PERFORMANCE ANALYSIS OF ADHOC NETWORK ROUTING PROTOCOLS BY CONSIDERING PHYSICAL EFFECTS

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Abstract : ***In most of the performance evaluation of routing protocols has done in ideal environments. However in real world it is difficult to get those type of error less or ideal environment. Hence the performance analysis of various routing protocols has been done in presence of different physical aspects like shadowing, fading and inter-channel interference. Throughput, End to end delay, Average Jitter and Packet delivery ratio are some of the different metrics taken to analyze the performance of various routing protocols. The Qualnet simulator of version 6.1 is used for the simulation. After simulation AODV protocol performs better when compared with various routing protocols. Simulation has done by considering physical effects into consideration.***

IndexTerms - Ad-Hoc Network, Physical Aspects, Routing Protocols.

I. INTRODUCTION

An Adhoc network[1] is a type of network that contains set of devices that exchange information with each other without having base station and centralized access point. In Ad-hoc networks each and every nodes moves haphazardly and each nodes communicating with each other directly in Multi-Hop form. In the majority of the research work the examination of routing protocols performance are performed in ideal environments. However in real world ideal environment does not present. Here the specific issue has been taken into concern.

Basically Infrastructured and Infrastructureless network are two categories of wireless network. The infrastructured network, which is also known by the name Cellular network, have wired and predefined number of gateways. The base stations in cellular networks are fixed and they are connected with wires. The base station transmission range is within the cell. Every nodes which are present inside a particular cell will get connected to and communicates with closest bridge (base station). The Mobile AdHoc networks (MANET's.) is also called Infrastructureless networks. Here the fixed routers are not present in the network. In MANETs every nodes are connected with each other in an subjective way and each nodes has a movement. The organization and managing tasks are decimated between the end devices itself. This end devices are allowed to move dependently w.r.t to each other because the whole network is mobility based.

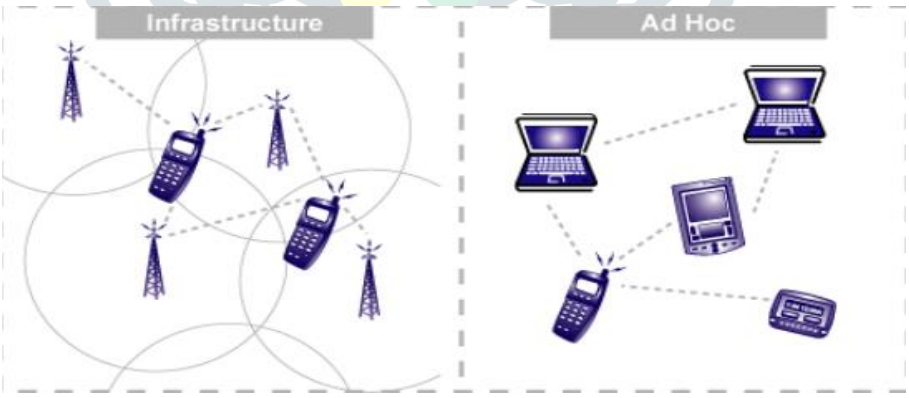

Fig.l Infrastructured network and Ad hoc networks.

In the vast number of the performance assessment routing protocols has done in ideal conditions. However in real environment it is impossible to find this conditions. Thus to analyze the performance endeavors has been made by taking Ad-hoc network routing protocols like pro-active(FSR,OLSR')[2], reactive(AODV, DYMO and DSR)[3] and hybrid(ZRP)[4] routing Protocols, in existence of various physical perspectives like Shadowing, Fading and Inter-channel interference. For simulation, the Qualnet simulator -6.1[5] is taken. Throughput, End to end delay, Average Jitter and Packet delivery ratio are some of the different measurements taken to analyze the performance of various routing protocols [6]. The performance analysis is done for all routing protocols.

