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Control and Media Sessions: IAX with RSW Control Criteria

Manjur S Kolhar[1], Anas. F. Bayan[1], Tat Chee Wan[1], O. Aboubdalla[1] and R. Sureswaran[1]
[1]National Advanced IPv6 Center of Excellence (NAv6) School of Computer Sciences, Universiti Sains Malaysia (USM)
11800 Minden, Penang, Malaysia.
{manjur, omar, tcwan and sures}@nav6.org

***Abstract*- This paper discusses technical issues related to delivery and control of IP multimedia services, such as multimedia conferencing, involving heterogeneous end terminals. In particular, it proposes the design of an experimental system for interworking between InterAsterisk eXchange Protocol and RSW session and call control signaling protocols. This IP videoconferencing interworking system is composed of two core units for supporting delivery of sessions and streams. These units perform various translation functions for transparent establishment and control of multimedia sessions across IP networking environment, including, session conversion, media conversion and address translation.**

***Keyword*- IP, IAX, RSW, Multimedia, Session Signaling Protocol Interworking.**

I. INTRODUCTION

Internet video conferencing and IP telephony have grown rapidly in the last few years. This rapid expansion and potential underlies the importance of an interworking. Multimedia technology promises to make smooth and very effective interactions among participants in different geographical areas. The growing need to support technical and group discussions, board meetings that occur across geographical distances have not been fully satisfied by the current technologies of phones, faxes, electronic mail, and video conference rooms. Visions of systems that allow people from around the world to see and hear each other have been promoted at least since AT&T unveiled the PicturePhone in the mid 1960's. The presence of multimedia communication in any organization and academic is considered to be beneficial in terms of decision making and cost saving. Many researches out come say that group/team who involved in decision making are more efficient in making decisions than individual [1]. The development of high speed network communication technologies have posed the growing demands of the distributed multimedia applications, at the same time it brings a series of new competitive signaling protocols such as SIP,H.323,RSW and IAX.

The video conferencing has become important media to have professional group discussions and to have communication with loved ones. The video conference technology is growing, as of now there are many different protocols are in use in videoconferencing systems. One of the protocols used is RSW control protocol, which is used in the development of the Multimedia Conferencing System called MCS [2] [3]. Another protocol called InterAsterisk eXchange or InterAsterisk eXchange Protocol [4] is also widely used for initiating an interactive user session that involves multimedia elements such as video and voice. Most of the IP telephony vendors are considering the InterAsterisk eXchange protocol as there VoIP protocol. Therefore, in order to achieve universal IP connectivity and Seamless IP multimedia services, well defined interworking procedures between RSW and IAX endpoints is required.

This paper is organized into 4 sections; **II** briefly describe RSW and IAX in terms of signaling and media handling. **III** propose possible architecture to bridge them together to have seamless end to end connectivity. In **IV** we posted discussions on some important issues, and **V** is a conclusion of this research paper.

II. MULTIMEDIA PROTOCOL

A. RSW

The idea of physical round table meeting is implemented in the RSW Control Criteria [5][6]. The RSW Control Criteria is focused more on badwidth reduction when a lot of people using the MCS system and priortizing the participants to avoid confusion when every body speaks up during confrence. In any round table meeting or multimedia conference is made up of a conference chairman, participants and passive observers. The chairman person of the conference is the organizer of the conference, while other conference members can be participants or observers. The RSW control criteria have the following privileges:

- Equal Privileges
- First come first serve
- First come first serve, with time-out
- Organizer Main site
- Restricted Active sites
- Observer sites

The participant can use these options or a combination of these, to control a conference and to avoid contradictions. RSW control protocol was designed and developed in late 1993 as a control mechanism for multimedia conferencing by the Network Research Group in School of Computer Sciences, University Sciences Malaysia (USM). Now, till date MCS version 6.1 is released.

