ISSN No. 0976-5697

Volume 3, No. 1, Jan-Feb 2012

International Journal of Advanced Research in Computer Science

RESEARCH PAPER

Available Online at www.ijarcs.info

Performance Modeling using RSVP for QoS Support for Audio and Video signal over Next Generation Network.

B. K Mishra
Principal,
Thakur College of Engineering and Technology
Thakur Village, Kandivali (East),
Mumbai-400101
drbk.mishra@thakureducation.org

S.K Singh*
Research Scholar
Mukesh Patel School of Technology Management and Engineering
NMIMS, University, Santacruz Mumbai-400056
sksingh14@gmail.com

Ruchi Shah
PG Student
Thakur College of Science and Commerce,
Thakur Village, Kandivali (East), Mumbai -400101
rshah_0210@yahoo.com

Abstract: This In the near future there will be demand for seamless service across different types of network, so it's a significant issue of how to guarantee the quality of service (QoS) and support a variety of services. The challenges of new communication architecture are to offer better quality of service (QoS) in internet Network. A large diversity of services based on packet switching in 3G network and beyond 3G leads dramatic changes in the characteristics and parameter of data traffic. In this paper we propose uses of RSVP protocol for real-time services to guarantee the QoS in heterogeneous networks. The uses of RSVP protocol in a different internetworking scenario and mobility management have been extensively discussed over the last decade [1]. As a resource reservation mechanism, the Resource Reservation Protocol (RSVP) faces a lot of challenges when applying it to wired, wireless, and Mobile Network. Through this paper packet end to end delay and packet delay variation is evaluated over variable bandwidth through simulation. Results are compared with and without using RSVP. Result shows with the uses of RSVP, it has better quality of service in a voice based and Video based services. Simulation is done using OPNET.

Keywords: QoS-Quality of service, NGN-Next generation network, RSVP- Reservation Protocol, Heterogeneous networks, VOIP, FTP, and OPNET.

I. INTRODUCTION

Resource Reservation Protocol (RSVP) is a proposed IETF standard for requesting and negotiating resource allocations between end users and networks or among network components. RSVP is broadly accepted in different QOS mechanisms. As a signaling protocol, RSVP has different functionalities in different QOS mechanisms. RSVP describes a conversation between end stations requiring a reserved segment of network bandwidth, and the intervening routers of the network responsible for providing that capability. This conversation allows each router in the path between a 'sender' and a 'receiver' to determine if it has sufficient bandwidth to support the new traffic request. If enough resources exist from end to end, the connection is allowed.

In IntServ, RSVP is used for specifying resource requirements of real-time flows. A sender that wishes to initiate a session issues a PATH message to the corresponding receiver, containing traffic parameters and QOS requirement of the sending application. The receiver then generates a RESV message to request the resources in each node along the path. The intermediate nodes may accept or reject the request when receiving RESV. If the sender successfully receives the RESV message, meaning that the end-to-end resources have been reserved for the flow, the sender starts to transfer data. In DiffServ, the Expedited Forwarding (EF) service is suitable for Internet Telephony and videoconferencing [2] [3]. However, EF services are expensive and ISPs are more likely to support dynamic Service Level Agreements (SLAs), which allow customers to request EF services on demand without subscribing to them.

II. MAINTAINING QUALITY OF SERVICE

In multimedia based services QOS is essentially having two phases. Initial setup phase and real-time multimedia exchange phases. In the audio based application, end to end transmission delay should be small enough so that interference should not affect the normal conversation. Resource Reservation Protocol (RSVP) is a widely accepted IETF standard to do resource negotiation between end users and network components to make sure that enough transport resources are provided to deliver multimedia flows promptly. In the generic Internet based solutions, call signaling and resource negotiation are handled by separate protocols [4]. A number of studies based on the integration of call signaling with resource negotiation and maintaining quality of service over next generation network can be found in the literature [5][6]. In order to provide a requested QOS, the nodes of a network must perform session initiation phase, reservation setup, admission control, policy control, packet scheduling, and packet classification functions.

A reservation setup protocol is used to pass the QOS request originating in an end-system to each router along the data path, or in the case of multicasting, to each router along the branches of the delivery tree. In particular, RSVP can be used for the reservation setup protocol for heterogeneous network [7].

