DPA KML Files with Embedded Data
DPA KML File Format Version: 1.0.7

April 12th, 2019

Purpose

This document describes the format for incorporating all information needed by a SAS about Dynamic Protection Areas (DPAs) into two KML files:

- A file describing sites activated by ESC (hereafter E-DPAs). This file contains coastal DPAs and any inland DPAs that are ESC-monitored.
- A file describing sites activated by portal (hereafter P-DPAs).

These files are created, posted, and updated by NTIA, and retrieved on a predetermined schedule by SASs.[1]

Data Elements

Each DPA in a KML file is specified as a placemark containing some or all of the following data elements depending on DPA type. Not all of these data elements are required for each type of DPA. The appendices contain more information on the data elements and sample KML code.

1. Placemark
    a. Typically a polygon defining the DPA
    b. May also be a point (single lat/lon)
    c. May be multiples or combinations of the above using MultiGeometry
2. Name of DPA.
    a. For E-DPAs, this is the DPA name.
    b. For P-DPAs, this is the DPA name, and the data element is needed by the informing incumbent portal as the “building” to which individual CBRS channels (“conference rooms”) are assigned for this DPA.
3. For P-DPAs, the name(s) of one or more informing incumbent portal organization(s) to which the DPA belongs. This establishes the authorization for portal users under the listed organization(s) to be allowed to “book” conference rooms (channels) belonging to this building (DPA). If no organizations are listed, only portal administrators will be able to activate any channels in this DPA.

[1] Posting or updating of a KML file is not related to DPA activation.

4. The frequency range(s) over which operations in the DPA are authorized. For P-DPAs, this is used by the portal to determine the CBRS channels that may be activated by this DPA. For both E-DPAs and P-DPAs, these ranges will also be used by the SAS in pre-computing move lists.
5. For each 10 MHz channel within the frequency range of a P-DPA, a unique identifier that is used to construct the ID of the calendar resource in the portal belonging to this channel in this P-DPA
6. Interference protection criterion for the DPA
7. Reference height to be used for interference calculations
8. Azimuth range requiring protection
9. Beamwidth of incumbent receiver antenna
10. Whether operations within the DPA are federal government (i.e., authorized in the GMF) or not government (i.e., experimental license issued by FCC). This data element will determine the precedence with which interference protection will be implemented. The data format specification does not imply any protection policy regarding protection of non-federal sites. (Note: Currently, all E-DPAs and P-DPAs are federal government.)
11. The DPA neighborhood distances for Category A and B, as well as Out-Of-Band neighborhood distances for Category A and B

Data elements 1 and 2 already exist in the standard KML specification. The remaining data elements are inserted as user-defined data fields, a feature that is supported by the KML standard under the <ExtendedData> tag. The data elements are incorporated in the KML by NTIA and are read by a SAS or portal admin when importing the DPA KML.

The beginning of the KML file includes document-wide data elements that specify the type of DPA file (either P-DPAs or E-DPAs), the version number of the DPA KML file format specification (i.e., version 1.0.7 is described here), the date the KML file was created, and a disclaimer.

The file may be distributed as a .kml file, which is a text format file that may be viewed in, for example, Google Earth, or inspected with any standard text editor such as vi or Emacs in Linux, TextEdit in MacOS, Notepad or Notepad++ in Windows, etc. The file may also be distributed as a .kmz file, which is the .kml file compressed using the standard zip file format. A .kmz file can be opened directly in Google Earth (for example) or, if the text of the data in a .kmz file is desired for inspection, the file may be renamed with a .zip extension and unzipped using any standard zip program.

Appendix A: Notes on Specific Data Elements

Document-wide data elements (specified at the beginning of the file):

- <Document><name>
  - Name of kml document.
  - Format: string
  - Examples:
    - E-DPAs
    - P-DPAs
  - Acceptable values for error checking: E-DPAs, P-DPAs

- <Document><ExtendedData><Data name="version">
  - File format version number
  - Format: string
  - Examples:
    - 1.0.1
    - 1.0.7
  - Acceptable values for error checking: Corresponds to a defined version number. The description in this document is 1.0.7

- <Document><ExtendedData><Data name="creationDate">
  - The ISO 8601 formatted date the file was created
  - Format: string. YYYY-MM-DD
  - Example:
    - 2019-04-09
  - Acceptable values for error checking: Any valid date on or after Jan 1, 2018.

