the local level**.

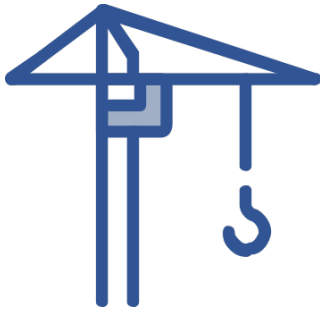
Why micro-airspace?



As allowed by State regulations, local authorities can manage and publish geofences to implement community-specific interests.

Why micro-airspace?

Temporary Festivals



Temporary Hazards

Temporary Events

Why micro-airspace?

Marathons

Parades

Even just hours

Why micro-airspace?

Individual property owners

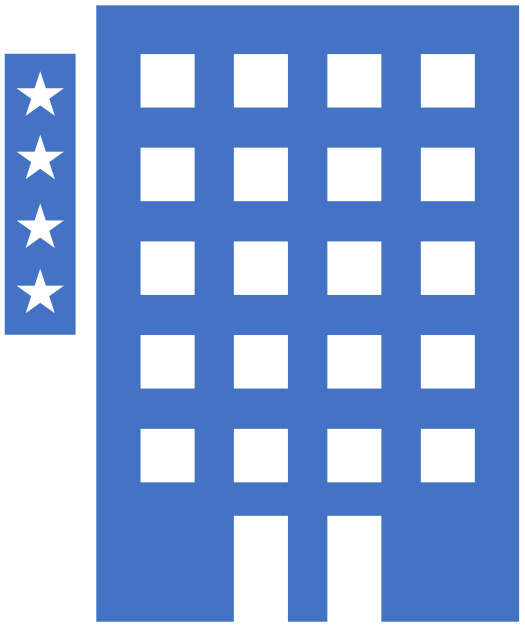
Making rules for micro-airspace

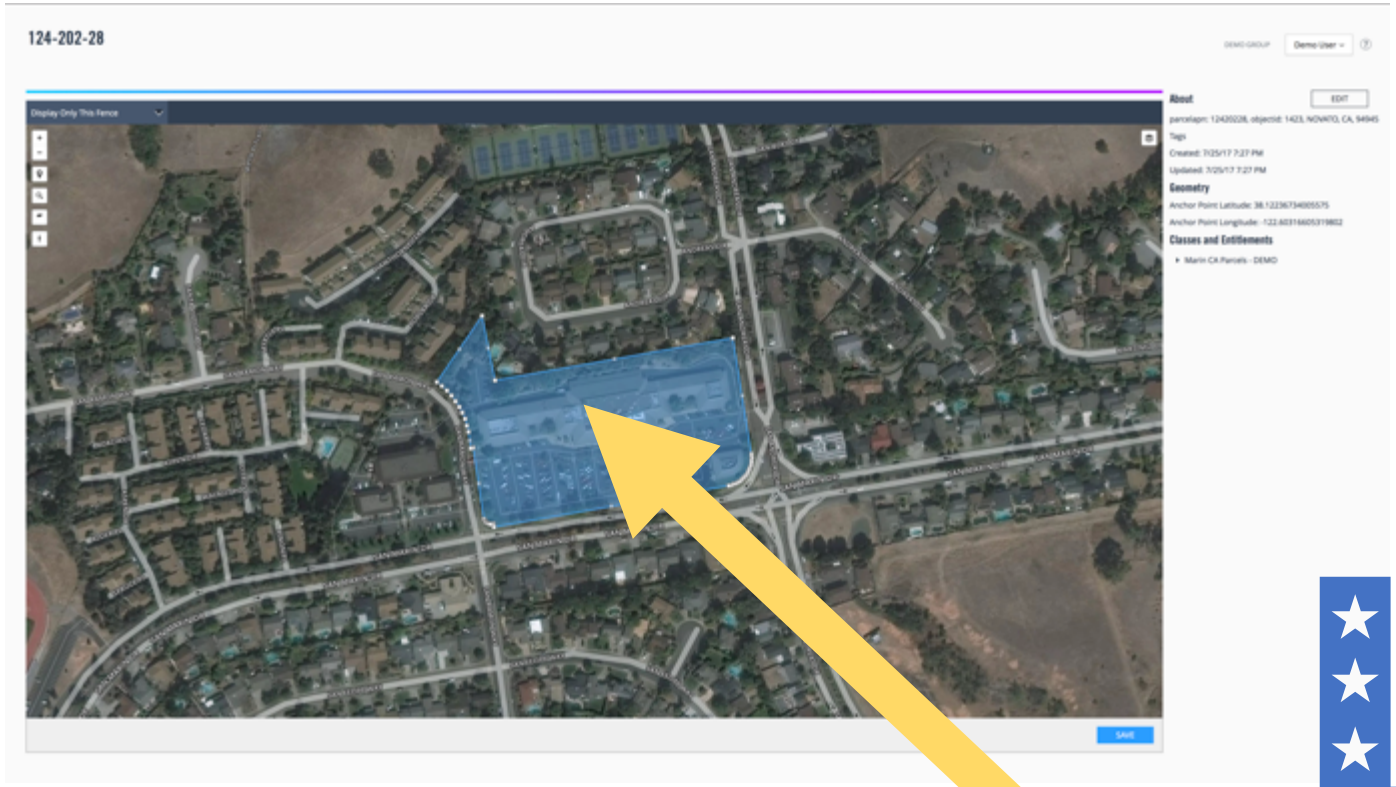
How do local authorities make their rules effective?

