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Multilevel CRC for Error Checking and Correction for Data Transmission Through IPv6 in Cross-layer Framework

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Abstract : The objective of enhancing the existing MIP limitations this research work focus on developing a generalized service free, resource independent protocol for global integration of various services in a wireless environment. The proposal to be developed is with the objective of providing roaming feasibility between different IP networks and providing a customized switching between different wireless communication systems while communicating in a dynamic manner. The solutions are to be developed with a focus of objective and quantitative improvements such as low complexities, fast switching and more reliable under different network scenario's.

Keywords :IPv6,CRC,Network dentification

1. Introduction

To achieve the objective of error flow, error detection and correction in IPv6 data transfer, various techniques were suggested in the past, to integrate the Internet services over one common platform with a valuable error checking method. Over the last few years ample new protocols have been developed for multimedia applications in the whole OSI layer's scale [1]. One of the most visible trends in today's commercial communication market is the adoption of wireless technology [2]. In integrated WAN + LAN + 3G cellular systems, data and multimedia communications are carried end to end over the existing Internet infrastructure [3]. A network consists of a number of layers for providing the service of communication [4]. Generally the network consists of a physical layer, data link layer, network layer, transport layer, secession layer, and application layer [5]. The future Airborne Network will include a core of loitering/orbiting aircraft which provide inter-networking over multiple heterogeneous wireless links [6]. Now a day, cross layer hand off is used to operate the mobile devices in a random layer of the network. Due to the unique structure of a mobile ad hoc network it can be deployed anywhere at any time where fixed networks cannot be deployed [7]. Multicast protocol is to minimize the energy dissipation of the network [8]. Protocols would be required to maintain the same level of performance in the wireless networking environment with frequent handoffs, as in the wire-lined environment [9] [10]. Applications and

protocols for wireless and mobile systems have to deal with volatile environmental conditions such as interference, packet loss, and mobility. MULTIMEDIA data transmission experience a number of constraints that result to low Quality of Service (QoS) that is offered to the end user [11]. Multi-hop wireless networks impose new challenges such as, the varying nature of the signal strength, higher bit-error rates [12], dynamic variations in channel quality, fading effects, interference problems, mobility, shared and contention based MAC, multi-hop transmission and path selection at network layer needs some degree of interaction amongst different layers so that to optimized the overall network performance [13]. To correct the errors present in the network general some error detection techniques are present. The error detections are cyclic redundancy check (CRC), check sum. CRC is a method where binary stream of data packet is divided with a specific stream of bytes. Reminder values dividend are detecting the errors. All mathematical calculation is done on binary stream of data. The CRC methods present are CRC-12, CRC-32, and CRC-16. IPv6 is carrying two dimensional data structure. Each row of IPv6 data structure is of 32 bits. So it is better to use CRC-32 in IPv6 data format. IPv6 is carrying multiple information in multiple layers; it is quite needed to find every layer redundancy have to correct it for secure data transmission.

2. Literature Review

The proposed in [14] cross-layer design is aimed to provide a solution for unidirectional link failure management, reliable route discovery, and power conservation. The link quality can be predicted by the received signal strength from the physical layer. The links having low signal strength can be discarded from the route selection. From the MAC layer, the minimum power required can be estimated by performing RTS/CTS packet exchange. Based on this, the application layer can readjust the transmission rate, to avoid collision.

This paper [15] proposes CRC Extension Header (CEH) to do error detection in Network layer and replaces the current error detection in the Data Link layer. In CEH, verification of CRC code is only done at the final destination indicated by destination address field of the IPv6 header.

Elimination of error detection in the Data Link layer of a router in the proposed method has decreased the network latency of IPv6 packet transmission. The value of processing time is very small compare to decrease network latency on IPv6 packet transmission with CEH. The proposed error detection mechanism also showed good ability to detect transmission error inside the transmitted packet.

The processing time of IPv6 packet with CEH is higher due to it has more complex processing than IPv6 packet with FCS.

In the paper [16] a novel design methodology to design an internet protocol specific packet processor has been introduced to have hardware acceleration for process and pass packets at high speed 1/10/20/40/100 Gigabit. The authors have designed an interface that directly translates the way packets need to be processed in a simple clean pipeline that has enough flexibility to allow for designing some powerful extensions to a basic switch and routers. Using this methodology, a very compact domain specific SoC can be designed using Ethernet packet processing core while maintaining the high speed requirements of Ethernet/IP switches and router. This Method finds wide application in design of Ethernet based products including high performance high capacity L2/L3 switches and router at 1/10/40/100 Gigabit is possible with this method.