An RSVP reservation request is basically composed of a *flowspec* and a *filter spec*. The flowspec defines the desired QOS, and the filter spec defines the subset of the data stream, an elementary reservation request contains the following information that is saved in the reservation state.

III. NETWORK DESIGN AND CONFIGURATION FOR RSVP

In order to meet requirements for Next generation Network, some proposal can be used such as MRSVP [8], RSVP Flow Transparency and Localized RSVP attempted to resolve mobility issues with RSVP. However, due to the complexity and difficulty in supporting large signaling messages, mobility, congestion control and security, these approaches which were directly derived from RSVP failed to achieve wide acceptance [9][10].

It is also required to separate of reservation functionality with signal routing functionality. Some of approaches already discussed in past address mobility but none of them demonstrates a greater extensibility in supporting various signaling services. Therefore, it is required to separate its general signaling functionality from application-specific signaling functionalities, known as "Two-Level Architecture for Internet Signaling".

A basic architectural principle is that integrated services are an optional extension to the underlying best-effort data delivery of the Internet; best-effort service must always be available. Since multicast forwarding must function whether or not there are reservations, the natural modularity is to separate reservation from routing, making RSVP a pure reservation setup protocol. This separation allows RSVP to operate with the wide variety of present and future routing protocols in the Internet, with minimal changes.

The network model consists of two routers having three kinds of traffic sources, FTP application, and one VOIP application without RSVP, one VOIP application with RSVP and Video Conferencing application. The link connecting the two routers is the bottleneck in the communication. Here the performance of voice caller and voice RSVP caller is evaluated by varying the capacity of bottleneck link to 10 Mbps, 100 Mbps and 1Gbps. and also by varying maximum reservable bandwidth available for RSVP enabled clients to 35%, 50% and 75%.

The following network design has been taken into consideration. At the first step single traffic is used for each of the functions such as FTP, Video Conferencing and VOIP which is shown in Fig. 1. For 3G and 4G requirement the basic architecture can be modified with reference of Bandwidth. A reference bandwidth of 50 Mbps to 100 Mbps is considered for Next Generation Network and tested multimedia content delivery over this network.

In this current research work the architecture has been modified and a reference bandwidth up to 1Gbps is considered and tested multimedia content delivery for audio and video signal. For both the signal packet end to end delay and packet delay variation is measured. The bellow configurations applied in the Opnet simulator and evaluated the results.

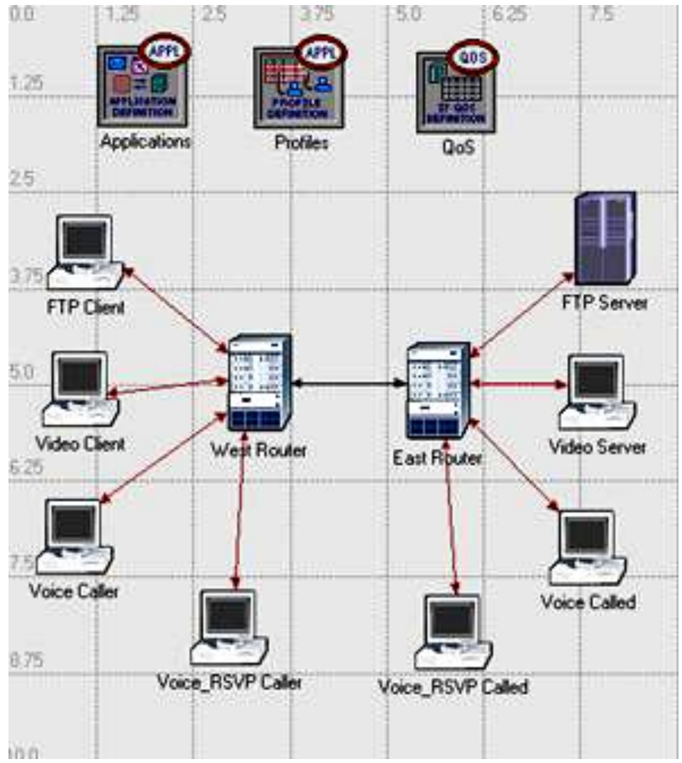

Figure 1. Network Architecture for RSVP

IV. SIMULATIONS RESULTS AND ANALYSIS

Simulation has been done using OPNET software for variable bandwidth condition. RSVP must be enabled on each link in the network. The parameters required for RSVP includes the "maximum bandwidth of the link" that it is allowable to use for high priority reserved traffic. Here the evaluation has been done for 10Mbps, 100 Mbps and 1Gbps which are the expected bandwidth of 3G and 4G networks. packet end to end delay and packet delay variation is measured. It is tested for voice traffic and video conferencing. Results have been compared with and without RSVP.

