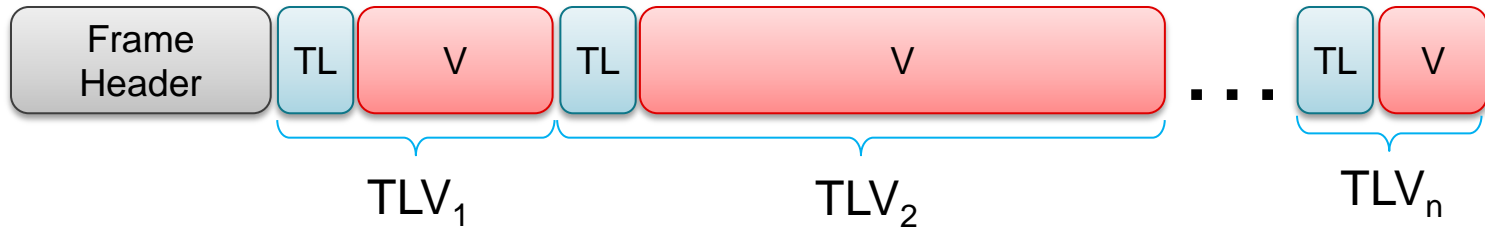


Radar Output Packet Structure

- Fixed sized Frame Header, followed by variable number of TLVs
- Each TLV has fixed header followed by variable size payload
- Byte order is Little Endian



Frame Header Structure

- Fixed size (52bytes), in name, type, length (in bytes) MATLAB syntax

```
frameHeaderStructType = struct(...
    'sync',          {'uint64', 8}, ... % Sync Pattern
    'version',       {'uint32', 4}, ... % mmWaveSDK version
    'platform',      {'uint32', 4}, ... % 0xA1642 or 0xA1443
    'timestamp',     {'uint32', 4}, ... % 600MHz free running clocks
    'packetLength',  {'uint32', 4}, ... % In bytes, including header
    'frameNumber',   {'uint32', 4}, ... % Starting from 1
    'subframeNumber', {'uint32', 4}, ...
    'chirpMargin',   {'uint32', 4}, ... % Chirp Processing margin, in us
    'frameMargin',   {'uint32', 4}, ... % Frame Processing margin, in us
    'uartSentTime',  {'uint32', 4}, ... % Time spent to send data, in us
    'trackProcessTime', {'uint32', 4}, ... % Tracking Processing time, in us
    'numTLVs',        {'uint16', 2}, ... % Number of TLVs in this frame
    'checksum',       {'uint16', 2}); % Header checksum
```

```
version is:
MMWAVE_SDK_VERSION_BUILD | (MMWAVE_SDK_VERSION_BUGFIX << 8) | (MMWAVE_SDK_VERSION_MINOR << 16) | (MMWAVE_SDK_VERSION_MAJOR << 24)
syncPattern is:
typecast(uint16([hex2dec('0102'),hex2dec('0304'),hex2dec('0506'),hex2dec('0708')]),'uint64');
```

TLV structure

- Fixed Header (8bytes)

```
tlvHeaderStruct = struct(...  
    'type',          {'uint32', 4}, ... % TLV object Type  
    'length',       {'uint32', 4});   % TLV object Length, in bytes, including TLV header
```

- Followed by TLV-specific payload

Point Cloud TLV, 2D

- Type = POINTCLOUD_2D
- Length = sizeof (tlvHeaderStruct) + sizeof (pointCloudUnitStruct) + sizeof (pointStruct) x numberOfPoints
- Point cloud unit structure is defined as:

```
% Point Cloud TLV object consists of an array of points.  
% Each point has a structure defined below  
pointCloudUnitStruct = struct(...  
    'azimuthUnit',    {'float', 1}, ... % unit resolution of Angle report, in rad  
    'dopplerUnit',    {'float', 1}, ... % unit resolution of Doppler report, in m/s  
    'rangeUnit',      {'float', 2}, ... % unit resolution of Range report, in m  
    'snrUnit',        {'float', 2}); % unit resolution of SNR report, ratio
```

- Each point (pointStruct) is defined as:

```
% Point Cloud TLV object consists of an array of points.  
% Each point has a structure defined below  
pointStruct = struct(...  
    'azimuth',        {'int18', 1}, ... % Angle report, in number of azimuthUnit  
    'doppler',        {'int8', 1}, ... % Doppler, in number of dopplerUnit  
    'range',          {'int16', 2}, ... % Range, in number of rangeUnit  
    'snr',            {'int16', 2}); % SNR, in number of snrUnit
```

Target List TLV, 2D

- Type = TARGET_LIST_2D
- Length = sizeof (tlvHeaderStruct) + sizeof (targetStruct) x numberOfTargets
- Each target is defined as:

```
% Target List TLV object consists of an array of targets.  
% Each target has a structure define below  
targetStruct2D = struct(...  
    'tid',          {'uint32', 4}, ... % Track ID  
    'posX',         {'float', 4}, ... % Target position in X dimension, m  
    'posY',         {'float', 4}, ... % Target position in Y dimension, m  
    'velX',         {'float', 4}, ... % Target velocity in X dimension, m/s  
    'velY',         {'float', 4}, ... % Target velocity in Y dimension, m/s  
    'accX',         {'float', 4}, ... % Target acceleration in X dimension, m/s2  
    'accY',         {'float', 4}, ... % Target acceleration in Y dimension, m/s  
    'EC',           {'float', 9*4}, ... % Tracking error covariance matrix, [3x3] in  
                                     % range/angle/doppler coordinates  
    'G',            {'float', 4}); % Gating function gain
```

Target Index TLV

- Type = TARGET_INDEX
- Length = sizeof (tlvHeaderStruct) + numberOfPoints
- Payload is a byte array, each byte is an Target ID

```
% Target List TLV object consists of an array of targets IDs.  
% Each target ID is a byte, 0-250 targets supported, values 251-255 has special meaning  
targetIndex = struct(...  
    'targetID',          {'uint8', 1} % Track ID  
    );
```

Classifier Output TLV

- Type = CLASSIFIER_OUTPUT
- Length = sizeof (tlvHeaderStruct) + sizeof (classifierOutputStruct) x numberOfActiveTargets
- Each active target's classification output is defined as:

```
% Target List TLV object consists of an array of targets IDs.  
% Each target ID is a byte, 0-250 targets supported, values 251-255 has special meaning  
targetIndex = struct(...  
    'activeTargetID',    {'uint32', 1},           % Active target ID  
    'targetTag',        {'int32', 1});           % Tag for the target, 1:human, -1:moving clutter
```