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Congestion Control Inventive Approach for Active Queue Management System in Wireless Network

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Abstract— ***The extensively studied literature in the context of wired networks is the Active Queue Management (AQM) algorithms. In this paper, we have used kalman filter in a inventive way. This paper presents recommendations to the Internet community concerning measures to improve and preserve Internet performance for congestion control. It presents a strong recommendation for congestion control, standardization and widespread deployment of active queue management to improve the performance of today's Internet. It also concern with the effort of research and measurement deployment of router mechanisms to protect the Internet from flows that are sufficiently responsive to congestion control notification. System primarily meant it was converted from continuous time domain to discrete time domain. Also to implement kalman filter we transformed our form to another model. By this paper we are going to represent that drop of packets can also be estimated so that it cannot drop before reached to destination or queue is full. The basic feedback nature of AQM which can be enabledby application of different principles and this is how we developthis approach which is uniqueness of the model which has been developed recently. So in our approach we use a solution called Random Early Detection which assists routers for managing network performance.***
Keywords— ***Transmission control protocol, real time, Random Early Detection data packets, synchronization.***

I. INTRODUCTION

The design of active queue management and scheduling for wireless networks needs to take into account the unique features of wireless networks (such as interference and the distributed nature of wireless networks). A systematic approach to this problem is still elusive as currently proposed approaches are either too complex, or do not provide clear design guidelines for obtaining good system performance. The development of new active queue management (AQM) routers will play a key role in meeting tomorrow's increasing demand for performance in Internet applications. A new developed active queue management (AQM) comes in role for increase of demand to perform better in internet applications. Where applications like (VoIP) voice over IP, (COS) class of service, streaming video where significant variations for packet size and session duration exhibit. This paper has got three objectives. 1st, AQM problem relates to key network parameters. 2nd, to analysis of the present *de-facto* AQM standard i.e. random early detection (RED) and last, to recommend alternative AQM schemes. To begin with first consideration of a simple sender–receiver connection passing through a bottleneck router as shown in Fig. 1.

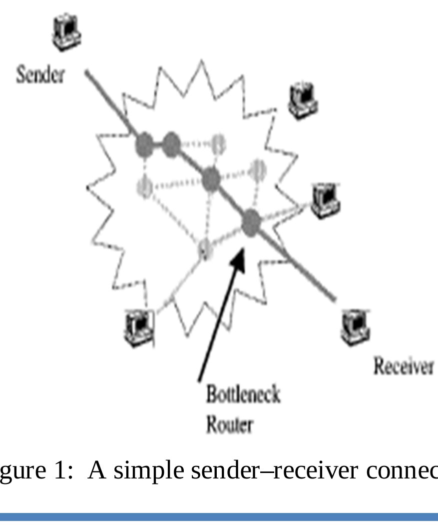

Figure 1: A simple sender–receiver connection

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Schematic of Figure 2, In TCP so many data packets are lost with increase of rate in available bandwidth for a sender in a network.

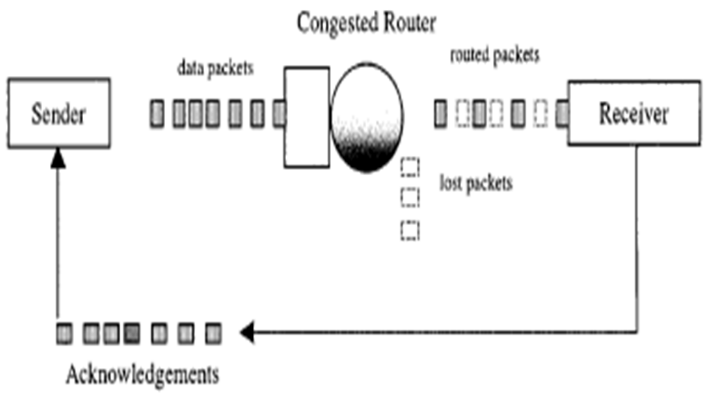

Figure 2 A schematic of a sender–receiver connection

With the loss of packet, the receiver gives signal the sender to reduce its rate. There are few drawbacks with this packet-dropping Scheme which include performance degradation and flow-synchronization due to excessive restarts and time-outs. RED scheme is introduced in many areas for reducing the error which exactly come from the difference between true state and estimated state. One of the example is shown in figure. There are a lot of ineffective for communicating between receiver and sender. Where the data lost is common now a days but by this approach the estimated packet loss can also be counted so that sender get alert from the damage. in Fig. 3 RED achieves this feedback indirectly by randomly dropping/marking packets and routing them to the receiver the receiver since TCP is an end-to-end protocol. Which then completes the feedback by acknowledging the receipt of marked packets to the sender, where we emphasize the delayed, implicit, 3 feeding-back of acknowledgment packets. After get receipt of such acknowledgments, the sender increases or decreases its rate according to the TCP algorithm.

