Open Drone ID

WiFi Broadcast Specification

Draft Specification Version 0.64.3

Protocol version 0

Mar 10, 2019

Contents

Update History

Version	Date	Changes	Author
0.60.0	8/23/2018	Established a separate WiFi spec document	G. Cox
0.61.0	11/8/2018	Updated diagrams to sync with Message Spec (removed Unique ID from header, increased remaining message size from 21 to 25 bytes.	G. Cox
0.61.1	12/10/2018	Removed wrong diagram in doc (Bluetooth frame diagram), changed message scheme to use the SSID as the message rather than Vendor specific tag (which is not compatible with IOS/Android). Max Message frame size is now 22 with a payload of 21 bytes due to encoding overhead of UTF-8.	G. Cox
0.62.0	2/11/2018	Added Vendor Specific Element requirement	G. Cox
0.64.3	3/10/2019	1. Major Update: Broadcast Technique has moved from Vender Specific Element + SSID to using the Neighbor Awareness Networking Protocol. This is a complete re-do of approach, so please read section 5 carefully. This was necessary to align with Android SDK. 2. Updated Message Pack definition by eliminating message type mask and including messages consistent with Open Drone ID message specification.	G. Cox, J. Caina

1 Introduction

On December 19th 2017 the Federal Aviation Administration (FAA) published the UAS Remote Tracking & ID ARC Report[1] to update the public about the latest results from the Aviation Rulemaking Committee (ARC) chartered by the FAA.

Within the ARC recommendation were some options for "Broadcasting" a Drone ID. This specification is designed to meet such needs expressed in the ARC Report.

This document is currently in *DRAFT* and is under a standardization process within the ASTM F38 Remote ID Workgroup. The outcome of this collaboration will most certainly result in many changes as a part of this process.

2 Related Documents

Open Drone ID – Message Specification: Contains the details of the Open Drone ID Messages that are referenced in this document.

Wi-Fi Alliance Neighbor Awareness Network* (NAN) Specification*: https://www.wi-fi.org/discover-wi-fi/wi-fi-aware

3 Implementation Overview

As detailed in this specification, a broadcast mechanism can be implemented in Wi-Fi by using (Public Action) management frames to encapsulate Open Drone ID messages. This method does not require a connection to the Wi-Fi broadcaster, therefore, the receiver can just passively listen to the messages and process them as they are sent. Messages can be correlated as coming from the same UAS by using the source MAC address. This specification leverages the Neighbor Awareness Network protocol since it has full SDK support out in Android OS (starting with Oreo).

* Other names and brands may be claimed as the property of others.

[1] https://www.faa.gov/news/updates/?newsId=89404

4 Transmitting Frequency

Depending on whether the data is static or dynamic, the messages will be sent at a low or higher frequency (respectively).

As such, the following message frequencies shall be maintained:
Static: Every 3 seconds.
Dynamic: Every 1 second.

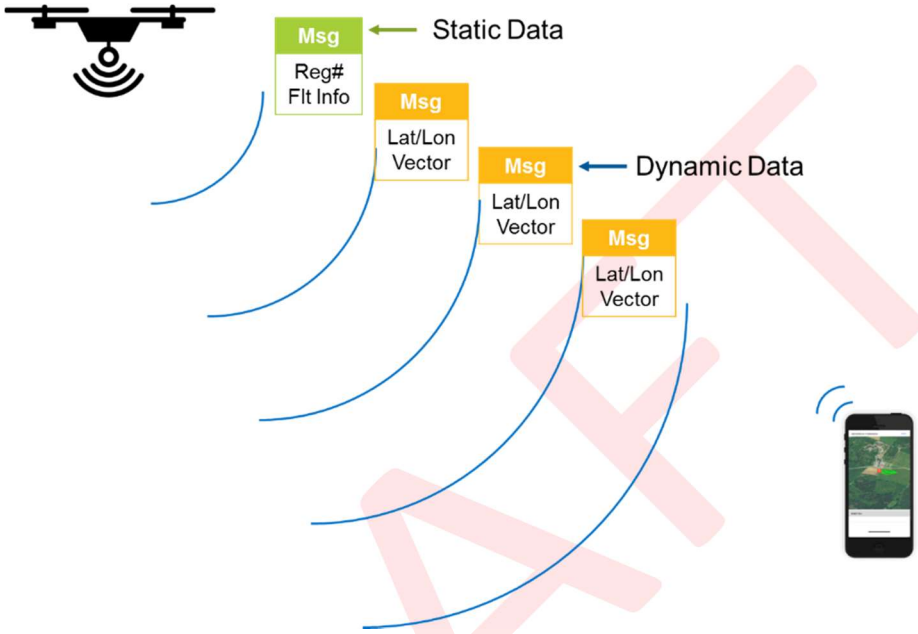

Figure 1 - Static and Dynamic Messages

5 WiFi Beacon Frames

For UAS implementing this protocol broadcast frame, a “management” (type 0), “action” (subtype 13) frame as prescribed by the IEEE 802.11-2016 Part 11 Wi-Fi specification [3.7] shall be encoded as NAN Service Discovery Frames as described in the NAN Specification. Additionally, the values shall be filled as described in the NAN Service Discovery Frame Diagram and NAN Service Discovery Frame Details Table below.

When sending multiple static frames at their prescribed interval, they shall be sent together in a single message pack. Likewise, dynamic frames shall be sent in a single message pack. Optionally, all dynamic and static frames can be sent together in a single message pack, and when doing so, they shall be sent at the dynamic message rate (as defined in section 4).

