

Method of enabling a private IP terminal to receive multimedia data

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Abstract— A terminal connected to a router has a private IP address. When this terminal sends a data packet to the service system via the router, the router will change the private IP to a public IP, then tries to send the data packet to the server. The service system knows only the router's public IP as the destination address. So the response packet is delivered to the router, and the router cannot deliver it to the private network. In the paper, a means of solving this problem is proposed. As this method enhances the service quality, user satisfaction improves.

Keywords— private IP, internet video phone, NAT, multimedia data stream

I. INTRODUCTION

Internet video phones enable video telephony and multimedia data communications. But an internet phone is connected to a router and also has a private IP. The application service system recognizes the router's public IP address as a destination address. In other words, the service system does not know the private IP information of an internet videophone user. In this paper, a means is developed by which a service system can know the private IP address of a user. Also, a method for the transmission of multimedia data is introduced that will still function in the event of an error.

II. PRIVATE & PUBLIC NETWORK SERVICE SCENARIOS AND DATA FLOW

A. Service Design and its Network Environment

The internet phone which has a private IP requests the multimedia data to the application server, but the application server knows only the modem's public IP not the internet phone's private IP. This status is the fact that the modem translates the private IP to the public IP when data is transporting to the server. This shows in Figure 1

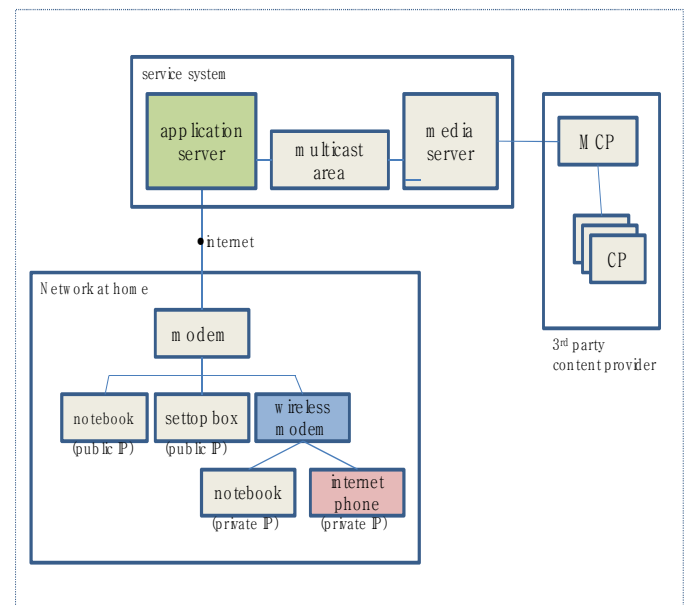


Figure 1. Service System Design

This Figure 1 is consists of three parties.

- home internet and IP terminals at home
- service server system (application server, multicast part, media server)
- main content provider and content providers

B. The Scenario and the Multimedia Data Flow Transporting to the Private Network

The service scenario description is below..

- 1) the terminal sends a multicast data request to the application server with TCP/IP protocol.
- 2) the application server will respond to the terminal through TCP/IP with the UDP IP address and its Port.
- 3) Then the terminal resends multimedia data request to the application server with UDP protocol until the UDP network is connected.
- 4) By analysing the input UDP header, service system can get a terminal's UDP IP address and port information. If the router is connected to the terminal service system, while maintain the UDP session with the IP ports are sent in an RTP packet. IP and Port for RTP data are sent serially to a

given destination.
from the application server to the terminal, then the application server sends the multimedia data to the destination by UDP IP and port.

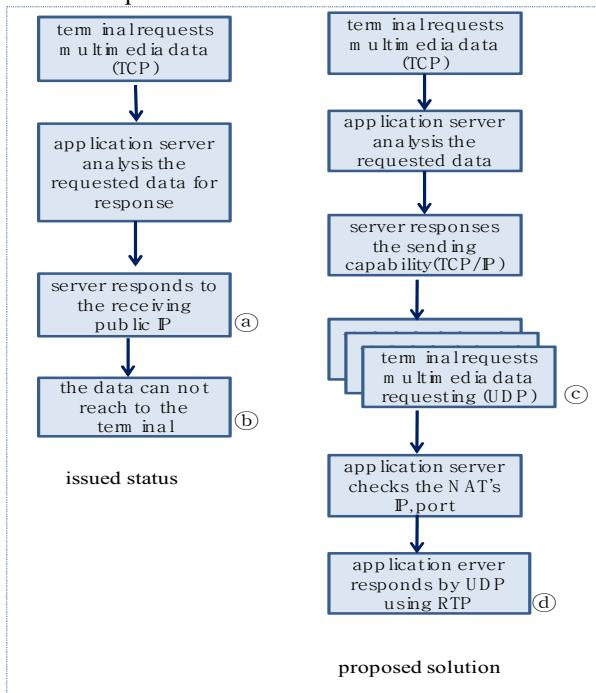


Figure 2. the issued point and the proposed solution

1) **Former method, also known as data transfer:** client requests the user of TCP for multimedia data. But after sending and receiving TCP the server and the client's session disconnected. Multimedia data is delivered to the public IP, but the router does not have private IP information. Therefore, multimedia data can not be transmitted to the terminal.