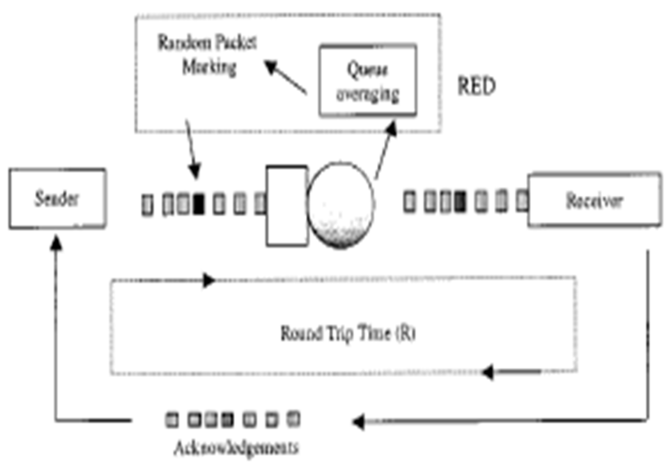

Figure 3 RED randomly marks packets to anticipate congestion.

II. RELATED WORK

C. V. Hollot et al. [4] In this paper author introduce an approach called RED scheme which allows the routers to act promptly by the help of measurement of throttling and senders' queue rate. Which in turn affect directly to the network performance. Autor wants to reduce the error rate with using the method to reduce the degradation of performance..

Jihoon Yang et al. [8] In this paper LQ-Servo controller for congestion control in TCP/AQM wireless networks environment are used with comaprision using previously developed controller. A wireless networks link, which is time-varying, has a capacity. For this, it is modeled by three-state mode for considering the dynamics of wireless links in this paper. And the proposed controller structure is made by augmenting a new state variable to the feed-forward loop.

Vishal Misra Et Al. [5] In this paper A study of prior developed linear model of TCP and AQM. Author use classical control system techniques to develop controllers suited well for the application. The controllers have shown a better theoretical properties

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than the well known RED controller. Author present a guidelines for designing a stable controllers subject to network parameters like propagation delay ,load level, etc. Author also give a simple implementation techniques which has a minimal change to RED implementations. The performance of the controllers is verified and compared with RED using network simulations tool. The second goal of authors designs, the (PI) Proportional Integral controller is shown out perform RED significantly.

Yifei Yang Et Al.[1] This paper gives a enhance algorithm for computing robust PID controller that gives stability region on the parameter planes: (*k p*, *k I*), (*k p*, *k d*) and (*k I* , *k d*) plane. Methodology is based on the D-partition and boundary cross theorem, Author can select any of PID parameters that satisfy robust performance constraint in the stability region that can be obtained by calculating the real and imaginary parts of the characteristic equated to zero. The method is vey simple and can be used in control systems with time-delay, it possess practical use and reference value.

Xing Zhu, Yeng Chai Soh And Lihua Xie Et Al. [9] In this paper, author gives a solution to the problem of finite And infinite horizon robust KALMAN filtering for uncertain discrete-time systems. Paper's necessary and sufficient conditions to the design of robust filters can be drawn . Through numerical example results of this paper are demonstrated.

Zidong Wang Et Al. [13] This paper, Author has studied the robust filtering problem for linear uncertain discrete time-delay systems with MARKOVIAN jump parameters. The system is under consideration and is subjected to time-varying norm-bounded parameter uncertainties, time-delay in the state, and MARKOVIAN jump parameters in whole system matrices. A guarantee is given is to designed a filter to that the dynamics of the estimation error is stochastically stable in the mean square terms, irrespective of the admissible uncertainties as well as the Time delay. The Matlab simulation numerical results imply that the desired goal is well achieved.