Table 1 shows the detail analysis of packet end to end delay in seconds for video content over variable bandwidth. Results have been taken with and without RSVP. Results shows packet end to end delay is comparatively less in RSVP. Table II shown the detail analysis of packet delay variation in seconds for video content over variable bandwidth. Here also results have been considered for both cases i.e. with and without RSVP. Results show packet delay variations is very less in RSVP.

Table III and IV shows statistics for voice content. It also justifies that packet end to end delay and packet delay variation is less while using RSVP. A detailed comparative analysis has been done by considering variable bandwidth condition and packet delay variation and packet end to end delay is plot which is shown from fig 2 to fig 9.

Table 1: Statistics of packet end to end delay for video over variable bandwidth

Bandwidth For Video	**Maximum Reservable Bandwidth**	**Packet End To End Delay (Sec)**	
		Non RSVP	**RSVP**
10 Mbps	35%	1.86466	0.332926
	50%	1.49345	0.332942
	75%	0.773023	0.332926
100Mbps	35%	1.836	0.330171
	50%	1.45591	0.330171
	75%	0.734879	0.330171
1 Gbps	35%	2.4002	0.280995
	50%	1.45649	0.281072
	75%	0.747525	0.281072

Table 2: Statistics of packet delay variation for video over variable bandwidth

Bandwidth For Video	**Maximum Reservable Bandwidth**	**Packet Delay Variation (Sec)**	
		Non RSVP	**RSVP**
10 Mbps	35%	0.779555	0.0120076
	50%	0.478386	0.0120076
	75%	0.119402	0.0120076
100Mbps	35%	0.822042	0.0119619
	50%	0.478435	0.0119619
	75%	0.118891	0.0119619
1 Gbps	35%	0.893909	0.00637832
	50%	0.511725	0.00637968
	75%	0.13497	0.00637968

Table 3: Statistics of packet end to end delay for voice over variable bandwidth

Bandwidth For Voice	**Maximum Reservable Bandwidth**	**Packet End To End Delay (Sec)**	
		Non RSVP	**RSVP**
10 Mbps	35%	0.0459654	0.0116417
	50%	0.0459691	0.0116313
	75%	0.044219	0.0116313
100Mbps	35%	0.0496363	0.0136434
	50%	0.0500574	0.129465
	75%	0.0500574	0.0129206
1 Gbps	35%	0.293758	0.0135138
	50%	0.293821	0.0131589
	75%	0.293937	0.0128039

Table 4: Statistics of packet delay variation for voice over variable bandwidth

Bandwidth For Voice	Maximum Reservable Bandwidth	Packet End To End Delay (Sec)	
		Non RSVP	RSVP
10 Mbps	35%	0.000361827	0.000119471
	50%	0.000361838	0.000119529
	75%	0.000359244	0.000119529
100Mbps	35%	0.000717431	0.000450085
	50%	0.000735641	0.000459153
	75%	0.00073567	0.000459543
1 Gbps	35%	0.0143565	0.000451224
	50%	0.0143541	0.00045589
	75%	0.0143454	0.000460582