2) **Proposed method:** In this scenario, TCP, UDP protocol is used. Terminal makes a request to the server (TCP). The server will respond (TCP). Terminal makes a request to the server (UDP). The server is responding (UDP). Between the terminal and the server the UDP session is formed. While UDP is maintained the terminal receives multimedia data from the server.

According to the data flow diagram below, this ure makes a distinction between TCP and UDP communication. TCP communication is represented by the black area in Figure 2, while the red part shows communication with the UDP. Multimedia data is transmitted in the red part in Figure 2.

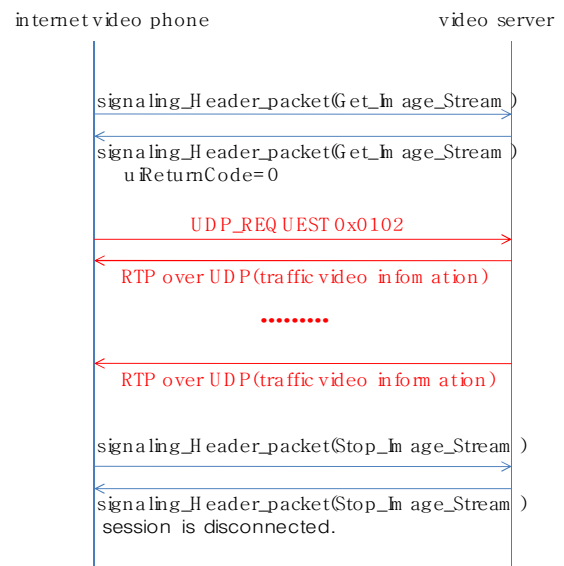


Figure 3. Terminal scenarios for receiving video data stream

A. Terminal Scenario for Receiving Multimedia Data

The VoIP Internet phone terminal should provide UDP communication. The following describes a scenario where the terminal is controlled.

1) Internet phone sends the signalling header packet to the server.

2) Internet phone request the UDP packet to the server.

3) Press 'multimedia data off' in the terminal, and then the terminal sends the stop request (TCP). Or, the UDP session is disconnected by a timeout between the server and the terminal

The multimedia data request or stop requesting structure is shown below.

```

typedef struct
{
    unsigned    int uCommand;           /*request or stop the video stream */
    unsigned    int uCid;               /*Content ID*/
    char        szVideoIp[];            /*RTP receiving P*/
    unsigned    int uVideoPort;         /*RTP receiving port*/
    char        szVideoCodec[];         /*receiving video codec*/
    char        szAudioIp[];            /*RTP receiving P - voice*/
    unsigned    int uAudioPort;         /*RTP receiving port - voice*/
    char        szAudioCodec[];         /*receiving voice codec*/
    unsigned    int uWidth;             /*video size-horizon*/
    unsigned    int uHeight;            /*video size-vertical*/
    unsigned    int uReturnCode;        /*server result code */
    char        szPhoneNum[];          /*VoP phone num ber*/
}SIGNALING_PACKET;

```

Figure 4. Data structure for communication

B. Service System Handles the Video Data

1) Server Integration Architecture

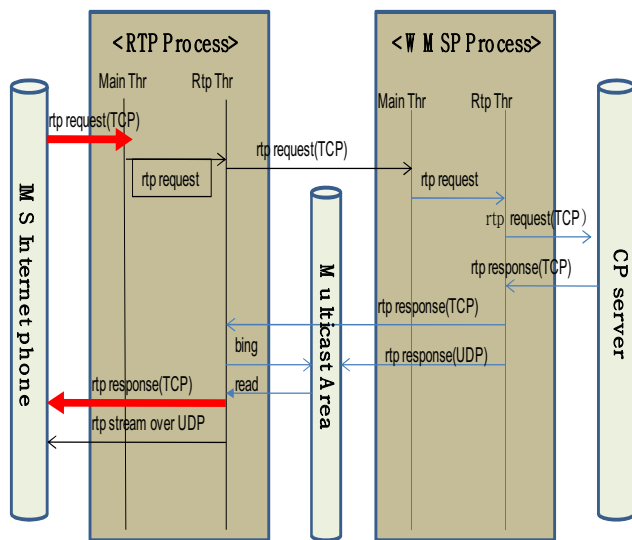


Figure 5. Server system architecture

Service system consists of ASM, MSM and a multicast area. ASM handles the request of the terminal and MSM in conjunction with the MCP receives the video content coming.

Multicast region is between ASM and MSM and it provides the same content which already it has.

(1) RTP request (TCP): Multimedia data request message is forwarded to ASM from the terminal.

