原 RTMPdump（libRTMP） 源代码分析 6： 建立一个流媒体连接 （NetStream部分 1）

2013年10月23日 00:41:04 阅读数：12730

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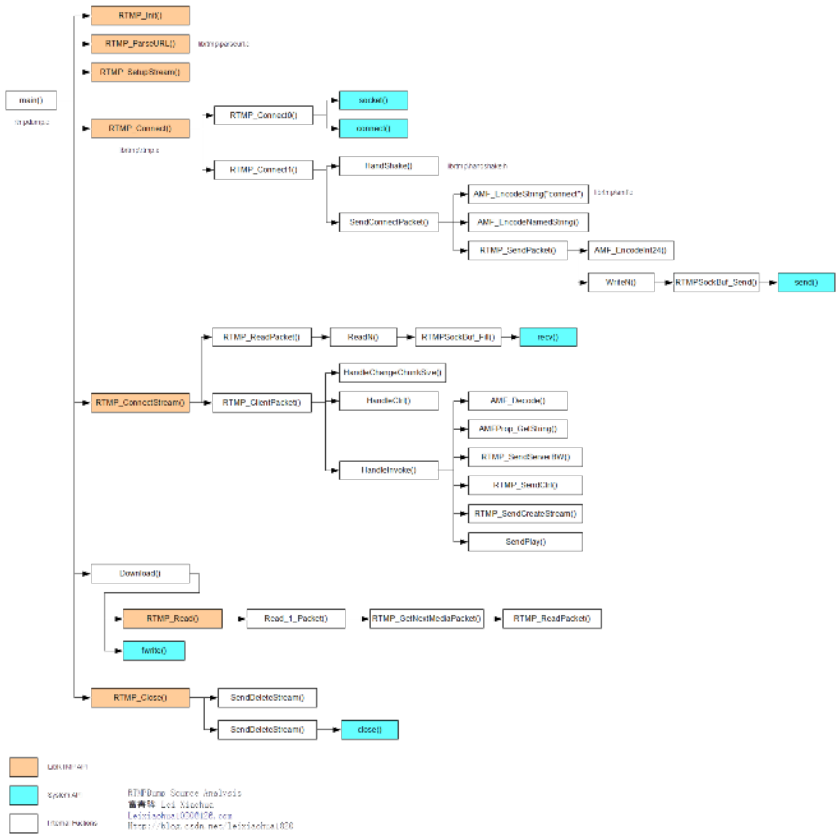
函数调用结构图

RTMPDump (libRTMP)的整体的函数调用结构图如下图所示。



单击查看大图

详细分析

前文已经分析了 RTMPdump中建立一个NetConnection的过程： RTMPdump 源代码分析 5： 建立一个流媒体连接 （NetConnection部分）

多余的话不多说，下面先来看看RTMP_ConnectStream()，该函数主要用于在NetConnection基础上建立一个NetStream。

RTMP_ConnectStream()

```cpp
//创建流
int
RTMP_ConnectStream(RTMP *r, int seekTime)
{
  RTMPPacket packet = { 0 };

  /* seekTime was already set by SetupStream / SetupURL.
   * This is only needed by ReconnectStream.
   */
  if (seekTime > 0)
    r->Link.seekTime = seekTime;

  r->m_mediaChannel = 0;

  while (!r->m_bPlaying && RTMP_IsConnected(r) && RTMP_ReadPacket(r, &packet))
    {
      if (RTMPPacket_IsReady(&packet))
    {
      if (!packet.m_nBodySize)
        continue;
      if ((packet.m_packetType == RTMP_PACKET_TYPE_AUDIO) ||
          (packet.m_packetType == RTMP_PACKET_TYPE_VIDEO) ||
          (packet.m_packetType == RTMP_PACKET_TYPE_INFO))
        {
          RTMP_Log(RTMP_LOGWARNING, "Received FLV packet before play()! Ignoring.");
          RTMPPacket_Free(&packet);
          continue;
        }
      //处理Packet！
      //----------------
      r->dlg->AppendCInfo("建立网络流：处理收到的数据。开始处理收到的数据");
      //----------------------------
      RTMP_ClientPacket(r, &packet);
      //----------------
      r->dlg->AppendCInfo("建立网络流：处理收到的数据。处理完毕，清除数据。");
      //----------------------------
      RTMPPacket_Free(&packet);
    }
    }

  return r->m_bPlaying;
}
```

