department 13

MESMER® Counter Drone Solution

May 2017

Phoenix Group ®

Exclusive Distributor for Latin America

Introduction

Department 13 is rapidly growing technology company focused on transformative communications and networking technology.

- Low Probability of Detect/Low Probability of Intercept (LPI/LPD)
- Cooperative Subspace Coding
- C-MIMO

Since its inception, Department 13 has been engaged with various US Government entities providing highly innovative solutions.

Department 13's flagship product, MESMER®, can detect, identify and mitigate either hostile or nuisance drones across a range of national security, defense, or commercial applications.

Highlights:

Headquarters: Columbia, MD

Employees: 22 full time

Contracts: $2.6 million since inception

- Rapid Response Technology Office (RRTO)
- Army GAPO (SOCOM)
- Johns Hopkins APL (US NAVAIR)
- Parsons (US Navy Research Lab)
- US Defense Advanced Research Projects Agency (DARPA)

CUAS Government Run Exercises

- Black Dart, September 2016
- MITRE CUAS Challenge, August 2016

13 Issued Patents, 22 Pending

Drone Economy

Drones are doing productive work in society.
The use of drones as part of the global economy will grow.

Drones – A Rapidly Growing Threat

Criminal Organizations are using and benefiting from this technology

Smugglers use drones to transport drugs across borders

Drones transport SIM cards, cell phones, pistols, drugs, and porn into prisons

Criminal groups use drones to collect information on targets for kidnaping, as well monitor Police and security operations

Drones – A Rapidly Growing Threat

Terrorist Groups are using and benefiting from this technology

ISIS, al Qaeda, Hizbollah, and other terror groups use drones to drop bombs (up to 100 kilos), collect intelligence, and conduct reconnaissance operations.

Japan's Prime Minister's residence – a drone with radioactive material landed on the roof terrace

Drones – una Amenaza Creciente

Paparazzi and Amateurs are using and benefiting from this technology

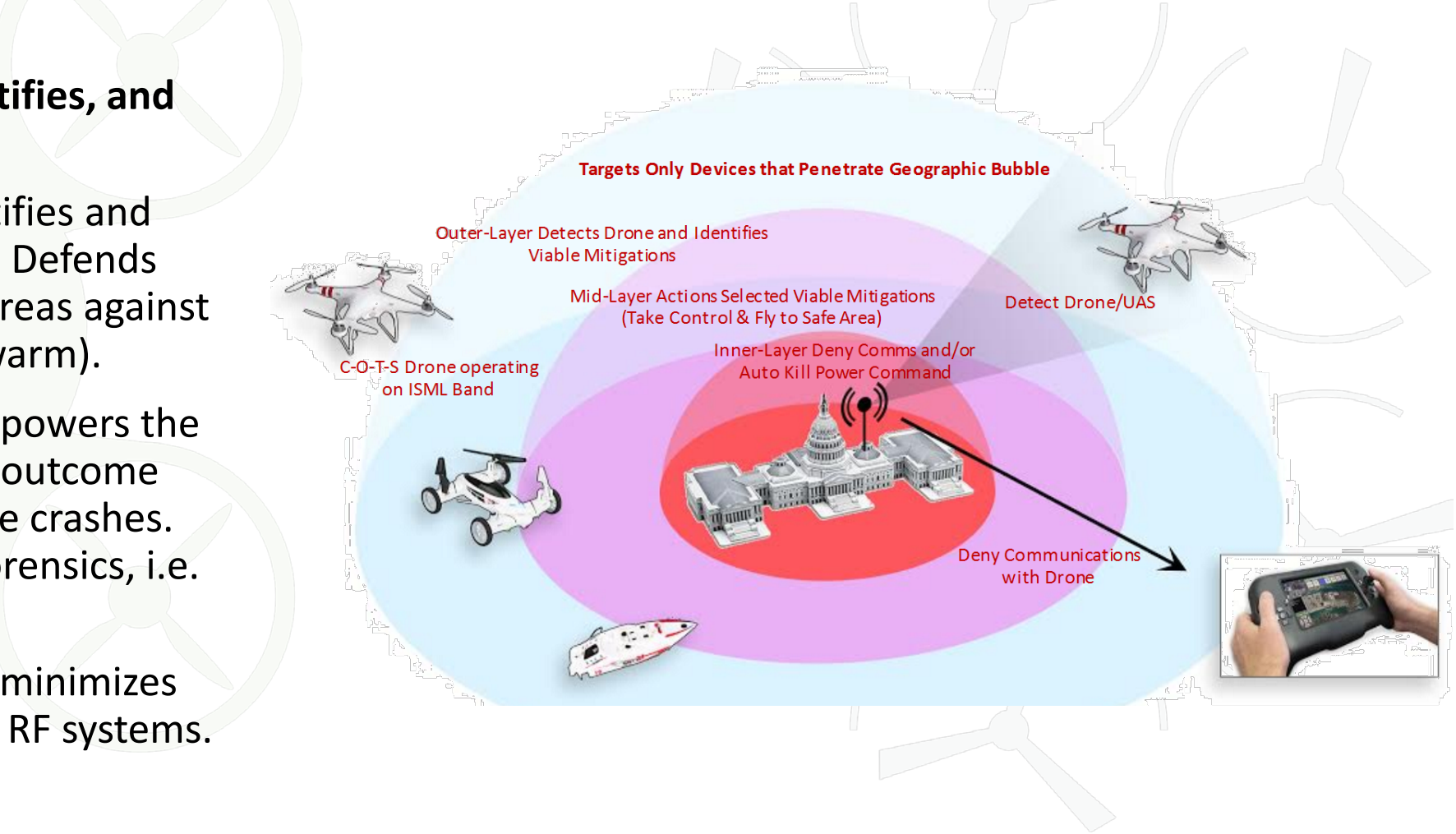
The *paparazzi* are using drones to spy on and take pictures/video of celebrities, government officials, and corporate leaders.