3. Problem definition The method described in paper [1] is giving a cross layer technique, which is working well on cross platform but not able to give a proper error detection and correction method with the flexibility of quantity of data transmitted. The paper [2] gives a better error checking method over IPv6 and providing a suitable method at the data link layer. But working in the data link layer of all mediums through which the data packet is moving are bigger task and more time consuming if we aggregate the time of consuming the data packet checking in the entire medium. The third paper [3] is correcting the method of paper two, by giving a special place in the data packet. But this method is not providing any flexibility on the data amount size. There are some wastage places in the data packet. Considering all above problem, this proposal presents a generalized data packet structure with the ability of varying the data amount, lowest computing parameter, well utilization of resources and each layer error checking and detection. This can work uses cross layer IPv6 header formats.

4. Proposed Methodology

The architecture of IPv6 mobile network consists of the sender, the repeater and the destination. A number of repeaters are present in the network. There is only one single source and destination is present. The error checking is done at every node. Here we assume that error checking should be done in the source and destination only.

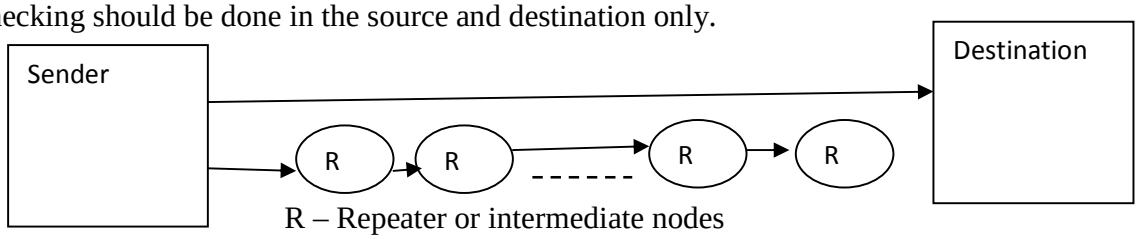

Figure-1 Architecture is showing IPv6 network

In this proposed method, when a data packet is reached in the destination field, it crosses a number of repeaters or intermediate nodes. Each node can be included in a network protocol. As IPv6 is two dimensional data packet, layer wise information is transferred through the data packet. So each layer is having CRC-32 data (reminder) only.

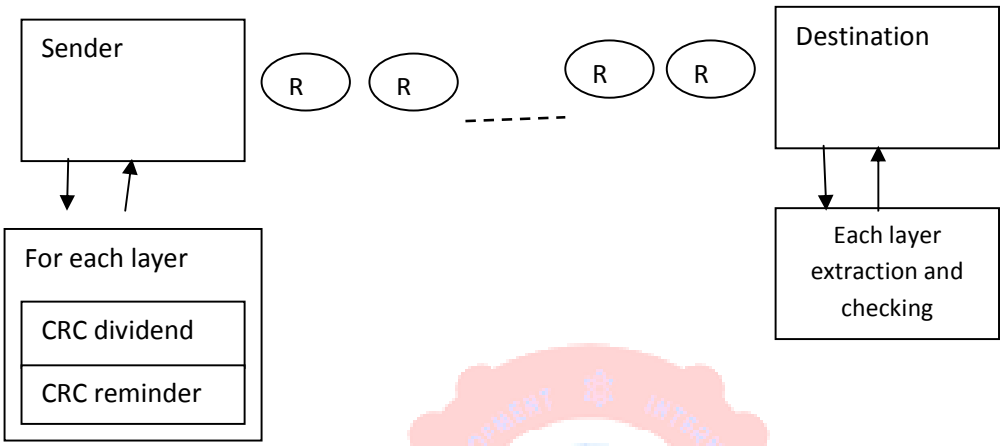

Figure-2 showing proposed methods architecture

For the cross-layer application, it is well needed the method of CRC should be applied in all the layers. The fundamental methods include-

Step-1- Generate each layer data individually. Add the CRC-32 for each layer.

Step-2 - Generate CRC-32 of another CRC-32 present for each layer.

Step-3- transmit the data through any type network acting in different levels.

Step-4- get the data packet, first check the CRC-32 fields.

Step-5-if the CRC fields are correct, and then go for each layer checking and get the correct data.

5. Conclusion - This method is acting in any quantity of data transmitted. This method is providing a common formula for every data packet without taking the overhead space and calculation method. This method can be adopted for the jumbo packets. As all the layers information is checked as well as corrected through CRC cross layer data can be transferred through a network. As this method is proposed data checking at each layer a sender, repeater and sender can work more than one layer. The method is in depended on the platform on which the network is working. This will

work on 3G and Wi-Fi (802.11 b/g/n) networks. The data and security checking method can be shared among different functional unit like airport, banking, government sector, automobile sector and insurance sector.

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