

Polycom® UC Software PTT/Group Paging Audio Packet Format

This engineering advisory provides details about the format of the packets used in the Push-to-Talk (PTT) and Group Paging features available in Polycom® UC Software 4.0.x.

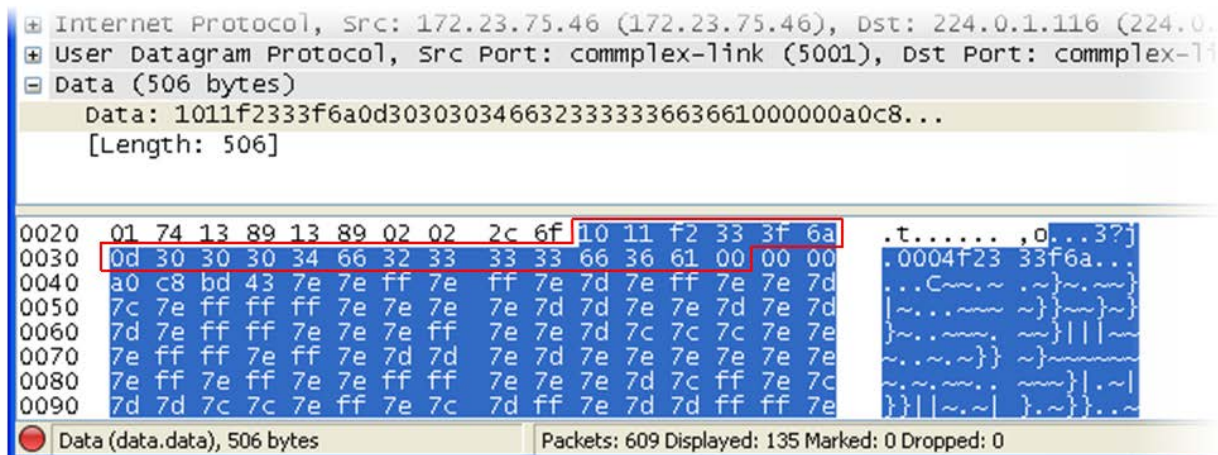
This engineering advisory applies to administrators or product developers who want to interoperate their products with the Polycom Multicast PTT/Group Paging feature.

The PTT and Group Paging features work by multicasting packets on a certain channel to an IP address and port set by an administrator. By default, packets are multicast to the IP address 224.0.1.116 using UDP and port 5001. Each packet consists of either a header, or a header and additional audio, depending on the packet type. The header of each packet is 20 bytes and consists of the 5 fields shown next in [Table 1: Header Fields and Size](#).

Table 1: Header Fields and Size

| Op Code | Channel Number | Host Serial Number | Caller ID Length | Caller ID |
|---------|----------------|--------------------|------------------|-----------|
| 1 byte | 1 byte | 4 bytes | 1 byte | 13 bytes |

The header network byte order begins with the Op Code field and ends with the Caller ID field as highlighted in the following Wireshark capture.



Header Fields

This section describes each of the 5 fields found in the header.

Op Code

The Op Code field is 1 byte and provides information about the packet type. There are three packet types: *PTT Alert*, *PTT Transmit*, and *PTT End of Transmit*. Use [Table 2: Op Codes](#) to match an Op Code to the corresponding packet type and to understand the function of each packet type.

Table 2: Op Codes

| <i>Op Code</i> | <i>Packet Type</i> | <i>Packet Purpose</i> |
|----------------|---------------------|--|
| 0F | PTT Alert | This packet signals all phones listening on the current channel that a phone is about to begin broadcasting. |
| 10 | PTT Transmit | This packet is used to transfer audio data and is the only packet type which contains audio frames. |
| FF | PTT End of Transmit | This packet signals all phones that the broadcasting phone has completed its broadcast. |

Channel Number

The channel number field is 1 byte and represents the channel that the packet is transmitted on. The channels range from 1 – 50, with channels 1 – 25 for PTT, and channels 26 – 50 for paging. The PTT/Paging feature enables users to broadcast messages with a certain priority level: Normal, Priority, or Emergency. By default, the PTT feature treats channel 24 as a Priority channel and channel 25 as an Emergency channel while the Paging feature treats channel 49 as the Priority channel and channel 50 as the Emergency channel. The Priority and Emergency channels can be changed by administrators.