The RSW uses the IP network protocol. The control or signaling will be used during the following control messages, and will be carried out with the help of TCP/IP protocols:

1) Create a Conference

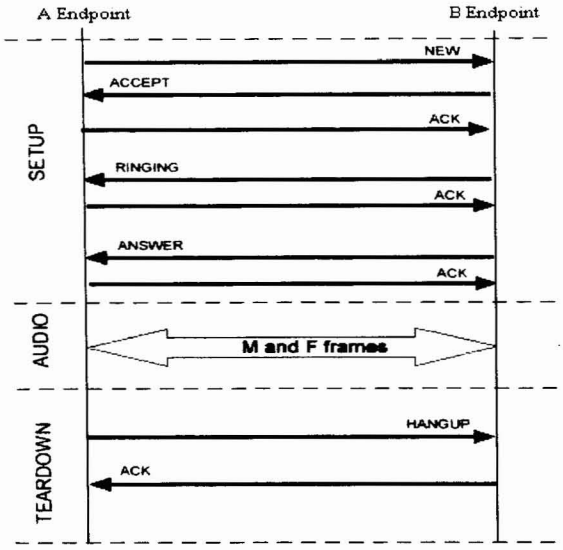

Figure 1. IAX Communication
(Source: http://www.voipforo.com/en/IAX)

2) *Join a Conference*
3) *Active Site Request*
4) *Active Site Request Release*
5) *End of Conference*
6) *Modify a Conference*

The transport protocol varies depending upon the data it carries. The audio and video will be transported using the UDP protocols.

B. *IAX Protocol*

There are more than one protocol are available to handle signaling and multimedia sessions, such as SIP [RFC 3261], MGCP [RFC435], and MEGACO/H.248 [RFC3525]. In general these protocol support streaming of many data types. Like SIP commonly uses Session Descriptive protocol [SDP] [RFC 4566] to specify Real Time Protocol [RTP] [RFC3550]. This idea allows great flexibility but again leads further overhead. We saw in NAT architecture, the SIP performance is very bad and so as security [7].

The IAX protocol or InterAsterisk Exchange Protocol was developed by Mr. Mark Spencer for Asterisk for VoIP signaling. IAX (InterAsterisk Exchange Protocol) has emerged as a third VoIP protocol which is gaining more widespread attention, particularly among the open source community. Like SIP, IAX is a peer-to-peer VoIP protocol with capability for signaling as well as media transfer.

Efforts are being made to make IAX protocol as IETF standard protocol. (The IAX protocol uses both signal and data in a single UDP stream). IAX is a matured protocol and is very simple protocol. It is able to handle common types of media streams. The main focus of IAX protocol is to have minimum bandwidth and low overhead. [8].

Fig 1 depict a typical communication message flows between two IAX communicating parties. The M and F frames are sent between two endpoints A and B. Each flow is of IAX Mini Frames (M frames) which contains 4 byte of header. The flow is supplemented by periodic Full Frames (F Frames) this includes synchronization information.

III. PROPOSED COMMUNICATION TRANSLATION PROTOCOL

A. *RAIS Architecture*

Computer networks today require the interconnection of heterogeneous networks obeying different architecture and protocols.

The proposed translation RAIS protocol is based on the above mentioned protocols that we used to bridge communication between RSW control protocol and IAX control and data protocol. This RAIS will perform the function of a translator so that any MCS client user can communicate with IAX client (IAX soft phone and IAX hard phone) and vice versa.

The translation between RSW and IAX is based on MCS version 6 and IAX version 2 which is called IAX2. The major goal of interworking between RSW and IAX2 is continuous support of signaling and data sessions. The proposed server provides the translation of RSW and IAX and is called RAIS.