Yeng Chai Soh And Carlos E. De Souza Et Al. [10] In this author have considered a robust KALMAN filtering problem for uncertain discrete-time systems with norm-bounded parameter uncertainty. The filter is required to provide a filtering error variance which is guaranteed to be within a certain bound irrespective of the parameter uncertainty. I t has been shown that a solution to this robust filtering problem is related to two algebraic RICCATI equations

M.S.Mahmoud ,L.Xie And Y.C.Soh et al.[11] Author had developed a robust KALMAN filter for a class with constant state delay of uncertain systems. Time varying and steady-state KALMAN filtering algorithms both have been treated successfully and has been proven that the both filter design amounts to solving two RI

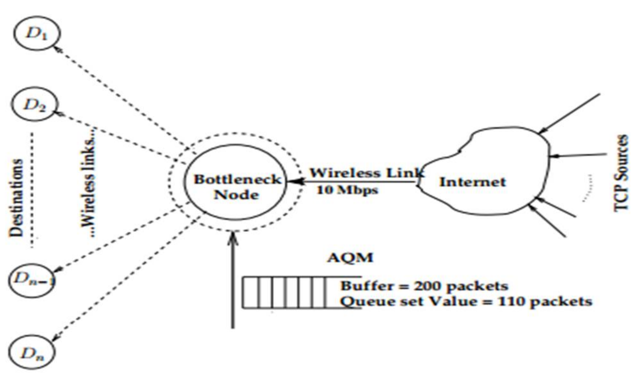


Figure 4: TCP Network Model

CCATI equations which involve scaling parameters. Most importantly properties of the proposed filter have been revealed. **A** numerical example has been provided to illustrate the theory.

III. OBJECTIVES

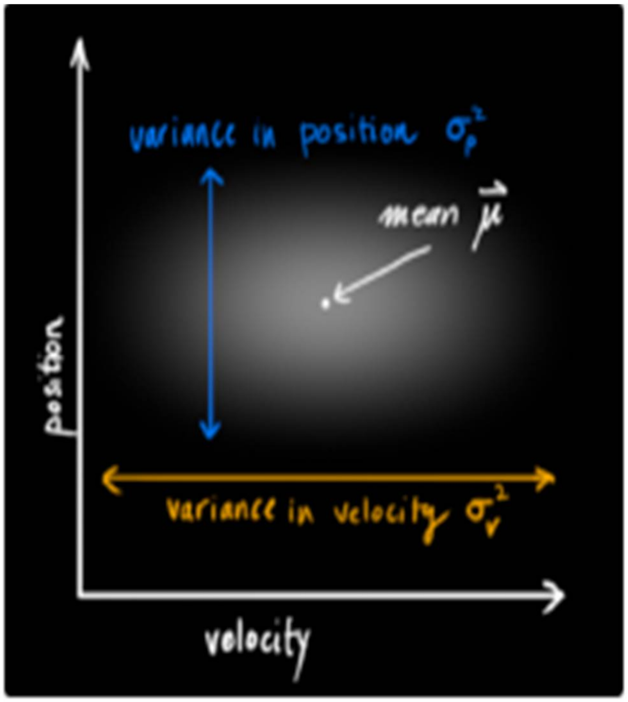
Main objectives are to configure a router which work is to hold the packets pf data when an interface is exist. As we know that about the queue if it is short in size the required data packets to be hold drop of data packets in result. Active queue disciplines drop or mark packets before the queue is full. To reduce the drop problem we need to find the approach which can be able to not even breaks the packets drop but also augment the performance of communication. TCP will play an important role in our thesis that will provide us to use the different protocols to achieve our goal.

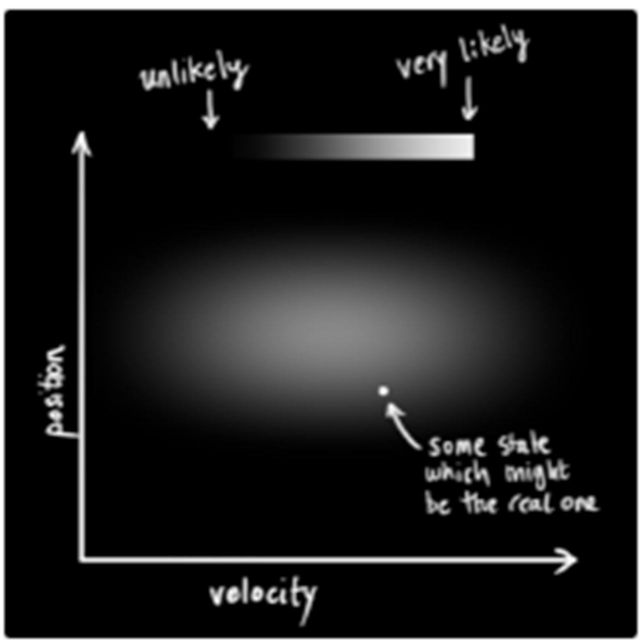
IV. METHODOLOGY

We Show With A Simple State Having Only Position And Velocity.