Host Serial Number

The host serial number field is 4 bytes and represents the last 4 bytes of the serial number/MAC address of the broadcasting phone. This field is used for contention resolution – when multiple phones begin broadcasting on the same channel at the same time, the phone with the lowest serial number continues to broadcast and all other phones will stop broadcasting. Any 32-bit number can be used in place of the serial number as long as its value is guaranteed to be unique among the multicast participants.

Caller ID Length

The caller ID length field is 1 byte and represents the number of bytes in the caller ID field. Although the packet includes the caller ID length, the encoded length and length of the caller ID string are fixed at 13.

Caller ID

The caller ID field is 13 bytes and consists of a text string (a phone's extension for example) that identifies the broadcasting phone. If this string is less than 13 bytes, it is terminated with a null. Otherwise, if this field is null, the value from `reg.1.displayName` (found in the **reg-basic.cfg** file) will be used. If that too is null, the phone's MAC address will be used. A receiving phone displays the caller ID on its screen.

Audio Data

Audio data is only present in a *PTT Transmit* packet. There are two codecs which can be used to send the audio data:

- 1 G.722 – Typical audio payload is 240 bytes (30ms)
- 2 G.711u – Typical audio payload is 240 bytes (30ms)

Audio data consists of a 6 byte audio header followed by two frames of audio data. The first frame is a redundant frame—it contains a copy of the audio from the previous packet. The second frame contains the current audio. The only exception is the first PTT Transmit packet, which will not contain a redundant audio frame. An example Audio Header is shown next in [Table 3: Audio Header Example](#)

Table 3: Audio Header Example

| Number of Bytes | Description | Notes |
|-----------------|--------------|---|
| 1 | Codec Type | 0x00 means G.711μ 0x09 means G.722 |
| 1 | Flags Byte | Not applicable |
| 4 | Sample Count | RTP timestamp for the second audio frame (except for the first PTT transmit packet, then it's for the first and only audio frame) |

PTT/Page Session

A PTT or Page is initiated by sending 31 PTT Alert packets at approximately 30 millisecond intervals, followed by the transmission of the audio data in PTT Transmit packets. Upon completion of the Page, after a 50 millisecond delay, 12 PTT End of Transmit packets are sent at approximately 30 millisecond intervals completing the Page.

Example Page Session

The following example shows a Wireshark capture of a short paging session, specifically a PTT session, using the G.711 μ codec with a 20 msec sample size (resulting in an audio frame of 160 bytes). A different PTT session will contain a different number of bytes (and packets).

The following tables (Tables 4 to 12) provide packet details of the entire audio frame (187 packets). Included is:

- Packet number and type
- Transmit time in seconds
- Source and destination IP addresses
- Protocol used
- VLAN formation
- Packet contents—Highlighted contents are explained in detail

In some instances, the packet contents are a repeat of previous packets. These are noted in the following tables.

Table 4: First PTT Alert Packet

| <i>Pkt No.</i> | <i>Time (seconds)</i> | <i>Source IP Address</i> | <i>Destination IP Address</i> | <i>Protocol</i> | <i>VLAN Info</i> |
|---|-----------------------|--------------------------|-------------------------------|-----------------|---|
| 1 | 0.000000 | 192.168.1.103 | 224.0.1.116 | UDP | Source port: complex-link Destination port: complex-link |
| 0000 01 00 5e 00 01 74 00 04 f2 11 15 11 08 00 45 00 ..^..t.....E. 0010 00 30 16 71 00 00 40 11 c0 c8 c0 a8 01 67 e0 00 .0.q..@.....g.. 0020 01 74 13 89 13 89 00 1c 90 63 0f 1a f2 11 15 11 .t.....c..... 0030 0d 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76 .Melody Meserv | | | | | Alert packet |
| | | | | | Highlighted contents described in table below |