The IAX can be used in the client to client architecture and client server architecture[4]. In this paper we discuss IAX client server architecture. The following modules will be involved in the interworking between RSW and IAX:

1) *MCS Server:* The MCS server is an entity on the network that performs the functions of a controller to a conference. It provides users a platform to register/login to participate in conferences. It also provides other services such as multicast address assignments and providing damage control when links break.
2) *MCS Client:* A MCS client is an endpoint on the network, which provides the real-time, two ways or multiple way communication consists of control, indication, audio, and video/data between the MCS clients.
3) *Translator server (RAIS):* It makes interworking between MCS and IAX. The MCS part of the RAIS is the part of the RAIS that terminates and originates the MCS signaling and data from and to the MCS network respectively. The IAX part of the RAIS is the part of RAIS that terminates and originates IAX network respectively. Fig. 2 illustrates our purpose. The RAIS is a server composed of two sides: RSW side and IAX side performing two-ways signaling translation between RSW and IAX domains.
4) *IAX Client:* This is a client based on the IAX2 protocol; it should be registered before making any calls.

B. *RSW side sessions*

The RSW side of the RAIS is part of the RSW, originates and terminates RSW calls from and to RSW network. We call this function as **RSW_TO_IAX.** All the clients who logged into the RSW domain are also having presence in the RAIS server and vice versa. This **RSW_TO_IAX** signaling allows a RSW to call IAX client. RSW client talks to IAX with RSW specification. The **RSW_TO_IAX** gets an INVITE message from the RSW client, **RSW_TO_IAX**

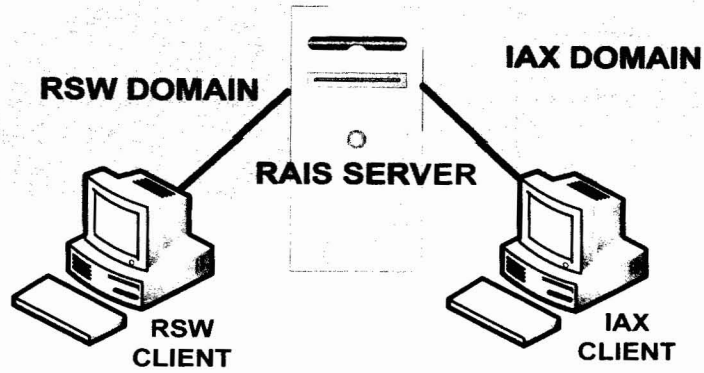

Figure 2. Translation Server

sends message to the IAX client about the call. When the session and the services are done, the **RSW_TO_IAX** sends messages to both the clients, OK (message) to RSW client and ACK to the IAX client

The following are steps for the call between User A (RSW client) and User B (IAX client):

Step a: RSW user A sends a "CREAT CONF" request to User B IAX client. This invitation is for the peer to peer conference. The CREAT CONF request contains: (1) The USER B's address will be present in the CREATE CONF" message in the form RSW URI format, (2) A unique number and time will be assigned to the conference, and (3) CODEC information will be sent.

Step b: When **RSW_TO_IAX** receives "CREATE CONF" request from the USER A. It checks and translates the destination number (USER B, is IAX client) to IAX URI format then sends "NEW" to the User B IAX client. This "NEW" message contains codec information of the called client that can be included in the codec information. The RSW_TO_IAX should perform one for the following actions: (1) Send a REJECT response, (2) Challenge the caller with an "AUTHREQ" response, Accept the call using "ACCEPT" message (BUSY, PROCEDDING, RINGING or ANSWER), and (3) Abort the connection using "HANGUP" message, although the "REJECT" message is preferred.

Step c: **RSW_TO_IAX** sends "WAIT" message to the user A if at all the User B "ACCEPTS" the call.

Step d: The peers have knowledge of each other. They exchanged their media capabilities, which are handshaking of CODEC related information between RSW client and IAX client.

Step e: It attaches the service of the peers and record of the conference.

1) *Time of the conf:* At the time the "CREAT CONF" called.
2) *Codec used:* This is very important area to settle down the codec to be used by these two endpoints.
3) *Conference ID:* This unique Identity will be created by the MCS server to differentiate between the conferences.
4) *User list:* This is also very important to keep the user's lists who are involved in the present conference. Fig. 4 illustrates all the above steps.