Amateurs (and thieves) use drones to video record sports events.

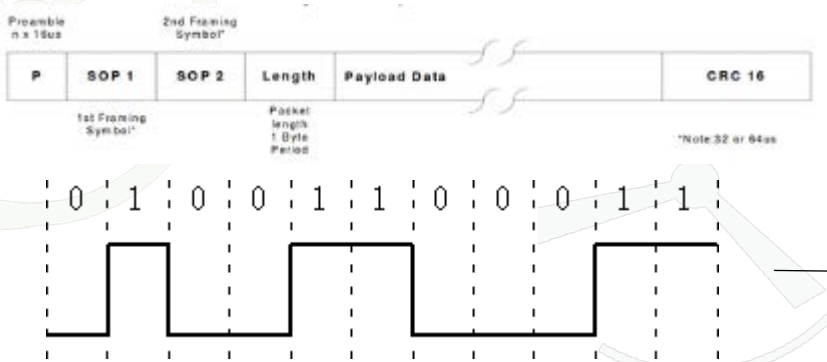
Airports worldwide have experienced dangerous situations due to drones crossing into aircraft flight paths.

MESMER® Counter Drone Solution

- **MESMER Detects, Identifies, and Mitigates Drones**
- **Control:** MESMER identifies and takes control of drones. Defends points, perimeters, or areas against one or more drones (swarm).
- **Forensics:** MESMER empowers the operator to control the outcome foregoing uncontrollable crashes. Allows for post event forensics, i.e. CEXC for CUAS.
- **Interference:** MESMER minimizes interference with other RF systems.



Protocol Manipulation



DETECT

MESMER passively listens to unlicensed frequency space searching for drone RF signals

IDENTIFY

MESMER uses signals analysis and information inspection to provide high-confidence identification

MITIGATE

MESMER takes advantage of protocol weaknesses to take control of the drone and send valid commands to the drone