Table 5: Contents of PTT Alert Packet

| <i>Field Value</i> | <i>Number of Bytes</i> | <i>Field Name</i> | <i>Notes</i> |
|--------------------|------------------------|-------------------|------------------------------------|
| 0f | 1 | Op Code | PTT Alert |
| 1a | 1 | Channel Number | 26 (first channel in paging range) |

| <i>Field Value</i> | <i>Number of Bytes</i> | <i>Field Name</i> | <i>Notes</i> |
|--|------------------------|--------------------|---|
| f2 11 15 11 | 4 | Host Serial Number | Last four bytes of phones MAC address (004f2111511) |
| 0d | 1 | Caller ID Length | 13 |
| 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76 | 13 | Caller ID | Melody Meserv |

Table 6: Remainder of PTT Alert Packets

| <i>Pkt Nos.</i> | <i>Time (seconds)</i> | <i>Source IP Address</i> | <i>Destination IP Address</i> | <i>Protocol</i> | <i>VLAN Info</i> |
|-----------------|-----------------------|--------------------------|-------------------------------|-----------------|---|
| 2 - 31 | every 0.030 (approx.) | 192.168.1.103 | 224.0.1.116 | UDP | Source port: complex-link Destination port: complex-link |
| | | | | | Repeat of Packet 1 |
| | | | | | 0000 01 00 5e 00 01 74 00 04 f2 11 15 11 08 00 45 00 ..^..t.....E. 0010 00 30 16 71 00 00 40 11 c0 c8 c0 a8 01 67 e0 00 .0.q..@.....g.. 0020 01 74 13 89 13 89 00 1c 90 63 0f 1a f2 11 15 11 .t.....c..... 0030 0d 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76 .Melody Meserv |

After the 32 PTT Alert packets, the actual data transmission starts with the PTT Transmit packets.

Table 7: First PTT Transmit Packet

| <i>Pkt No.</i> | <i>Time (seconds)</i> | <i>Source IP Address</i> | <i>Destination IP Address</i> | <i>Protocol</i> | <i>VLAN Info</i> |
|----------------|-----------------------|--------------------------|-------------------------------|-----------------|---|
| 32 | 0.969281 | 192.168.1.103 | 224.0.1.116 | UDP | Source port: complex-link Destination port: complex-link |

| Pkt No. | Time (seconds) | Source IP Address | Destination IP Address | Protocol | VLAN Info |
|---------|----------------|--|------------------------|------------------|---|
| | | | | | 1 st PTT Transmit packet |
| | 0000 | 01 00 5e 00 01 74 00 04 f2 11 15 11 08 00 45 00 | | ..^.t.....E. | |
| | 0010 | 00 d6 16 90 00 00 40 11 c0 03 c0 a8 01 67 e0 00 | |@.....g.. | |
| | 0020 | 01 74 13 89 13 89 00 c2 65 76 10 1a f2 11 15 11 | | .t.....ev..... | |
| | 0030 | 0d 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76 09 00 | | .Melody Meserv.. | |
| | 0040 | 6f ca 7b f5 5e 7a f7 70 f4 7a 5e db f2 5e d7 dc | | o.{.^z.p.z^..^.. | |
| | 0050 | f5 f8 ef fb 5c 6d b1 9f b9 9d b9 b3 f3 9d f9 f3 | | ...m..... | |
| | 0060 | 79 f6 dd f4 9f df fb f2 b3 fb 76 f6 ba d7 fb b8 | | y.....v..... | |
| | 0070 | de 59 f8 f8 b2 fa dc dc fb df 9b 5f f9 d8 dd b7 | | .Y....._..... | |
| | 0080 | b8 f9 5d f9 df f9 9d f5 f9 f7 bb 79 f7 9d f5 75 | | ..].....y...u | |
| | 0090 | f9 f5 9f f9 fb fb f2 f9 79 f9 b7 fb bb df f7 f7 | |y..... | |
| | 00a0 | f9 b9 f9 f9 5f 76 b9 f6 b9 6e ea a8 6d f1 f3 9d | |_v...n..m... | |
| | 00b0 | df 75 76 9c d7 fa ba 5d da 7e 57 99 dc 98 de f4 | | .uv....]..~W.... | |
| | 00c0 | f3 30 f4 f7 b8 de df f4 73 bb 7e 78 fa da 99 f9 | | .0.....s.~x.... | |
| | 00d0 | df 5b de da 5e 5f bc 9c f7 bc 78 f8 79 b4 6d f4 | | .[.^_.....x.y.m. | |
| | 00e0 | fc fb fa bc | | | Highlighted contents described in table below |