…for all stakeholders?

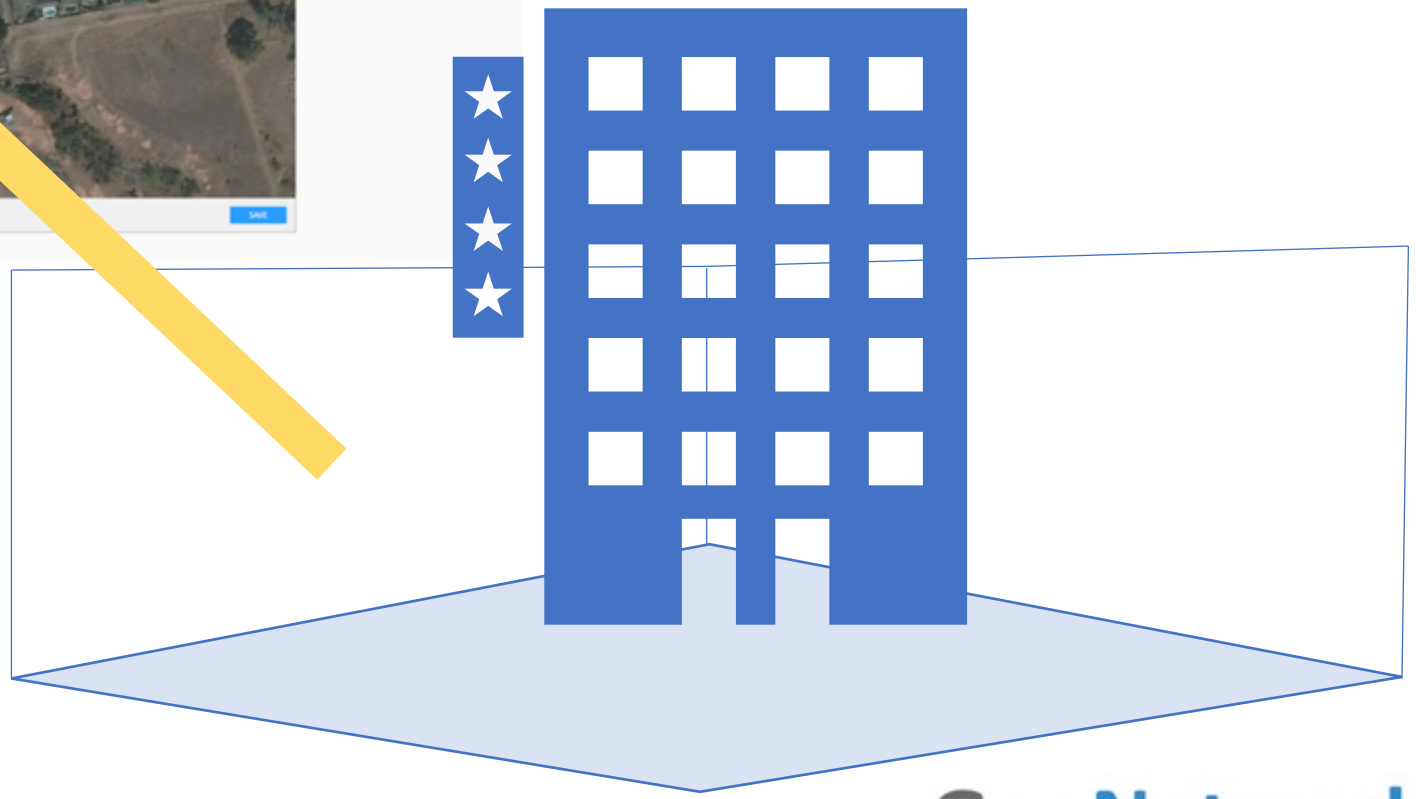
Creating the Geofence

The Town Mayor





Geofence created around the town square by using the Geofence Portal.