MESMER System Description

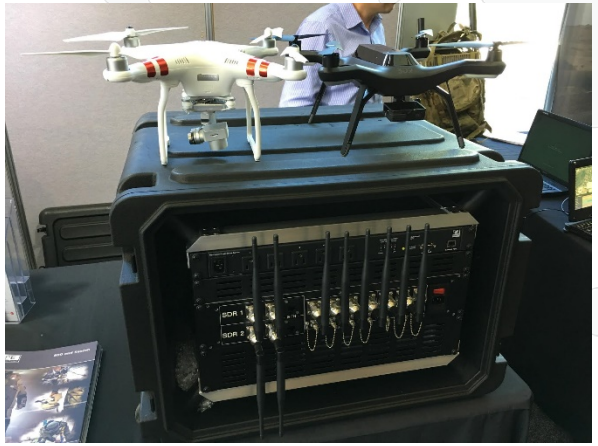
MESMER was specifically designed to maximize flexibility and portability to allow users to adopt or integrate into multiple situations including existing perimeter defense systems, airborne platforms, sea borne platforms, or even mobile VIP protection.

- MESMER hardware includes:
  - High performance general purpose computer with all necessary networking interfaces running MESMER software
  - Rackmount packaged, commercially available software defined radios and RF front end
  - Android device running ATAK-based operator console
  - Omnidirectional antennas and RF cabling
  - Ruggedized: within environmental closure
- Security: designed with security in mind, mitigates, and isolates drones into secure enclaves, and uses TLS to secure communications between the user interface and server.
- Drone updates: delivery of software upgrades for additional drone mitigations

Current Configurations

Fixed installation (on a rooftop)

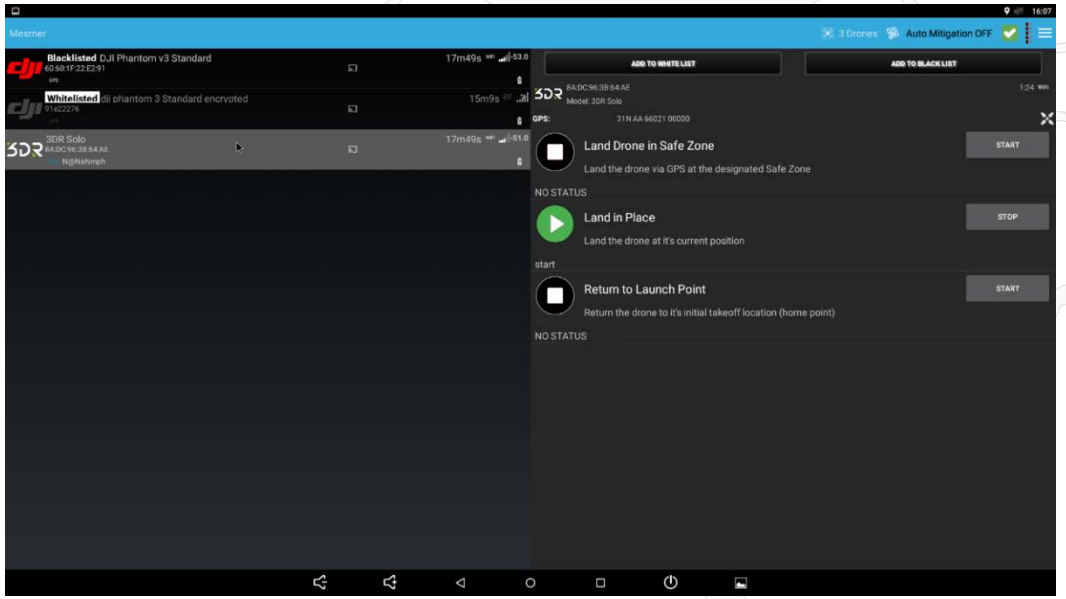
Mobile Platform



MESMER User Interface

User interface utilizes the ATAK application for integration flexibility

- Displays drones detected within the protected area by model
- Displays drones that are “blacklisted” (known enemy drones) and “whitelisted” (known friendly drones)
- Mitigation options (dependent on drone type) and execution status, i.e.
  - Land in safe zone
  - Land in place
  - Return to Launch Point
- Auto-mitigation mode: automatically mitigates to a predetermined default mitigation reducing drone mitigation time
- Mapping (drone dependent)
- Telemetry data (drone dependent)
- Detection history: log of drone type and when the drone was detected for intel analysis