- <Document><ExtendedData><Data name="Disclaimer">
  - Any required disclaimer.
  - Format: string
  - Acceptable values for error checking: Any.

Data elements for each DPA:

- <Placemark><name>
  - Name of DPA
  - Format: string
  - Examples:
    - East1
    - BARKING SANDS
  - Acceptable values for error checking: Any. However, if this is a new portal DPA that did not exist in a KML file that was previously issued by the government, the creator of the KML file needs to coordinate in advance with the portal

administrator (admin@cbrsportal.com) to ensure that proper resources are created in the portal to support the new DPA.

- <Placemark><ExtendedData><Data name="portalOrg">
    - If this DPA is managed by portal, this field contains the name of the portal organization which is authorized to activate this DPA.
    - More than one value may be provided if multiple portal organizations have permission to activate the DPA.
    - The portalOrg field is not needed for E-DPAs, and will be ignored.
    - Example:
        - BARKING SANDS
    - Format: string
    - Acceptable values for error checking: Any. However, if this is a new portal organization that did not exist in a KML file that was previously issued by the government, the creator of the KML file needs to coordinate in advance with the portal administrator (admin@cbrsportal.com) to ensure that proper resources are created in the portal to support the new organization.

- <Placemark><ExtendedData><Data name="freqRangeMHz">
    - Frequency range over which DPA can be active
    - Must be multiples of 10 MHz (i.e., consistent with nominal CBRS channel definitions)
    - Can have multiple ranges specified for one DPA. Each will be specified by its own freqRangeMHz entry.
    - Each value consists of two frequencies in MHz, separated by a dash
    - Format: A string consisting of a pair of four-digit integers separated by a dash
    - Example:
        - 3550-3650
    - Acceptable values for error checking: Frequencies must be one of the following: 3500, 3510, 3520, …, 3700, and the first frequency must be less than the second frequency. No commas, spaces, or decimal points are used in the numbers (e.g. "3,500", "3 500", and "3.500" are not acceptable variants of "3500").

- <Placemark><ExtendedData><Data name="federalOp">
    - Required for P-DPAs only
    - Indicator if this is a federally-operated DPA. Value is either True or False.
    - Format: string/boolean
    - Examples:
        - True
        - False
    - Acceptable values for error checking: True, False

- <Placemark><ExtendedData><Data name="protectionCritDbmPer10MHz">
    - Protection criterion in dBm per 10 MHz

    - Required for P-DPAs
    - Required for E-DPAs if protection criterion differs from pre-established criterion of -144 dBm/10 MHz
    - Format: integer or floating point
    - Example:
        - -144
    - Acceptable values for error checking: ≥ -144

- <Placemark><ExtendedData><Data name="refHeightMeters">
    - Height of an isotropic antenna at which protection criterion must be met
    - Required for P-DPAs
    - Optional for E-DPAs, otherwise 50 m is used
    - Format: integer or floating point
    - Example:
        - 26.3
    - Acceptable values for error checking: ≤ 50

- <Placemark><ExtendedData><Data name="antennaBeamwidthDeg">
    - Beamwidth of receive antenna that is being protected, in degrees
    - Required for P-DPAs
    - Optional for E-DPAs (default is 3 deg)
    - Format: integer or floating point
    - Example:
        - 2.5
    - Acceptable values for error checking: (0, 360]

- <Placemark><ExtendedData><Data name="minAzimuthDeg">
    - If the receive antenna sweeps over a limited azimuth, this is the minimum pointing azimuth in deg true
    - Optional for both E-DPAs and P-DPAs
    - Default = 0 if not specified
    - For fixed-azimuth systems, set minAzimuthDeg = maxAzimithDeg
    - Format: integer or floating point
    - Example:
        - 90
    - Acceptable values for error checking: [0, 360), and minAzimuthDeg ≤ maxAzimuthDeg

- <Placemark><ExtendedData><Data name="maxAzimuthDeg">
    - If the receive antenna sweeps over a limited azimuth, this is the maximum pointing azimuth in deg true
    - Optional for both E-DPAs and P-DPAs
    - Default = 360 if not specified
    - For fixed-azimuth systems, set maxAzimuthDeg = minAzimithDeg