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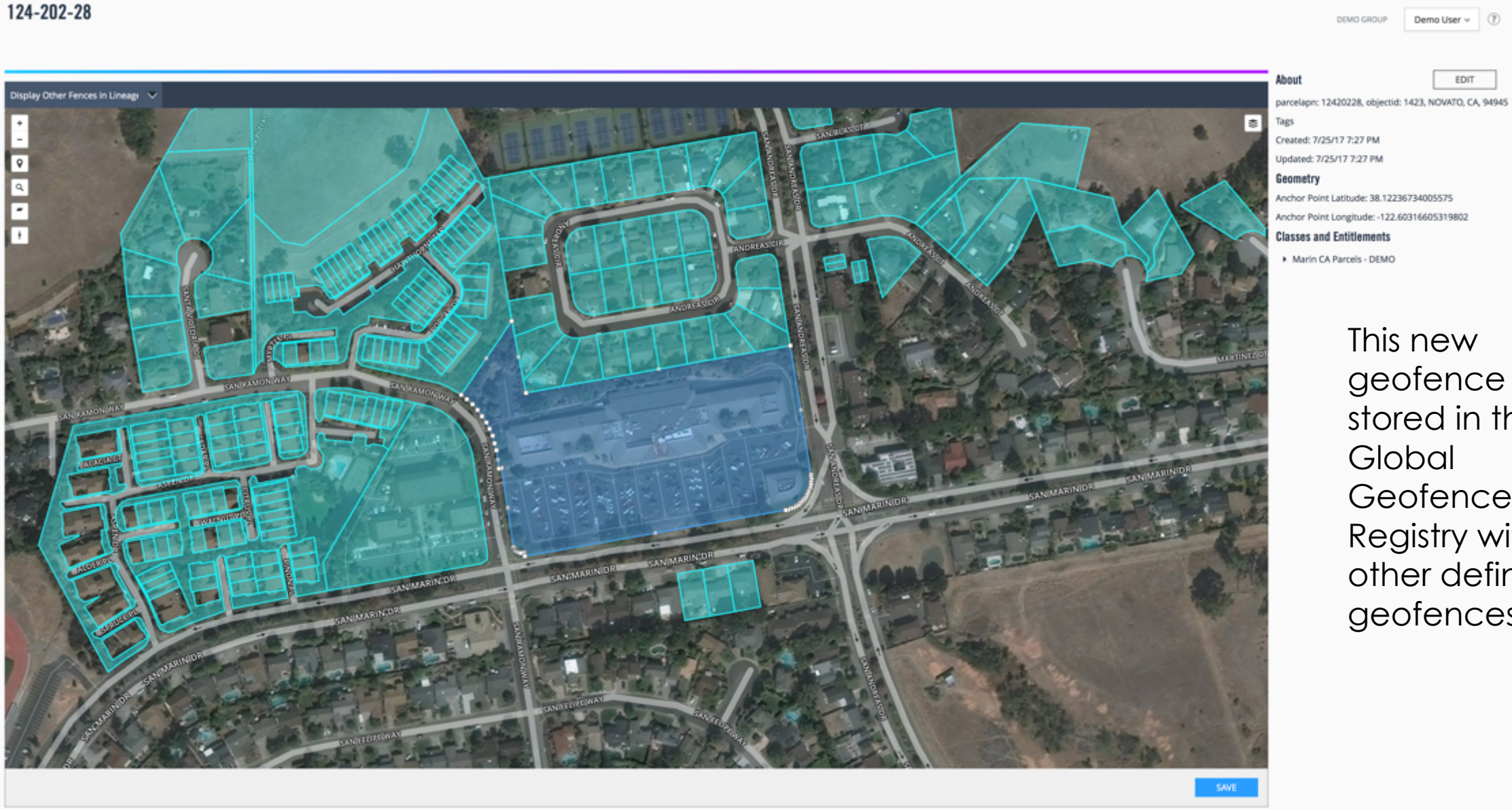
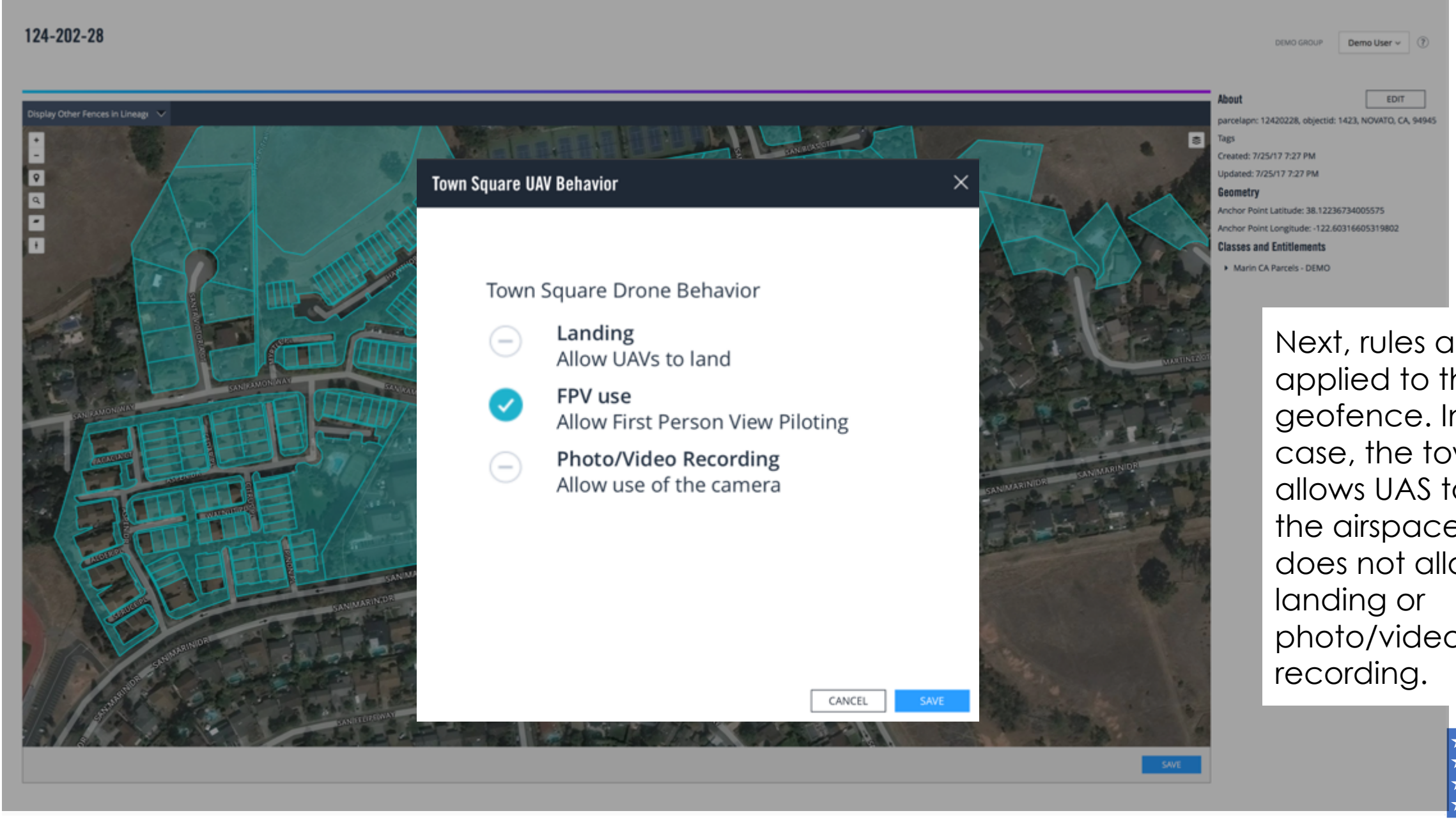