$$\vec{x} = \begin{bmatrix} p \\ v \end{bmatrix}$$

Initially the *actual* position and velocity are UNKNOWN BUT there are VARIOUS range S of feasible combinations of position and velocity that might be true,





From the assumption of the Kalman filter position and velocity are random and Gaussian distributed. Each variable has a **mean** value μ, which is the center of the random distribution and a **variance** σ2, which is the uncertainty

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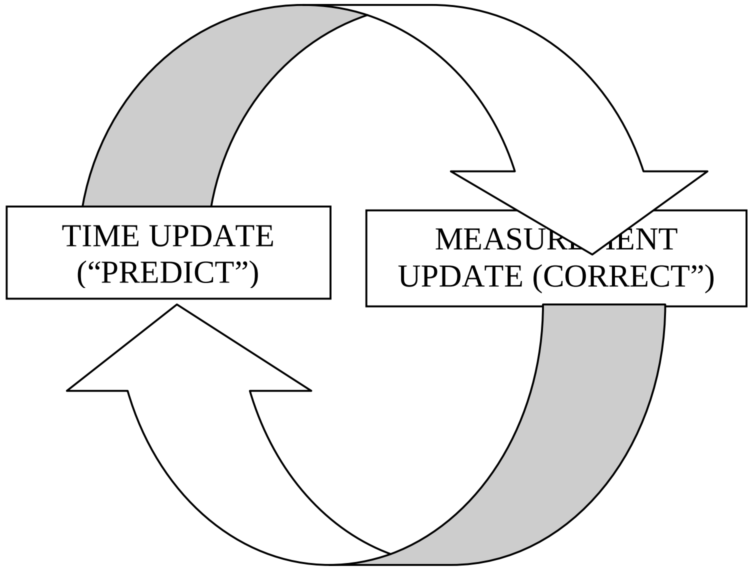

Figure 5: Discrete KALMAN Filter Cycle

The time and measurement update equations are presented below:

The time updates equations:

$$\hat{x}_{k+1}^{-} = A\hat{x}_k + Bu_k \quad (0.1)$$

$$P_{k+1}^{-} = AP_k A_k^T + Q_k \quad (0.2)$$

The measurements update equations:

$$K_f = P_k^- C_k^T \left(C_k P_k^- C_k^Y + R_k\right)^{-1} \quad (0.3)$$

$$\hat{x}_k = \hat{x}_k + K_f\left(y_k - C_k \hat{x}_k^-\right) \quad (0.4)$$

$$P_k = \left(I - K_f C_k\right) P_k^- \quad (0.5)$$

The time-update equation projects the state estimate and covariance from time step k to step $k+1$. To compute the KALMAN Gain (KG) K_f is the first job in the measurement update equations. Den y_k is obtained by actual measurement of the system. Incorporating the actual measurement and the estimated one in equation(0.3), we generate a posterior estimate. The last step is to compute a posterior error covariance. This is the recursive operation of the KF. A complete picture of the operation of the KF is illustrated in Fig.4, after each time and measurement update pair, the recursive algorithm is repeated with the previous a posterior estimates to predict the new a priori estimates. This recursive nature is the biggest advantage of the KF. This makes the practical implementation of the KF much easier and feasible then the implementation of the Wiener filter, because the Weiner filter obtains its estimates by using all of the precedent data directly. In contrast, the KF only uses the immediately previous data to predict the current states .The standard KF algorithm is shown in Fig. 4.

We apply the various input data in out methodology and output comes in form of plot where graph between true state and estimated state.

Simulation Result of Kalman Filter

1) KF Verification on matlab Fig. 5 shows the estimated states by KF and true state of a system which is considered. And we observe from the Fig. that estimated state is nearly equal to true state with some error.