Table 8: Contents of First PTT Transmit Packet

| Field Value | Number of Bytes | Field Name | Notes |
|---|-----------------|---------------------|---|
| 10 | 1 | Op Code | PTT Transmit |
| 1a | 1 | Channel Number | 26 (first channel in paging range) |
| f2 11 15 11 | 4 | Host Serial Number | Last four bytes of phones MAC address (004f2111511) |
| 0d | 1 | Caller ID Length | 13 |
| 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76 09 | 13 | Caller ID | Melody Meserv |
| 00 | 1 | Codec | G.711 μ |
| 6f | 1 | Flags | Not applicable |
| ca 7c 95 5e | 4 | RTP Sequence number | |
| 7a f7 70 f4 7a... | 160 | Audio frame | |

Table 9: Second PTT Transmit Packet

| Pkt No. | Time (seconds) | Source IP Address | Destination IP Address | Protocol | VLAN Info |
|---------|--|-------------------|------------------------|--------------------|---|
| 33 | 0.989055 | 192.168.1.103 | 224.0.1.116 | UDP | Source port: complex-link Destination port: complex-link |
| | | | | | 2 nd PTT Transmit packet |
| 0000 | 01 00 5e 00 01 74 00 04 f2 11 15 11 08 00 45 00 | | | ..^.t.....E. | |
| 0010 | 00 d6 16 90 00 00 40 11 c0 03 c0 a8 01 67 e0 00 | | |@.....g.. | |
| 0020 | 01 74 13 89 13 89 00 c2 65 76 10 1a f2 11 15 11 | | | .t.....ev..... | |
| 0030 | 0d 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76 09 00 | | | .Melody Meserv.. | |
| 0040 | 6f ca 7b f5 5e 7a f7 70 f4 7a 5e db f2 5e d7 dc | | | o.{.^z.p.z^.^.^. | |
| 0050 | f5 f8 ef fb 5c 6d b1 9f b9 9d b9 b3 f3 9d f9 f3 | | | ...m..... | |
| 0060 | 79 f6 dd f4 9f df fb f2 b3 fb 76 f6 ba d7 fb b8 | | | y.....v.... | |
| 0070 | de 59 f8 f8 b2 fa dc dc fb df 9b 5f f9 d8 dd b7 | | | .Y....._.... | |
| 0080 | b8 f9 5d f9 df f9 9d f5 f9 f7 bb 79 f7 9d f5 75 | | | ..].....y...u | |
| 0090 | f9 f5 9f f9 fb fb f2 f9 79 f9 b7 fb bb df f7 f7 | | |y..... | |
| 00a0 | f9 b9 f9 f9 5f 76 b9 f6 b9 6e ea a8 6d f1 f3 9d | | |_v...n...m... | |
| 00b0 | df 75 76 9c d7 fa ba 5d da 7e 57 99 dc 98 de f4 | | | .uv....]...~W.... | |
| 00c0 | f3 30 f4 f7 b8 de df f4 73 bb 7e 78 fa da 99 f9 | | | .0.....s...~x... | |
| 00d0 | df 5b de da 5e 5f bc 9c f7 bc 78 f8 79 b4 6d f4 | | | .[.^_...x.y.m. | |
| 00e0 | fc fb fa bc d7 5f 7b 5a ba f8 be d8 79 f4 dc bb | | |{Z...y... | |
| 00f0 | 75 f7 fe f9 78 71 9f b9 71 f5 9d 5f f8 7e d9 bc | | | u...xq.q..._...~.. | |
| 0100 | ba 5e dd db 7a 5b b0 f6 f0 df 77 78 b5 b9 f4 f2 | | | ^.z[....wx.... | |
| 0110 | 79 fc 5f 73 bc 9f f9 f9 f6 57 fc 79 b8 fc f8 ba | | | y...s....W.y.... | |
| 0120 | fe fc fa 73 fc db f5 f7 9d 76 fe fa 9e ba 78 7e | | | ...s....v....x~ | |
| 0130 | fe dc de b8 d9 fb f3 de b8 f6 38 fb 9f f3 f5 f7 | | |8..... | |
| 0140 | f8 74 71 9b 7c b8 fa de fe de f3 5e b4 f1 f8 76 | | | .tq.^...v | |
| 0150 | b8 b8 fc de 75 75 f7 f8 fe be 5c 99 9f 75 7b 7a | | |uu....\...u{z | |
| 0160 | f6 9f 78 f8 f8 fb dd f1 f5 fb fb f2 78 de f3 9e | | | ..x.....x.... | |
| 0170 | f6 9e 7b f5 b8 de f2 7a 97 b7 de f8 75 b7 78 b4 | | | ..{....z....u.x. | |
| 0180 | 5c fa f1 fa | | | | Highlighted contents described in table below |