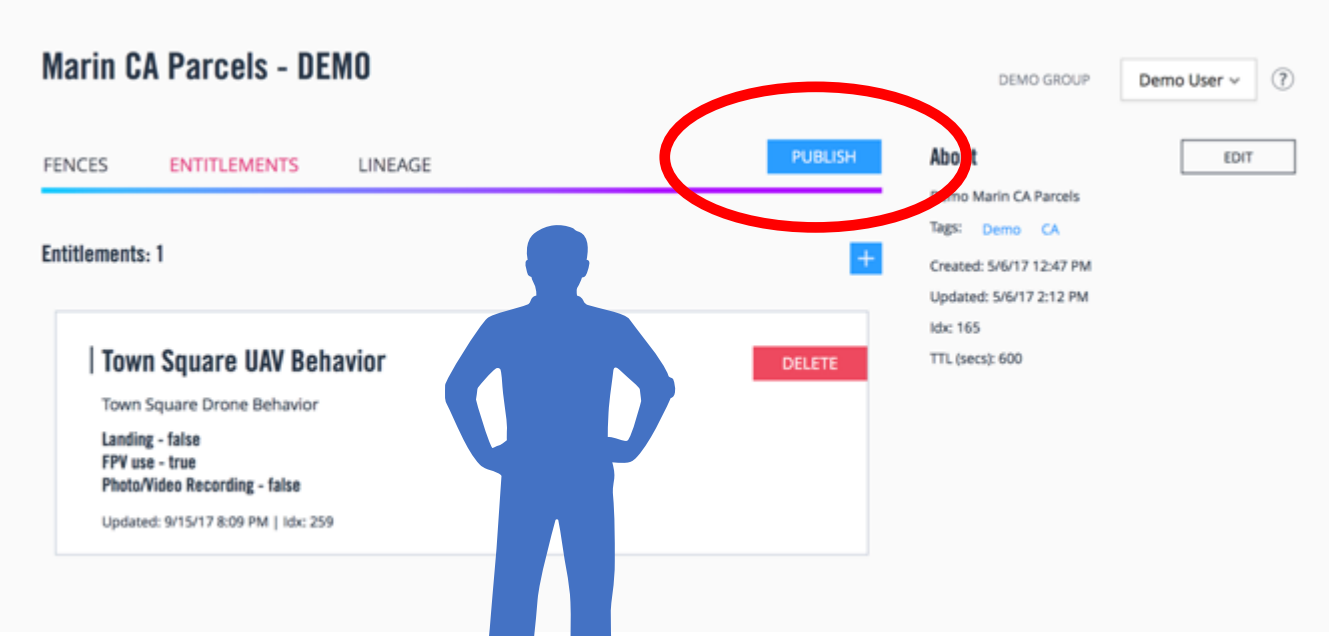
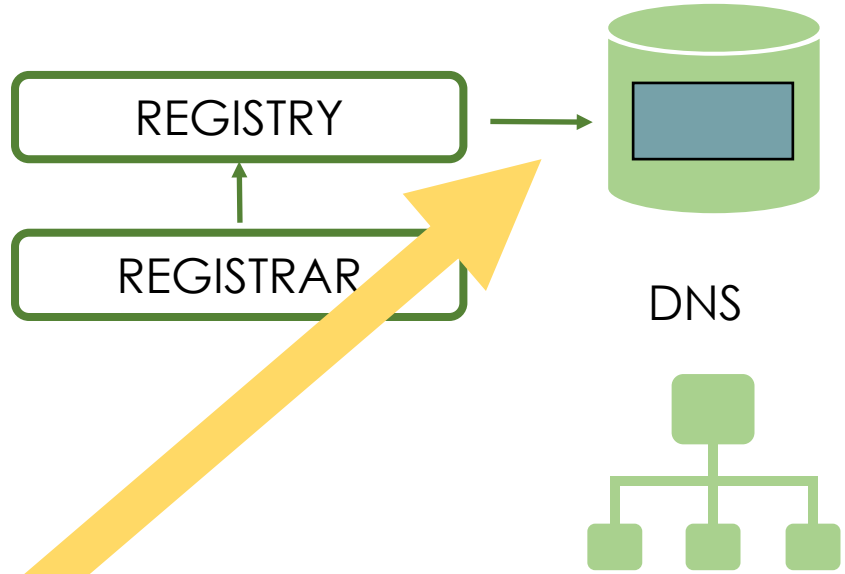