MESMER v1 Specifications

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GENERAL	
Frequency	2.4 – 2.5 GHz, 5.18 – 5.825 GHz
Transmit Power*	< 1W. Configurable upon request.
Antenna	An array of 9 antennae
EFFECTIVE RANGE	
	1 km nominal at < 1W transmit power using omnidirectional antenna. Range may vary depending on antenna type, transmit power, and terrain.
OPERATION MODES	
	Detection Only Mode
	Auto-Mitigation Mode
	Manual Mitigation Mode
SUPPORTED DRONE MODELS	
	Multiple models and manufacturers of commercial drones.
EXTERNAL SENSORS	
	Open architecture and standardized interface for ease of integration with external sensors; e.g. acoustic, radar, electro-optical sensors.

PHYSICAL (STAND-ALONE SYSTEM)	
Dimensions (Rack)	19 W x 10.5 H x 20 D in (48.3 W x 26.7 H x 50.8 D cm)
Volume (Rack)	2.3 ft^3 (0.07 m^3)
Dimensions (External)	28 W x 19.5 H x 28.5 D in (71.1 W x 49.5 H x 72.4 D cm)
Volume (External)	9 ft^3 (0.25 m^3)
Weight	100 lbs.(45 kg) in transit case
POWER	
Supply Voltage	88-264 VAC, 50/60 Hz
Power Consumption (Avg.)	220 W (110V/2A, or 220V/1A)
ENVIRONMENTAL	
Temperature (Indoor Ver.)	50°F to 95°F (10°C to 35°C)
Temperature (Outdoor Ver.)	-40°F to 131°F (-40°C to 55°C), with additional air conditioned enclosure

* Depending on local laws and specific requirements Mesmer's power can be tuned up or down to increase range and capabilities.

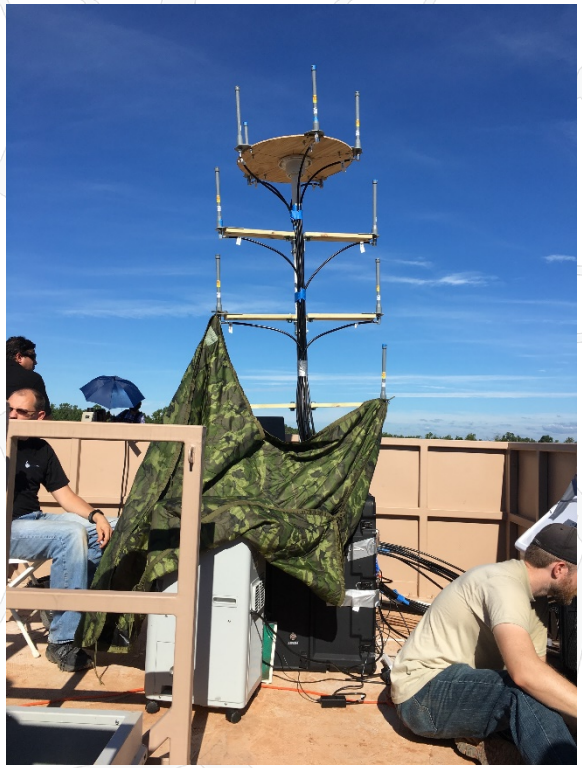
CUAS Demonstrations & Evaluations

MITRE CUAS Challenge – 8/2016

- MESMER picked as a finalist – only 8 finalist out of 42 submissions
- Detect, Identified and Mitigated (2) 3DR Solo drones at 1.2 km

Black Dart – 9/2016

- Detect, Identified and Mitigate DJI Phantom 3 Standard at a max range of ~ 1 km
- Detected DJI Phantom 3 Advanced and DYI Hexacopter
  - Detection technique for these drones was implemented in 48 hours (roughly 24 hours for each)



MESMER Version 1.5 – A Major Advance

MESMER V1.5 – Available in June 2017

**** Important Technical Updates & Advancements ****

- The effective rage for detection/identification/mitigation increased up to 5 km**
- 4 band coverage
- The mitigation library of commercial drone models and communication system protocols amplified, to include drones using "*Lightbridge*". **
- Capability to identify the location of home base (drone dependent)

**** Confirmed in May at a US Military site**

MESMER® Counter Drone Solution

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