C. IAX side sessions

The IAX side of the **RAIS** is called IAX_TO_RSW, which handles the signaling from the IAX to IAX_TO_RSW. The IAX_TO_RSW signaling allows an IAX client call to the RSW client.

Following are the process, when the User A, IAX client calls the User B RSW client:

Step a: IAX user A sends a "NEW" request to User B IAX client. This invitation is for the peer to peer conference. The "NEW" request contains: A unique version number, Caller ID, Codec preference, calling presentation, Calling TON, Calling TNS, and Calling Format.

Step b: When **IAX_TO_RSW** receives "NEW" request from the USER A. It checks and translates the destination number (USER B, is RSW client) to RSW URI format then sends "CREATE CONF" to the User B RSW client. This "CREATE CONF" message will contain codec information of the called client. The **IAX_TO_RSW** should perform one for the following actions: (1) Send a "REJECT" response, (2) Accept the call using ACCEPT message (BUSY), or (3) Abort the connection using HANGUP.

Step c: If and only if the User B accepts the call, then **IAX_TO_RSW sends** "ACK" message to the user A.

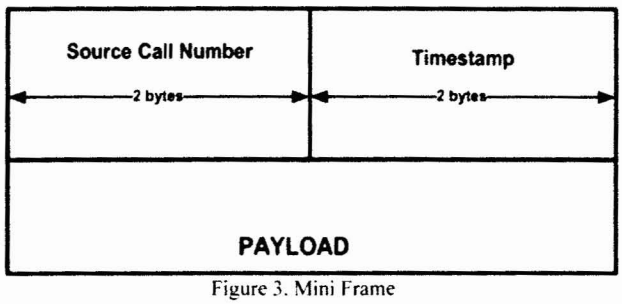

Figure 3. Mini Frame

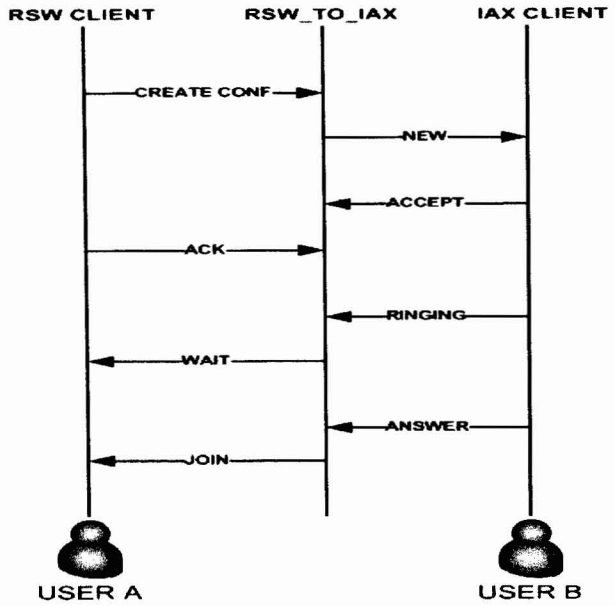

Figure 4. RSW_TO_IAX

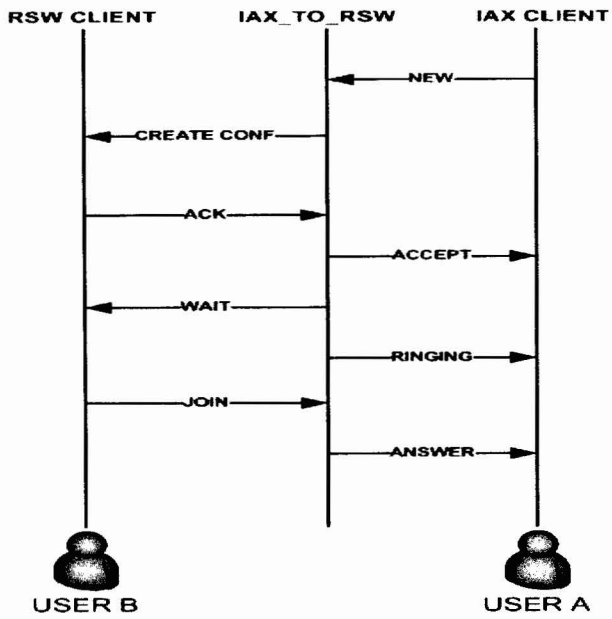

Figure 5. IAX_TO_RSW

Step d: The peers have knowledge of each other. They exchanged their media capabilities, which are handshaking of CODEC related information between IAX client and RSW client.