The NAN Service Discovery frame (SDF) is a Vendor Specific Public Action frame as defined in NAN Specification with the Wi-Fi Alliance OUI and Wi-Fi Alliance OUI type indicating the NAN protocol. The format and the values for the NAN SDF are defined below. The mandatory NAN Service Descriptor attribute shall be included in the NAN SDF frames. Please refer to NAN Specification Part 9 for detailed information.

802.11 (Type 0, Subtype 13) Vendor Specific Public Action (NAN Service Discovery Frame)				
Category (1 Byte)	Action (1 Byte)	OUI (3 Bytes) (Wi-Fi Alliance)	OUI Type (1 Byte)	NAN Attribute(s)
0x04 - Public	0x09 – Vend Specific	50-6F-9Ah	0x13	<15 + N*25 Bytes>

NAN Service Descriptor Attribute								
Attribute ID (1 Byte)	Length (2 Bytes)	Service ID (6 Bytes)	Instance ID (1 Byte)	Requestor Instance ID (1 Byte)	Service Control (1 Byte)	Service Info Length (1 Byte)	Service Info	
							Message Counter (1 Byte)	Open Drone ID Message Pack
0x3	<14+N*25>	88-69-19-9D-92-09h	0x01	0x00	0x10	<4+N*25>	0x00	<3 + N*25 Bytes>

*N = Number of Message Types in Message Pack

Open Drone ID Message Pack						
MsgType (4 bits) [MsgPk]	Version (4 bits)	Single msg size (1 byte)	No of Msgs in Pack (N)	Message (Type 0)	Message (Type 1)	....
0xF	0x0-0xF	0x16 (25)	<1 Byte>	<25Bytes>	<25Bytes>	....

Open Drone ID Message		
Msg Type (4 bits)	Version (4 bits)	Message (24 Bytes)
0x1 – 0xF	0x0-0xF	<Open Drone ID message>

The details of the encapsulated messages are contained in the *Open Drone ID Message Specification*.

<table>
<tr><th>Field</th><th>Size</th><th>Value</th><th>Description</th></tr>
<tr><td>Category ID</td><td>1</td><td>0x4</td><td>IEEE 802.11 Public Action frame</td></tr>
<tr><td>Action Field</td><td>1</td><td>0x9</td><td>IEEE 802.11 Public Action frame Vendor Specific</td></tr>
<tr><td>OUI</td><td>3</td><td>50-6F-9A</td><td>Wi-Fi Alliance specific OUI</td></tr>
<tr><td>OUI Type</td><td>1</td><td>0x13</td><td>Identifying the type and version of the NAN</td></tr>
<tr><td colspan="4">NAN Attributes</td></tr>
<tr><td>Attribute ID</td><td>1</td><td>0x3</td><td>Identifies the type of NAN attribute (Service Descriptor attribute)</td></tr>
<tr><td>Length</td><td>2</td><td>Variable</td><td>Length</td></tr>
<tr><td>Service ID</td><td>6</td><td>88-69-19 9D-92-09</td><td>Mandatory field that contains the hash of the Service Name. The first 48 bits of the SHA-256 hash of the Service Name. A lower-case representation of the Service Name shall be used to calculate the Service ID. The format of the Service ID field shall be as defined as the Service Hash in "Wi-Fi Peer-to-Peer Services Technical Specification". The service name is "org.opendroneid.remoteid". Hash: 88-69-19-9D-92-09h</td></tr>
<tr><td>Instance ID</td><td>1</td><td>1</td><td>Should always be 1 for this implementation</td></tr>
<tr><td>Requestor Instance ID</td><td>1</td><td>0x00</td><td>Instance ID from the frame that triggered the transmission if available, otherwise set to 0x00.</td></tr>
<tr><td>Service Control</td><td>1</td><td>0x10</td><td>Mandatory field that defines the Service Control bitmap as defined below.
Bit 0-1: Identifies the Service Control Type, The value shall be set to "00":
00: Publish
01: Subscribe
10: Follow up
11: Reserved
Bit2-3: "00"Bit4: The value shall be set to "1" and present Service Info field is found in the Service Descriptor attribute</td></tr>
<tr><td>Service Info Len</td><td>1</td><td>4+(N*25)</td><td>Mandatory field set to the length of Service Info</td></tr>
<tr><td>Service Info</td><td>4+(N*25)</td><td>Variable</td><td>Mandatory field that carries the Open Drone ID message pack and with a capacity of up to 255 bytes.
<table>
<tr><td>Message Counter</td><td>0 - 0xFF: Increment with each message sent, reset back to 0 after FF is reached.</td></tr>
<tr><td>Open Drone ID MessagePack</td><td>Open Drone ID Message Pack</td></tr>
</table></td></tr>
</table>

6 Compliance and Interoperability

As of this version, compliance can be “self-certified” using the following means:

1. Every “shall”, “must” and any other logical directive in this document must be implemented. (See IETF RFC2119 for adopted definitions of imperatives: https://www.ietf.org/rfc/rfc2119.txt)
2. Interoperability shall be verified against “known working” clients for both BLE 4 and Bluetooth 5 Extended Advertising receivers.
3. Hardware/RF/Signal compliance TBD.
4. If a system is not compliant with this spec, then it may not claim, advertise or display references to “Open Drone ID”.