乍一看，这个函数的代码量好像挺少的，实际上不然，其复杂度还是挺高的。我觉得比RTMP_Connect()要复杂不少。

其关键就在于这个While()循环。首先，循环的三个条件都满足，就能进行循环。只有出错或者建立网络流（NetStream）的步骤完成后，才能跳出循环。

在这个函数中有两个函数尤为重要：

RTMP_ReadPacket()

RTMP_ClientPacket()

第一个函数的作用是读取通过Socket接收下来的消息（Message）包，但是不做任何处理。第二个函数则是处理消息（Message），并做出响应。这两个函数结合，就可以完成接收消息然后响应消息的步骤。

下面来开一下RTMP_ReadPacket()：

```cpp
//读取收下来的Chunk
int
RTMP_ReadPacket(RTMP *r, RTMPPacket *packet)
{
    //packet 存读取完后的的数据
    //Chunk Header最大值18
  uint8_t hbuf[RTMP_MAX_HEADER_SIZE] = { 0 };
    //header 指向的是从Socket中收下来的数据
  char *header = (char *)hbuf;
  int nSize, hSize, nToRead, nChunk;
  int didAlloc = FALSE;

  RTMP_Log(RTMP_LOGDEBUG2, "%s: fd=%d", __FUNCTION__, r->m_sb.sb_socket);
  //收下来的数据存入hbuf
  if (ReadN(r, (char *)hbuf, 1) == 0)
    {
      RTMP_Log(RTMP_LOGERROR, "%s, failed to read RTMP packet header", __FUNCTION__);
      return FALSE;
    }
  //块类型fmt
```

```
  packet->m_headerType = (hbuf[0] & 0xc0) >> 6;
  //块流ID（2-63）
  packet->m_nChannel = (hbuf[0] & 0x3f);
  header++;
  //块流ID第1字节为0时，块流ID占2个字节
  if (packet->m_nChannel == 0)
    {
      if (ReadN(r, (char *)&hbuf[1], 1) != 1)
    {
      RTMP_Log(RTMP_LOGERROR, "%s, failed to read RTMP packet header 2nd byte",
          __FUNCTION__);
      return FALSE;
    }
      //计算块流ID（64-319）
      packet->m_nChannel = hbuf[1];
      packet->m_nChannel += 64;
      header++;
    }
  //块流ID第1字节为0时，块流ID占3个字节
  else if (packet->m_nChannel == 1)
    {
      int tmp;
      if (ReadN(r, (char *)&hbuf[1], 2) != 2)
    {
      RTMP_Log(RTMP_LOGERROR, "%s, failed to read RTMP packet header 3nd byte",
          __FUNCTION__);
      return FALSE;
    }
      tmp = (hbuf[2] << 8) + hbuf[1];
      //计算块流ID（64-65599）
      packet->m_nChannel = tmp + 64;
      RTMP_Log(RTMP_LOGDEBUG, "%s, m_nChannel: %0x", __FUNCTION__, packet->m_nChannel);
      header += 2;
    }
  //ChunkHeader的大小（4种）
  nSize = packetSize[packet->m_headerType];

  if (nSize == RTMP_LARGE_HEADER_SIZE)  /* if we get a full header the timestamp is absolute */
    packet->m_hasAbsTimestamp = TRUE;    //11字节的完整ChunkMsgHeader的TimeStamp是绝对值

  else if (nSize < RTMP_LARGE_HEADER_SIZE)
    {               /* using values from the last message of this channel */
      if (r->m_vecChannelsIn[packet->m_nChannel])
    memcpy(packet, r->m_vecChannelsIn[packet->m_nChannel],
           sizeof(RTMPPacket));
    }

  nSize--;

  if (nSize > 0 && ReadN(r, header, nSize) != nSize)
    {
      RTMP_Log(RTMP_LOGERROR, "%s, failed to read RTMP packet header. type: %x",
      __FUNCTION__, (unsigned int)hbuf[0]);
      return FALSE;
    }

  hSize = nSize + (header - (char *)hbuf);

  if (nSize >= 3)
    {
    //TimeStamp(注意 BigEndian to SmallEndian)(11，7，3字节首部都有)
      packet->m_nTimeStamp = AMF_DecodeInt24(header);

      /*RTMP_Log(RTMP_LOGDEBUG, "%s, reading RTMP packet chunk on channel %x, headersz %i, timestamp %i, abs timestamp %i", __FUNCTIO
, packet.m_nChannel, nSize, packet.m_nTimeStamp, packet.m_hasAbsTimestamp); */
    //消息长度(11，7字节首部都有)
      if (nSize >= 6)
    {
      packet->m_nBodySize = AMF_DecodeInt24(header + 3);
      packet->m_nBytesRead = 0;
      RTMPPacket_Free(packet);
    //(11，7字节首部都有)
      if (nSize > 6)
        {
          //Msg type ID
          packet->m_packetType = header[6];
          //Msg Stream ID
          if (nSize == 11)