When Delta = 0

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In result one at figure 1:-

Blue line represent the estimated state and red line represented true state. We can see the difference on those lines-

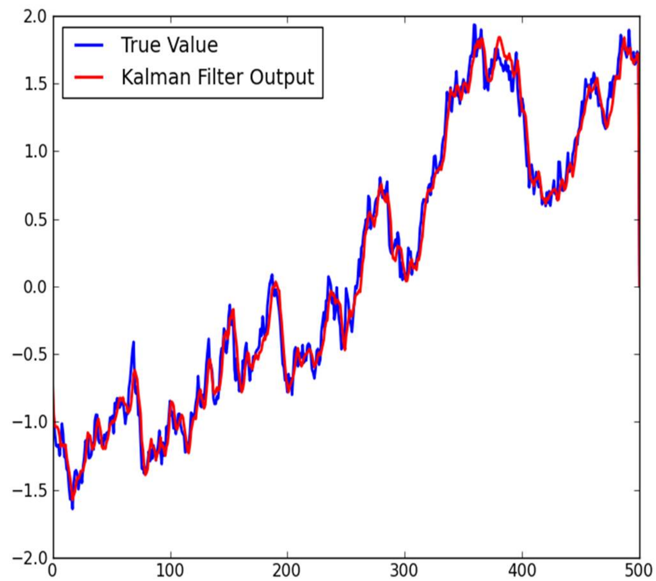

Figure 5.: True State And Kalman Filte(With Difference)

Result 2:- In figure 5 It can be seen that there is some difference between estimated line and true line on given graph.

Error = Estimated State – True State

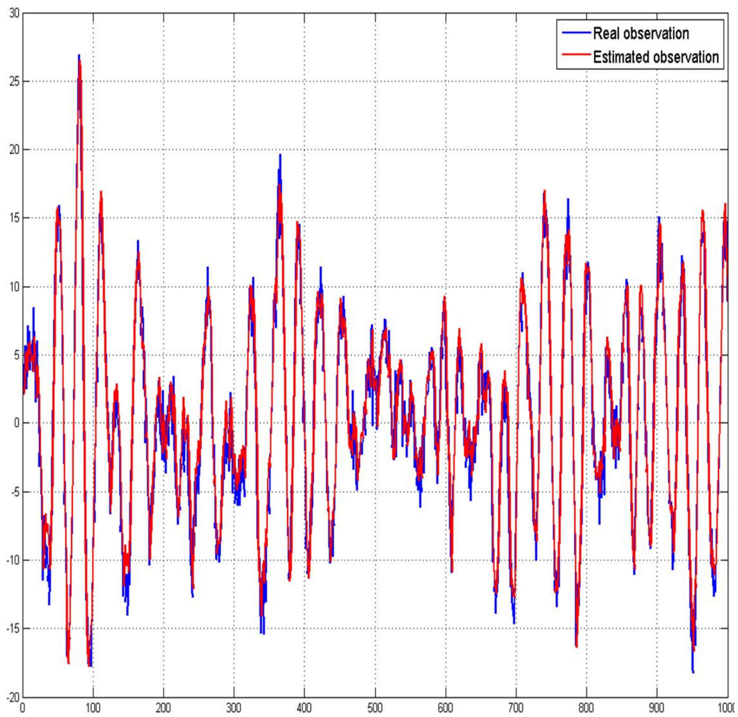

Figure 6: No. Of Iteration Vs. Error

Result 3:- In result 3 our methodology proves that the estimated state and the true state goes parallels which means the estimation we are projected would be approximately accurate:-

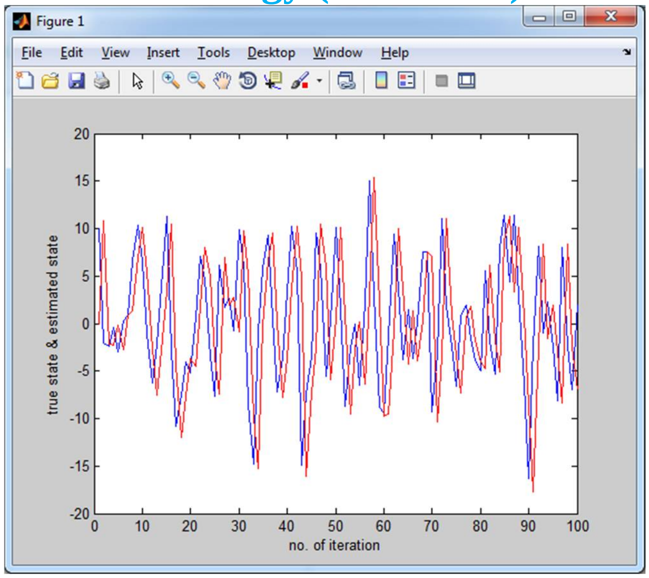

Figure 7: No. Of Iteration Vs. True State and Estimated State

V. CONCLUSIONS

We presented a organized approach to the design of active queue management in wireless networks. Through analysis and experimental results, we showed that the resulting distributed algorithms lead to fair bandwidth allocation among TCP connections. In this paper investigation is done for performance of Kalman Filter. In this research paper, one of the applications of Kalman Filter has been used as approach.