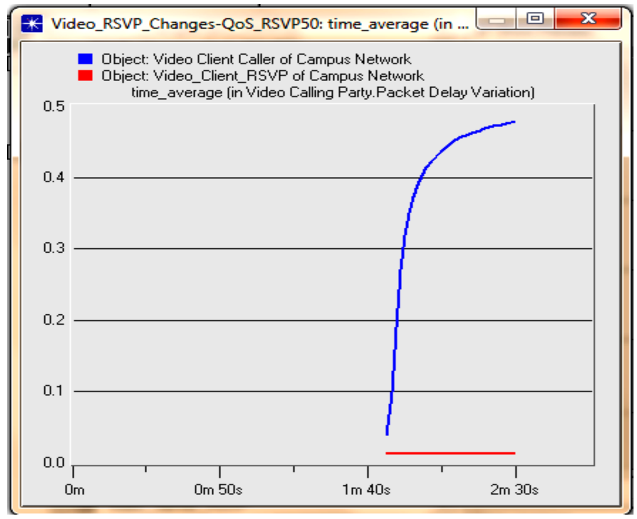

Figure 2. Packet delay variation for video calling at 50% bandwidth

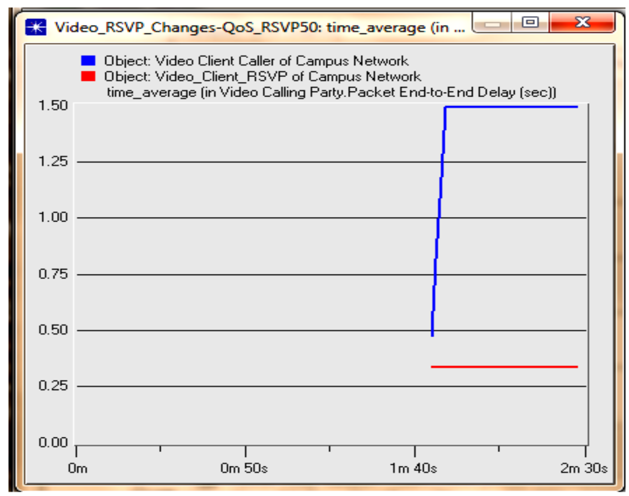

Figure 3. Packet End to End Delay for video calling at 50% bandwidth

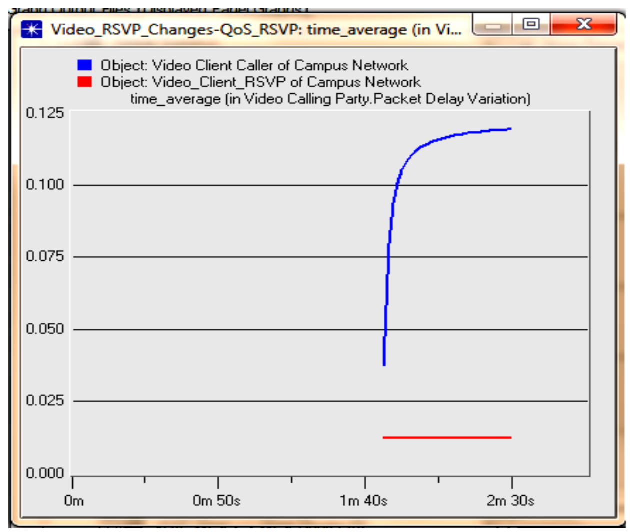

Figure 4. Packet delay variation for video calling at 75% bandwidth

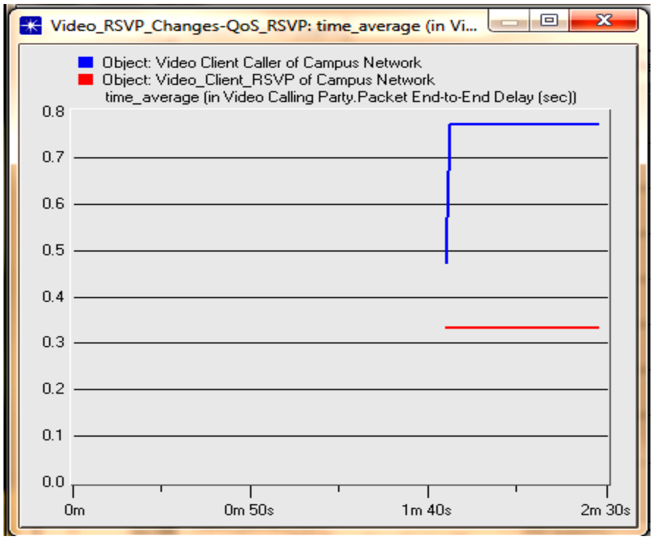

Figure 5. Packet End to End Delay for video calling at 75% bandwidth

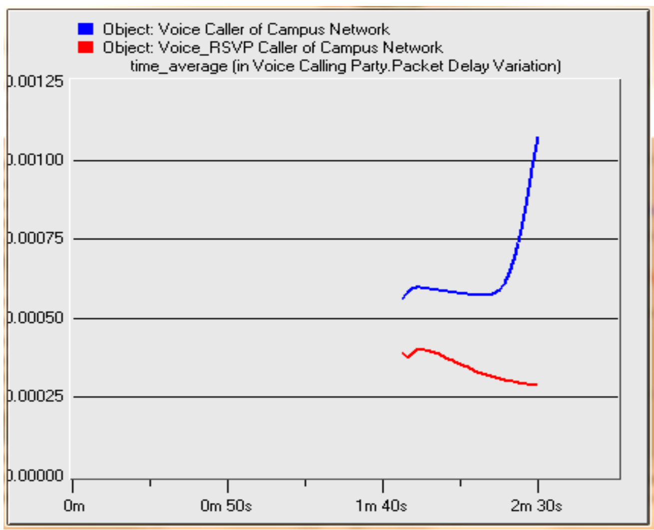

Figure 6. Packet delay variation for voice calling at 50% bandwidth

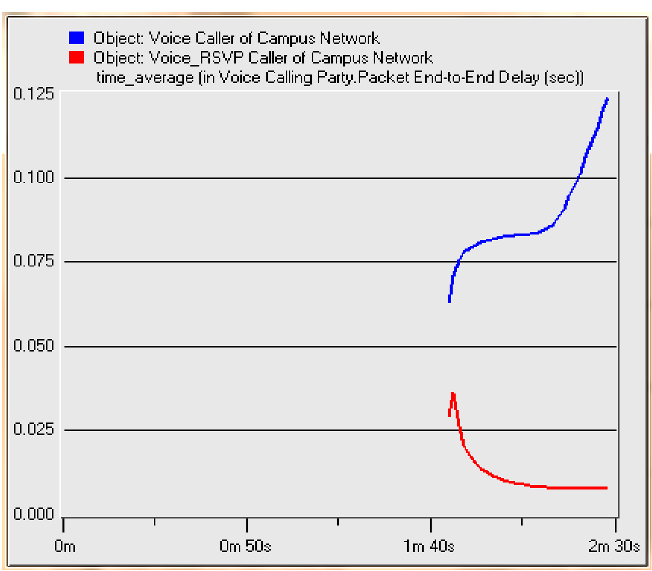

Figure 7. Packet End to End Delay for voice calling at 50% bandwidth

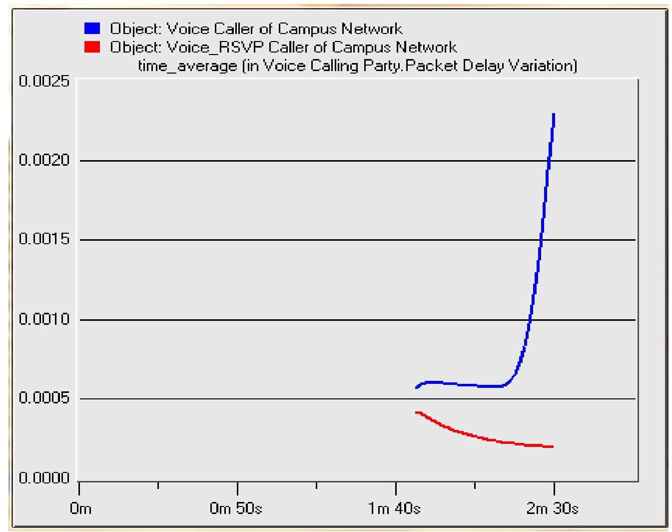

Figure 8. Packet delay variation for voice calling at 50% bandwidth

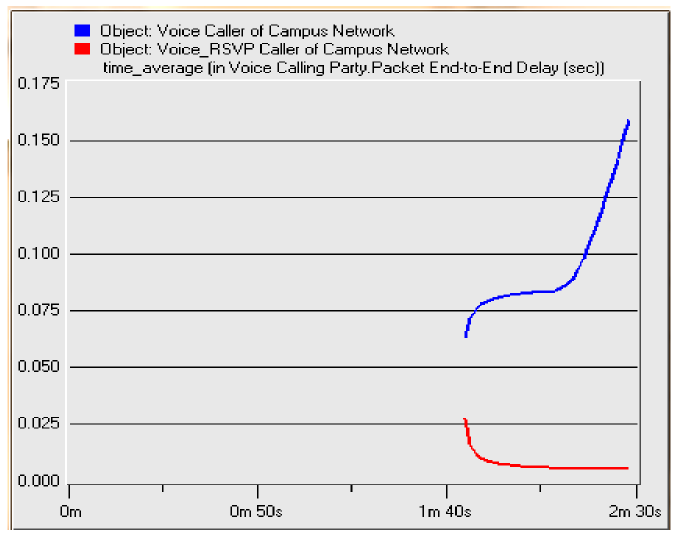

Figure 9. Packet Delay variation for voice calling at 50% bandwidth

Fig 2 and fig 4 shows packet delay variation for video calling for RSVP and non RSVP network. In both the cases packet delay variation is considerably low for RSVP network. Fig 3 and fig 5 shows packet end to end delay for video calling for RSVP and non RSVP network. Some efforts has been discussed in past for improvement of QoS for multimedia based services over 3G network [11] [12]. It has been observed that Packet end to end delay is low for RSVP based network. The same application has been tested for voice services and Fig 6 and fig 8 shows packet delay variation for voice calling for RSVP and non RSVP network and Fig 7 and fig 9 shows packet end to end delay for voice based network. Packet end to end delay is also found low for RSVP based network which can improve the overall quality of service effective for voice and video based services.