    - Format: integer or floating point
    - Example:
        - 270
    - Acceptable values for error checking: (0, 360], and maxAzimuthDeg ≥ minAzimuthDeg

- <Placemark><ExtendedData><Data name="catBNeighborhoodDistanceKm">
    - Neighborhood distance (in km) over which Category B CBSDs must be included in the DPA move list calculation
    - Default value: Mandatory
    - Format: integer or floating point
    - Example:
        - 221
    - Acceptable values for error checking: (0, 500]

- <Placemark><ExtendedData><Data name="catANeighborhoodDistanceKm">
    - Neighborhood distance (in km) over which Category A CBSDs must be included in the DPA move list calculation
    - Default value: 150 km (optional field).
    - Format: integer or floating point
    - Example:
        - 160
    - Acceptable values for error checking: (0, 500]

- <Placemark><ExtendedData><Data name="catBOOBNeighborhoodDistanceKm">
    - Neighborhood distance (in km) over which Category B CBSDs must be included in the DPA move list calculation for Out-of-Band channels (within 3500 to 3550 MHz).
    - Default value: 25 km (optional field).
    - Format: integer or floating point
    - Example:
        - 30
    - Acceptable values for error checking: (0, 500]

- <Placemark><ExtendedData><Data name="catAOOBNeighborhoodDistanceKm">
    - Neighborhood distance (in km) over which Category A CBSDs must be included in the DPA move list calculation for Out-of-Band channels (within 3500 to 3550 MHz)
    - Default value: 0 km (optional field).
    - Format: integer or floating point
    - Example:
        - 10
    - Acceptable values for error checking: (0, 500]

- <Placemark><ExtendedData><Data name="calendarIdXXXX-YYYY">
    - For P-DPAs, specifies the unique portion of the portal calendar ID for a specific 10 MHz block within the DPA's operating frequency
    - One calendarId will be provided for each 10 MHz block within the DPA's operating range
    - Default value: none (required fields for portal DPAs)
    - Format: hex string
    - Acceptable values for error checking: Any string. However, the data name must be such that the value XXXX is one of 3500, 3510, 3520, …, 3690; and the value YYYY must be XXXX + 10. If adding new calendarIds that did not exist in a previous version of the portal DPA KML file that was released by the government, the creator of the KML file must coordinate with the portal administrator (admin@cbrsportal.com) in advance to ensure that the proper resources are created in the portal calendar and to obtain the calendar ID values.
    - Note: A SAS Administrator may inquire with the portal administrator (admin@cbrsportal.com) for instructions on how to construct the complete calendar ID from the value provided in the KML file.

Other placemark data not specified here (for example, the geographic description of the DPA) follow the standard KML placemark format.

Appendix B: Sample P-DPA KML Code Snippet

Note: Data are for example only. The current and complete P-DPA KML file is posted at https://www.ntia.gov/fcc-filing/2015/ntia-letter-fcc-commercial-operations-3550-3650-mhz-band

```
<?xml version="1.0" encoding="utf-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
   <Document>
      <name>P-DPAs</name>
<ExtendedData>
<Data name="version">
<value>1.0.7</value>
</Data>
<Data name="creationDate">
<value>2019-04-09</value>
</Data>
<Data name="Disclaimer">
<value>The Category A and Category B Neighborhood distances contained in this
file were provided by WInnForum and are not a requirement of the federal
government.</value>
</Data>
</ExtendedData>
      <Placemark>
         <name>BARKING SANDS</name>
<ExtendedData>
<Data name="portalOrg">
<value>BARKING SANDS</value>
</Data>
<Data name="calendarId3500-3510">
<value>3132313135383533313333</value>
</Data>
<Data name="calendarId3510-3520">
<value>4241524b494e475f53414e44535f333531302d33353230</value>
</Data>
<Data name="calendarId3520-3530">
<value>4241524b494e475f53414e44535f333532302d33353330</value>
</Data>
<Data name="calendarId3530-3540">
<value>4241524b494e475f53414e44535f333533302d33353430</value>
</Data>
<Data name="calendarId3540-3550">
<value>4241524b494e475f53414e44535f333534302d33353530</value>
</Data>
<Data name="calendarId3550-3560">
<value>4241524b494e475f53414e44535f333535302d33353630</value>
</Data>
<Data name="calendarId3560-3570">
```