Table 10: Contents of Second PTT Transmit Packet

| Field Value | Number of Bytes | Field Name | Notes |
|-------------|-----------------|--------------------|---|
| 10 | 1 | Op Code | PTT Transmit |
| 1a | 1 | Channel Number | 26 (first channel in paging range) |
| f2 11 15 11 | 4 | Host Serial Number | Last four bytes of phones MAC address (004f2111511) |
| 0d | 1 | Caller ID Length | 13 |

| Field Value | Number of Bytes | Field Name | Notes |
|---|-----------------|---------------------|--|
| 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76 09 | 13 | Caller ID | Melody Meserv |
| 00 | 1 | Codec | G.711 μ |
| 6f | 1 | Flags | Not applicable |
| ca 7c 95 5e | 4 | RTP Sequence number | |
| 7a f7 70 f4 7a... | 160 | Audio frame | Redundant frame (duplicate of last frame in previous packet) |
| d7 5f 7b 5a ba... | 160 | Audio frame | New audio frame |

The remainder of the PTT Transmit packets (34 - 174) are transmitted every 30 milliseconds. Each packet will contain two audio frames:

- A duplicate of the last audio frame from the previous packet
- A new audio frame

The data transmission is complete. The end of the broadcast is signaled by 12 PTT End of Transmit packets.

Table 11: End of PTT Transmission Packets

| Pkt No. | Time (seconds) | Source IP Address | Destination IP Address | Protocol | VLAN Info |
|---------|----------------|-------------------|------------------------|----------|---|
| 175-187 | 3.824994 | 192.168.1.103 | 224.0.1.116 | UDP | Source port: complex-link Destination port: complex-link |
| | | | | | End of Transmission packet |
| | | | | | Highlighted contents described in table below |

```

0000 01 00 5e 00 01 74 00 04 f2 11 15 11 08 00 45 00  ..^.t.....E.
0010 00 30 17 1e 00 00 40 11 c0 1b c0 a8 01 67 e0 00  .0....@.....g..
0020 01 74 13 89 13 89 00 1c a0 62 ff 1a f2 11 15 11  .t.....b.....
0030 0d 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76      .Melody Meserv
    
```

Table 12: Contents of End of PTT Transmission Packet

| Field Value | Number of Bytes | Field Name | Notes |
|-------------|-----------------|------------|---------------------|
| ff | 1 | Op Code | PTT End of Transmit |

| <i>Field Value</i> | <i>Number of Bytes</i> | <i>Field Name</i> | <i>Notes</i> |
|--|------------------------|--------------------|---|
| 1a | 1 | Channel Number | 26 (first channel in paging range) |
| f2 11 15 11 | 4 | Host Serial Number | Last four bytes of phones MAC address (004f2111511) |
| 0d | 1 | Caller ID Length | 13 |
| 4d 65 6c 6f 64 79 20 4d 65 73 65 72 76 | 13 | Caller ID | Melody Meserv |

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6001 America Center Drive
San Jose, CA 95002
USA



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