This new geofence is stored in the Global Geofence Registry with other defined geofences.

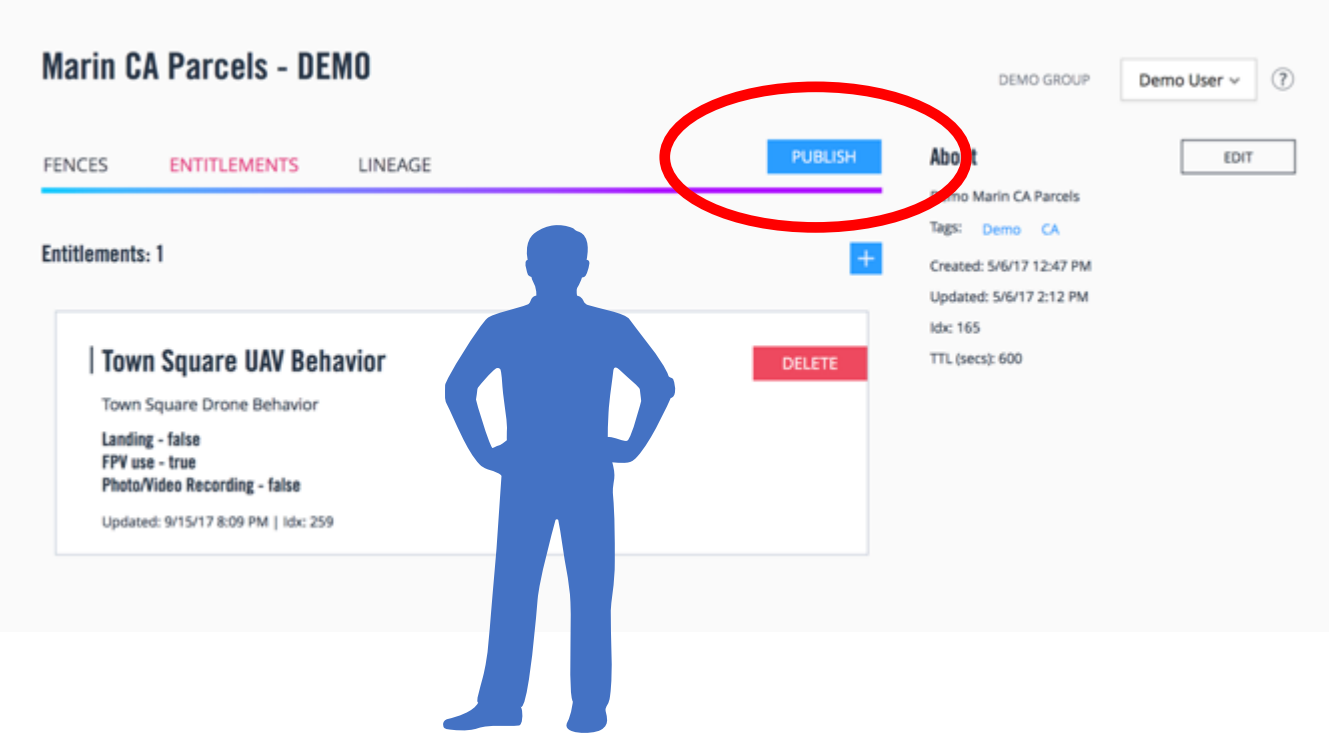


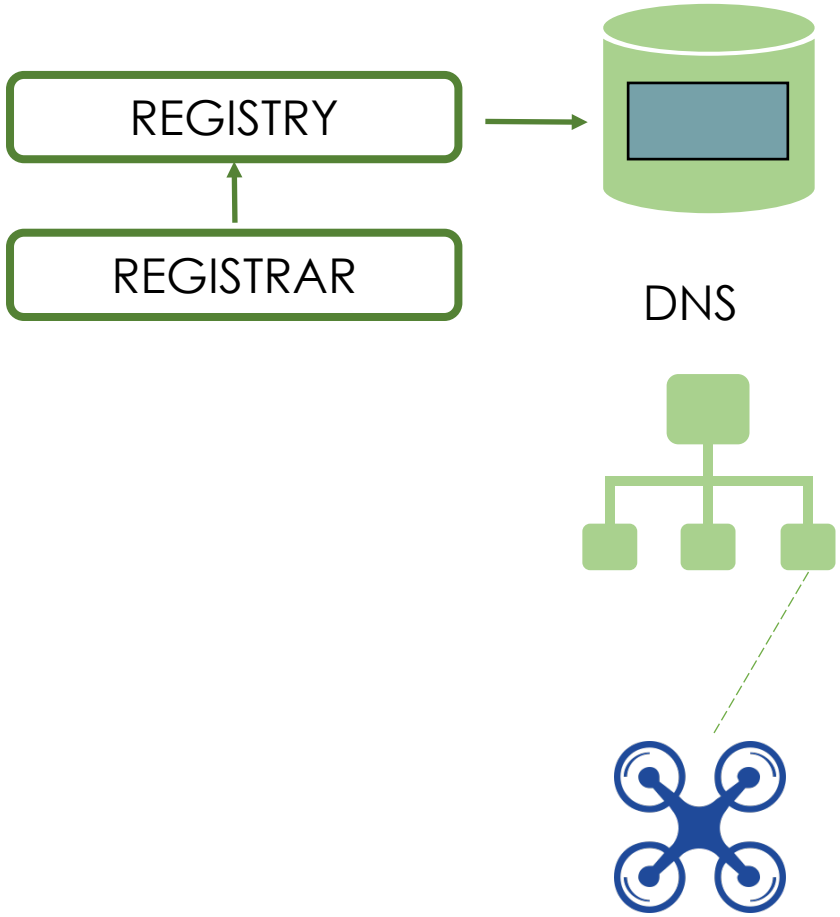
Next, rules are applied to the geofence. In this case, the town allows UAS to fly in the airspace, but does not allow landing or photo/video recording.


Marin CA Parcels - DEMO
DEMO GROUP
Demo User
FENCES
ENTITLEMENTS
LINEAGE
PUBLISH
EDIT
Tags: Demo CA
Created: 5/6/17 12:47 PM
Updated: 5/6/17 2:12 PM
Idx: 165
TTL (secs): 600
Entitlements: 1
Town Square UAV Behavior
DELETE
Town Square Drone Behavior
Landing - false
FPV use - true
Photo/Video Recording - false
Updated: 9/15/17 8:09 PM | Idx: 259


REGISTRY
REGISTRAR
DNS


124-202-28





1. **Published via DNS.**
2. **DNS delivers to appropriate region.**
3. **UAS cache geofences onboard and comply with their rules.**

Readiness

Technology

- Deployed since summer 2016

OEMs

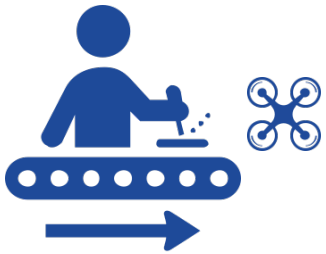
- Software agent integration
- Demonstrations on 3 leading consumer UAVs

A practical future

I follow the rules.

CAA

I still define airspace and rules, and provide the tools for others to do so locally.



UAS Manufacturer

I create dynamic capabilities and the software agent enables compliance with evolving rules.

UAS Pilot

I follow the rules because I understand them.

Civil Society

I trust UTM is under control because we can set local rules.