V. CONCLUSION

One of the unexpected results of the RSVP research effort has been the realization that the heterogeneity that can be achieved without severe complexity. RSVP's receiver-initiated reservations accommodate heterogeneous QOS requests from different receivers. Here the network architecture has been tested on variable bandwidth condition for voice and video based application. Results have been evaluated for both non RSVP and RSVP network. It has been observed that packet end to end delay and packet delay variation has been minimizing to great extent by using RSVP. It shows fair results from 10Mbps to 1Gbps which reflects that it can be used in 3G as well as 4G networks. To summarize RSVP is simple, robust, scalable, flexible, easily deployable and extensible protocol and general objective of achieving high degree of quality of service over 3G and 4G networks can be met by using RSVP.

VI. ACKNOWLEDGMENT

Our sincere thanks to Thakur educational trust and management to provide all the facilities and infrastructure to carried out the research work.

VII. REFERENCES

[1] G. Camarillo, W. Marshall, J. Rosenberg, Integration of resource management and SIP, IETF RFC 3312, October, 2002.

[2] Eunkyu lee,Sang Ick Byun, Myungchul kim "A Translator between Integrated services RSVP and differentiated services for End to End QOS". IEEE March 2003 Page(s): 1394 - 1401 vol.2.

[3] Yorem Benet "The complementary role of RSVP and differentiated services in the full service QOS network." Communication Magazine IEEE Feb 2000. Volume:38, On page(s): 154-162.

[4] Yu Ge, Winston seah "A method to efficiently integrate Internet Telephony calls signaling with dynamic resource negotiation. Computer Networks Vol 50, Issue 17 Pages 3334-3352.

[5] Neill Weilkinson "Next Generation Network Services Technologies and Strategies" john willey and sons ltd pp 167-170.

[6] Pascal Lorenz, "QOS in Next Generation Network. 26th International Conference Interfaces ITI 2004, June 7-10.

[7] Mubashar Mushtaq and Toufiq ahmed "Multimedia Caching Integration for Efficient content Delivery over Heterogeneous Networks". March 31 2008-April 4 2008 on page(s): 1011-1012.

[8] Talukdar, B. Badrinath and A. Acharya, MRSVP: a Resource Reservation Protocol for an Integrated Services Network with Mobile Hosts, Wireless Networks 2001.

[9] C. Shen, W. Seah, et al., Mobility Extensions to RSVP in an RSVP-Mobile IPv6 Framework, Internet draft (July 2002) [Online]

[10] Nen chaung Wang and jyh-Woei Jiang "Extending RSVP for QOS support in Heterogeneous wireless networks".ICCS 2006. 10th IEEE Singapore International Conference. Volume, Oct. 2006 Page(s):1 – 5.

[11] Tomas Robles, Hector velyous, Arndt kadelka, "QOS for all IP System beyond 3g", Communications Magazine, IEEE Volume 39, Issue 8, Aug 2001 Page(s):64 - 72

[12] J. Manner, K. Raatikainen, Localized QoS Management for Multimedia Applications in Wireless Access Networks, in: Proc. IASTED IMSA 2003 (January 2003).