<value>4241524b494e475f53414e44535f333536302d33353730</value>
</Data>
<Data name="calendarId3570-3580">
<value>4241524b494e475f53414e44535f333537302d33353830</value>
</Data>
<Data name="calendarId3580-3590">
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</Data>
<Data name="calendarId3590-3600">
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</Data>
<Data name="calendarId3600-3610">
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</Data>
<Data name="calendarId3620-3630">
<value>4241524b494e475f53414e44535f333632302d33363330</value>
</Data>
<Data name="calendarId3630-3640">
<value>4241524b494e475f53414e44535f333633302d33363430</value>
</Data>
<Data name="calendarId3640-3650">
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</Data>
<Data name="freqRangeMHz">
<value>3500-3650</value>
</Data>
<Data name="federalOp">
<value>True</value>
</Data>
<Data name="protectionCritDbmPer10MHz">
<value>-144</value>
</Data>
<Data name="refHeightMeters">
<value>12</value>
</Data>
<Data name="antennaBeamwidthDeg">
<value>3</value>
</Data>
<Data name="minAzimuthDeg">
<value>0</value>
</Data>
<Data name="maxAzimuthDeg">
<value>360</value>
</Data>
<Data name="catBNeighborhoodDistanceKm">

```
<value>200</value>
</Data>
<Data name="catBOOBNeighborhoodDistanceKm">
<value>25</value>
</Data>
<Data name="catANeighborhoodDistanceKm">
<value>150</value>
</Data>
<Data name="catAOOBNeighborhoodDistanceKm">
<value>0</value>
</Data>
</ExtendedData>
<Point>
                  <coordinates>-159.78305556,22.05027778,0</coordinates>
</Point>
      </Placemark>
...
</Document>
</kml>
```

Appendix C: Sample E-DPA KML Code Snippet

Note: Data are for example only. The current and complete E-DPA KML file is posted at https://www.ntia.gov/fcc-filing/2015/ntia-letter-fcc-commercial-operations-3550-3650-mhz-band

```
<?xml version="1.0" encoding="utf-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2">
   <Document>
      <name>E-DPAs</name>
<ExtendedData>
<Data name="version">
<value>1.0.7</value>
</Data>
<Data name="creationDate">
<value>2018-10-16</value>
</Data>
<Data name="Disclaimer">
<value>The Category A and Category B Neighborhood distances contained in this
file were provided by WInnForum and are not a requirement of the federal
government.</value>
</Data>
</ExtendedData>
      <Placemark>
         <Snippet maxLines="0"> </Snippet>
         <description> </description>
         <name>East1</name>
<ExtendedData>
<Data name="freqRangeMHz">
<value>3550-3650</value>
</Data>
<Data name="protectionCritDbmPer10MHz">
<value>-144</value>
</Data>
<Data name="refHeightMeters">
<value>50</value>
</Data>
<Data name="antennaBeamwidthDeg">
<value>3</value>
</Data>
<Data name="minAzimuthDeg">
<value>0</value>
</Data>
<Data name="maxAzimuthDeg">
<value>360</value>
</Data>
<Data name="catBNeighborhoodDistanceKm">
<value>368</value>
```

```
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<value>25</value>
</Data>
<Data name="catANeighborhoodDistanceKm">
<value>150</value>
</Data>
<Data name="catAOOBNeighborhoodDistanceKm">
<value>0</value>
</Data>
</ExtendedData>
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            </LineStyle>
            <PolyStyle>
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               <fill>1</fill>
               <outline>1</outline>
            </PolyStyle>
         </Style>
         <Polygon>
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                  <coordinates> -75.0974167479281,38.0273656925171,0
-75.1075631832988,38.0315824222682,0 -75.1130590665644,38.0234614001533,0
...
<data truncated for brevity>
...
-75.0568426860385,38.0104900575404,0 -75.0669844497128,38.0147102732152,0
-75.0771273812054,38.018929617758,0 -75.0872714805871,38.0231480909361,0
-75.0974167479281,38.0273656925171,0</coordinates>
               </LinearRing>
            </outerBoundaryIs>
         </Polygon>
      </Placemark>
...
</Document>
</kml>
```