GeoNetwork

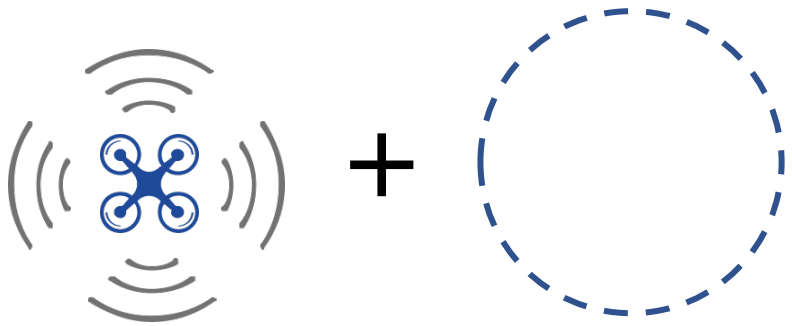
Geofencing

- ✓ Standards-based
- ✓ Functional solution
  - Scalable infrastructure
- ✓ Extensible

…for a future still forming

One last thought

What about collision avoidance?



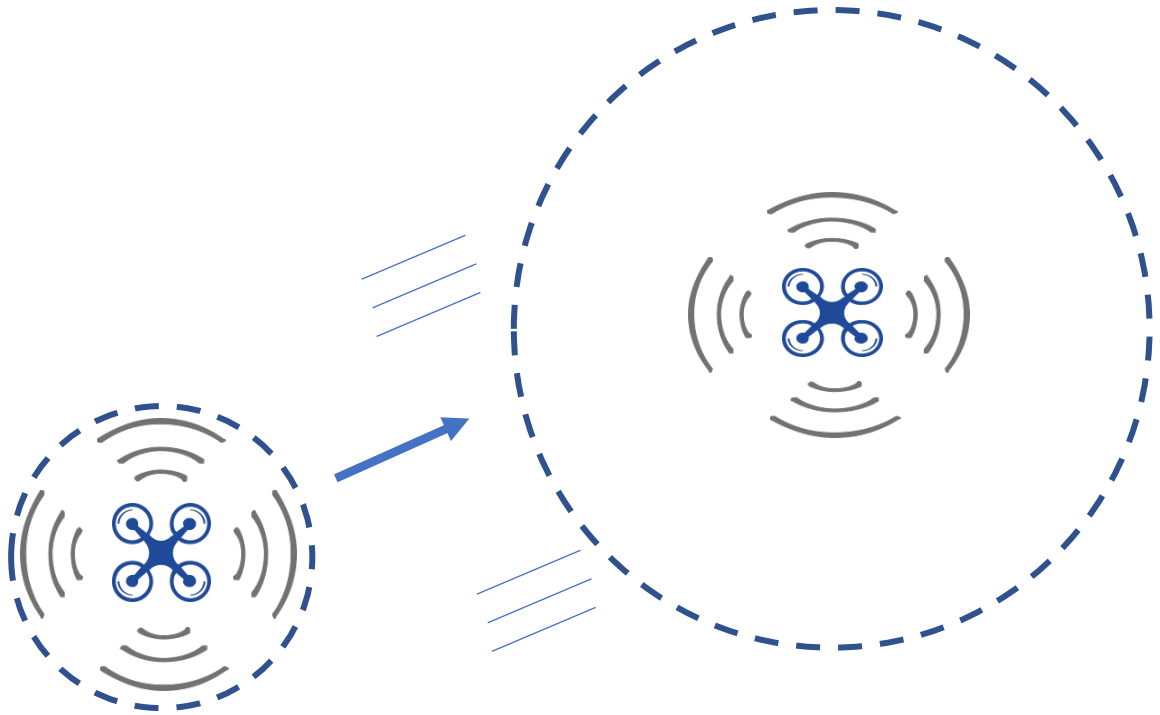
Beacon

Geofence

One last thought

Combining the functionality
of MBSB Beacons
and Geofences

One last thought



Collision Avoidance

UAS beacons out its ID and location infoormation, plus a geofence "bumper".

This geofence expands at higher speeds or position uncertainty.

Other UAS treat this as a "No Fly" zone.

Thank you

Request white paper or additional info:

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GeoNetwork
The Geofence Company