Step e: It attaches records such as unique version number, Caller ID, Codec preference, Calling presentation, Calling TON, Calling TNS, Calling Format, time of the conf, Caller ID, Codec preference and Calling presents to the running conference. Fig. 5 illustrates all the above steps.

D. Media Sessions

RSW and IAX have very negligible differences for supporting the exchange of voice packets. Once the session is setup the RSW client will be busy in handling voice packets. The IAX depends on its IAX mini frame architecture. These mini frames only have a 4-byte header which is composed of the source call number and lower two octets of the timestamps. Both protocol uses different codec's. The following algorithm will be used for the conversion of media:

Step 1: Read the request

Step 2: Check the request if MCS client calling IAX client then do check up address translation unit to convert destination address into URI format [4]. If destination endpoint is on-line send "trying" .If IAX calling MCS, then convert the address format to MCS addressing format. Then jump step 7.

Step 3: Send NEW packet to the IAX client, wait till get reply. If get "ACCEPT" reply, do reply back by sending ACK.

Step 4: If get reply from the IAX client "Ringing", then send "ringing" to MCS client and send IAX client "ACK". Send "ANS" to the MCS client.

Step 5: Strip the mini frame into one frame and send to the MCS client, and vice versa.

Step 6: The above continue until any of them hang-up.

Step 7: Send NOTIFY message to the MCS server, wait till get reply from the MCS server. If get "join" then send ACK to the IAX client and CONF info to the MCS server.

Step 8: Prepare mini frames to send to the IAX client, and vice versa.

IV. DISCUSSION

The RSW and IAX signaling technique appears very much similar in nature. Messages for both protocols can be grouped into two sections namely "REQUESTS" and "RESPONSES". IAX signaling utilizes full frames which have header size of 12 Bytes and adjustable to suit a wide variety of control signals. For basic sessions like call set up and teardown, RSW and IAX behave very similar.

We have seen that RSW performance better when it comes to NAT and firewall [7]. IAX has the ability to bypass the firewall and NAT [4].

RSW and IAX have very negligible differences for supporting the exchange of voice packets. Once the session is setup the RSW client will be busy in handling voice packets. The IAX depends on its IAX mini frame architecture. Fig 3, These mini frames only have a 4-byte header which is composed of the source call number and lower two octets of the timestamps. The quality and performance of any multimedia protocol depends on the codec it uses. Both protocols have been using number of codec's.

Diversity and heterogeneity of multimedia endpoints and services characterize today IP networking environment. Consequently, interworking becomes a critical issue for resolving the differences in these elements and enabling seamless provision of audiovisual applications across networks. Interworking is a way of making different communicating systems cooperate to perform a particular service. In this paper, we discussed protocol translation to

achieve interoperability between the IAX and RSW. It is different with other related protocol conversions such as RS232 to IP and IP to RS232 convertors, in the sense that one has to add translator server RAIS middle between IAX client and RSW client to get seamless end-to-end connectivity. However, this approach considers almost all the transition sequences on the intended interworking functions between these two protocols.

V. CONCLUSION

For guaranteeing a seamless end to end connectivity for RSW and IAX heterogeneity network multimedia terminals, we have proposed solution to these interworking problems. Currently, we are implementing prototype system. In the near future, we will evaluate and analyze the prototype system and obtained knowledge will show that relation among media, resource and session parameters. However, the required knowledge for translation entity for IAX and RSW server is acquired.

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