        packet->m_nInfoField2 = DecodeInt32LE(header + 7);
        }
    }
      //Extend TimeStamp
      if (packet->m_nTimeStamp == 0xffffff)
    {
      if (ReadN(r, header + nSize, 4) != 4)
        {
          RTMP_Log(RTMP_LOGERROR, "%s, failed to read extended timestamp",
          __FUNCTION__);
          return FALSE;
        }
      packet->m nTimeStamp = AMF DecodeInt32(header + nSize);
```

```
        hSize += 4;
      }
      }

    RTMP_LogHexString(RTMP_LOGDEBUG2, (uint8_t *)hbuf, hSize);

    if (packet->m_nBodySize > 0 && packet->m_body == NULL)
      {
        if (!RTMPPacket_Alloc(packet, packet->m_nBodySize))
      {
        RTMP_Log(RTMP_LOGDEBUG, "%s, failed to allocate packet", __FUNCTION__);
        return FALSE;
      }
        didAlloc = TRUE;
        packet->m_headerType = (hbuf[0] & 0xc0) >> 6;
      }

    nToRead = packet->m_nBodySize - packet->m_nBytesRead;
    nChunk = r->m_inChunkSize;
    if (nToRead < nChunk)
      nChunk = nToRead;

    /* Does the caller want the raw chunk? */
    if (packet->m_chunk)
      {
        packet->m_chunk->c_headerSize = hSize;
        memcpy(packet->m_chunk->c_header, hbuf, hSize);
        packet->m_chunk->c_chunk = packet->m_body + packet->m_nBytesRead;
        packet->m_chunk->c_chunkSize = nChunk;
      }

    if (ReadN(r, packet->m_body + packet->m_nBytesRead, nChunk) != nChunk)
      {
        RTMP_Log(RTMP_LOGERROR, "%s, failed to read RTMP packet body. len: %lu",
        __FUNCTION__, packet->m_nBodySize);
        return FALSE;
      }

    RTMP_LogHexString(RTMP_LOGDEBUG2, (uint8_t *)packet->m_body + packet->m_nBytesRead, nChunk);

    packet->m_nBytesRead += nChunk;

    /* keep the packet as ref for other packets on this channel */
    if (!r->m_vecChannelsIn[packet->m_nChannel])
      r->m_vecChannelsIn[packet->m_nChannel] = (RTMPPacket *) malloc(sizeof(RTMPPacket));
    memcpy(r->m_vecChannelsIn[packet->m_nChannel], packet, sizeof(RTMPPacket));
    //读取完毕
    if (RTMPPacket_IsReady(packet))
      {
        /* make packet's timestamp absolute */
        if (!packet->m_hasAbsTimestamp)
      packet->m_nTimeStamp += r->m_channelTimestamp[packet->m_nChannel]; /* timestamps seem to be always relative!! */

        r->m_channelTimestamp[packet->m_nChannel] = packet->m_nTimeStamp;

        /* reset the data from the stored packet. we keep the header since we may use it later if a new packet for this channel */
        /* arrives and requests to re-use some info (small packet header) */
        r->m_vecChannelsIn[packet->m_nChannel]->m_body = NULL;
        r->m_vecChannelsIn[packet->m_nChannel]->m_nBytesRead = 0;
        r->m_vecChannelsIn[packet->m_nChannel]->m_hasAbsTimestamp = FALSE;   /* can only be false if we reuse header */
      }
    else
      {
        packet->m_body = NULL; /* so it won't be erased on free */
      }

    return TRUE;
}
```

在这里要注意的是，接收下来的实际上是块（Chunk）而不是消息（Message），因为消息（Message）在网络上传播的时候，实际上要分割成块（Chunk）。

这里解析的就是块（Chunk）

可参考：RTMP规范简单分析

具体的解析代码我就不多说了，直接参考RTMP协议规范就可以了，一个字节一个字节的解析就OK了。

rtmpdump源代码（Linux）：http://download.csdn.net/detail/leixiaohua1020/6376561

rtmpdump源代码（VC 2005 工程）：http://download.csdn.net/detail/leixiaohua1020/6563163

文章标签： rtmpdump rtmp 源代码 流媒体

个人分类： libRTMP

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