(2) RTP response (TCP): ASM sends the multimedia request message to MSM. MSM delivers the requested multimedia content to the multicast area.

C. The Multicast Area Structure



Figure 6. Multicast area structure

(1) The basic structure of the content ID and the multicast area is matched on a 1:1 basis.

(2) Multicast is a shared area of multimedia data. Multicast area for the same data maintains one connection with ASM.

(3) For example, multimedia data(1) is kept at the multicast area, and the multicast area is available to respond to the ASM.

D. Main thread and RTP thread roll in the multicast area

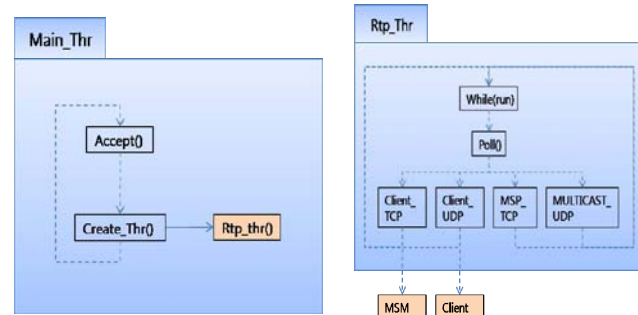


Figure 7. Main thread & RTP thread structure

TABLE 1. MAIN THREAD & RTP TREAD

thread type	description
main thread	① Thread creation: 1:1 session between terminal and the service system ② Thread is assigned a number generated. The RTP thread is to manage the session. ③ Thread has a maximum number. If you exceed this, an error is returned and control signal the switch over to the next ASM.
rtp thread	① Poll: Thread waiting for the request analyses the input message. ② Client TCP: TCP message comes in, then response to the requester or thread is requested to MSM. ③ Client UDP: Multimedia data in the multicast area is sent to the client in the form of RTP of UDP. ④ MSP_TCP: MSM requests or responds to the message. ⑤ MULTICAST_UDP: Multimedia data is sent to the multicast area from MSM, and the thread reads this. Multicast area checks the video data from MSM and then as soon as it gets it, it catches the data.

Figure 7 shows the input/output parameters in the terminal predefined image display. Next is the input parameter definition for displaying the alternative video.

• I/O parameters



Figure 8. Data structure for the multicast area

(1) When each client program is running, it is managed through the memory allocated.(Signaling, packet information, use, mutex, conditional etc)

(2) Main Thread receives a client request, then gives a non-use memory assigned. Also checks whether to use ('nUse')

III. PROVIDING ALTERNATIVE IMAGES FOR MULTIMEDIA DATA TRANSMISSION ERROR

A. Why the Alternative Image is Needed

An internet video phone can not display the image when the CP(content provider) video servers, service systems, multicast area and the connecting network happen to have an error. However customers wondering at the cause of the failure will lose their faith in the reliability of the system. Therefore the terminal is to display a pre-defined terminal image to replace the normal image in the case of failure.

The error cases are as follows.

TABLE 2. ERROR TYPE DURING THE DATA TRANSPORTING

number	error type
0	normal
1	video receiving error
2	unknown content id
3	IP address error
4	port error
5	transmission failure (sending port creation failure)
6	unsupported codec
7	unsupported resolution

```
typedef struct _RtpThread Info {
    int nSrcType;           // SRC_TYPE_M YLIVE, SRC_TYPE_FILE
    int nStarted;           // 1: received ASM request
    int nPfd Idx;
    RTP_POLLFD *pPfd;
    unsigned int nCurCid;
    int nNum Frame;
    unsigned int unStartSec; // RTP Start time
    unsigned int unStartM Sec;
    int nSentM Sec;
    RtpStream Info Stream Info;
    SIGNALING_HEADER_PACKET shpSend;
    // Transcoder info --
    int nWaitingJpeg;
    // waiting for JPEG image from M yLive Server1: received ASM request
    unsigned int *yuv;
    CParam *param s;
    Bits *bits;
    // File Stream er info --
    avi_handle* hAvi;
    int nStream Idx;
    int nFrameInterval;    // m sec
    unsigned char* avBuf;
    int nFrameSize;
    int nKeyFrame;
} RtpThread Info;
```

Figure 9. Data structure of the RTP thread

IV. DISPLAYING THE MULTIMEDIA DATA TO INTERNET PHONE

Through the UDP session the internet phone with private IP gets multimedia data and display within the LCD.



Figure 10. internet phone LCD screen(multimedia data)

In the error case, internet phone controls by itself and then display another image to the LCD screen.



Figure 11. internet phone LCD screen(error case)

V. CONCLUSIONS

In this paper, a solution method is introduced that enables the creation and maintenance of a video communication session when using a router for a private network and public network. This method needs not a session border controller device, but the solution is made only with the session control. As IP devices are increasing at home and at the office, this method is useful for providing multimedia service. The session management service is available in the field in KT internet video phone.

REFERENCES

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