Initially we implement the KF to a nominal discrete-time system and applied that in the absence of uncertainty and delay the KF works adequately, and the satisfactory result has found for covariance of error in the estimation of true state.

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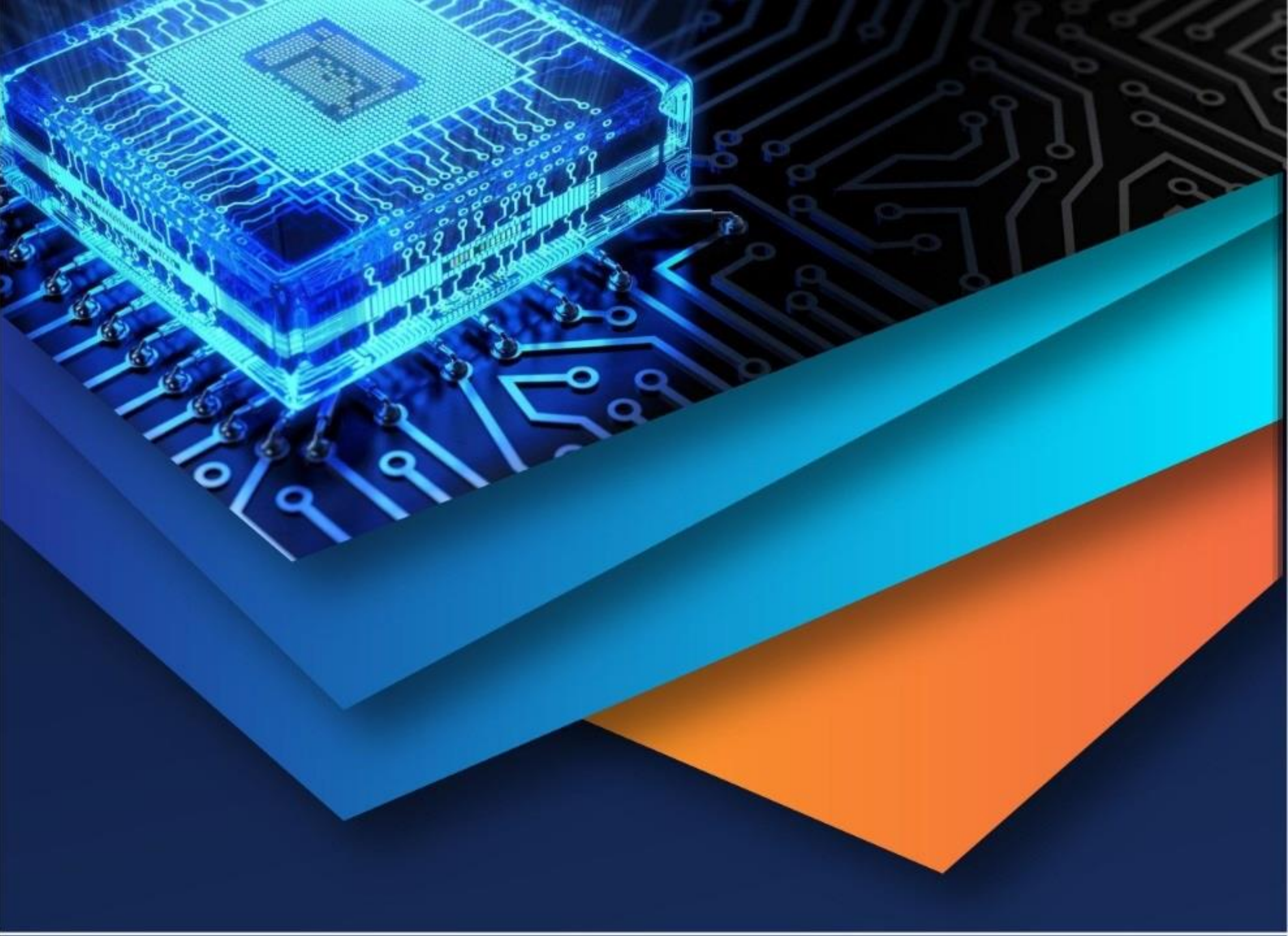

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