II. OBJECTIVES

The fundamental goal of the project is performance examination of different routing protocols and to give best suitable routing protocol for Ad-hoc network by analyzing its performance under various physical aspects like ,

1. Fading Environment.
2. Shadowing .

3. Inter channel interference.

III. METHODOLOGY

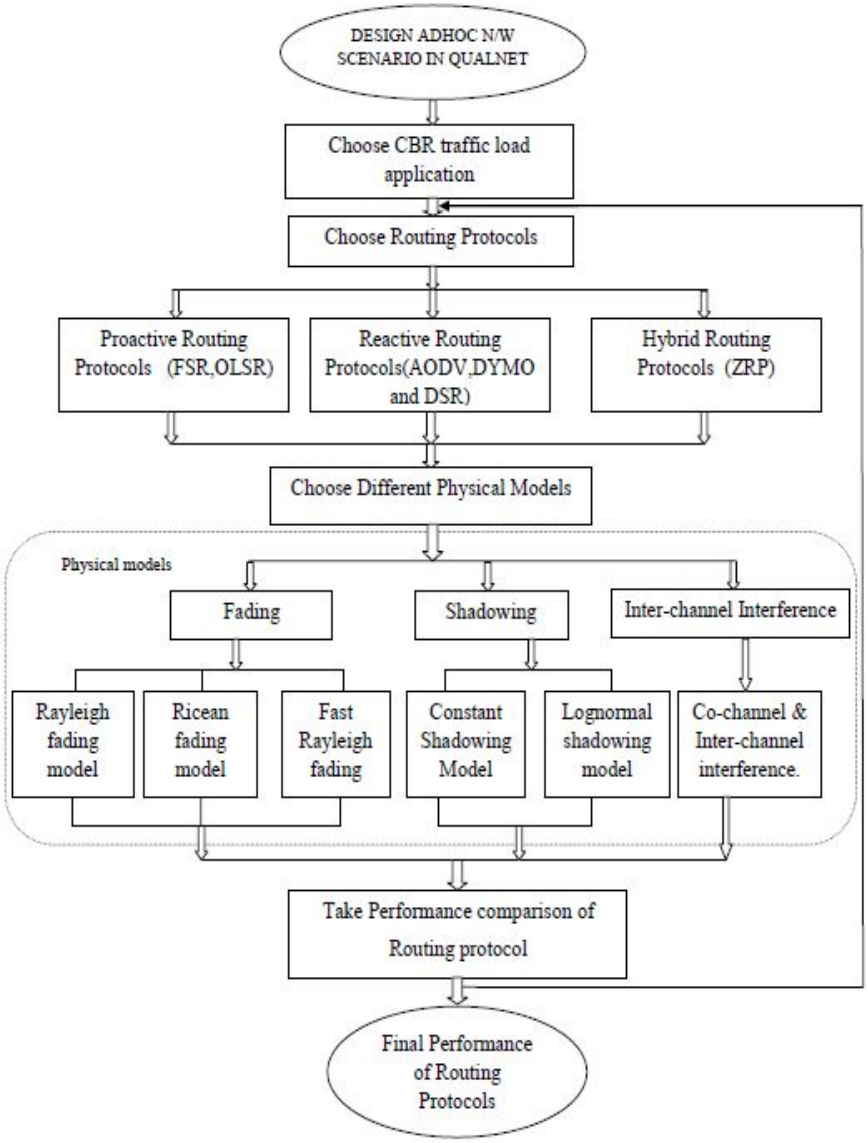

Fig.2 Block diagram of proposed methodology.

We have discussed the methodology proposed for this work, which are utilized in the Qualnet simulator for the simulation. The work is divided into following main steps.

Step 1: The modeling of scenarios, i.e., to create network model on the canvas area.
Step 2: The selection of CBR & draw application between different Nodes from source to destination.
Step 3: Apply routing protocols for Ad-hoc network scenario .
Step 4: Apply physical effects and simulate the network scenarios.
Step 5: In the fifth step compare the performance1of different routing protocols.
Step 6: Analysis of the results obtained.

IV. DESIGNING OF NETWORK SCENARIOS ON QUALNET

Designing using the Qualnet simulator for simulation on the Windows based platform. The Qualnet simulator is capable for simulating the complex and real world network scenarios on both wired and wireless systems. In our simulation, we are considering the 50 nodes node density and all mobile nodes are-connected wirelessly. The terrain size considered here is 15 m×15 m flat area. The network design is as shown in the Fig 3. Two Ray Ground propagation model is taken as wireless propagation model. The simulation are performed on the basis of Constant-Bit-Rate(CBR) traffic flow.

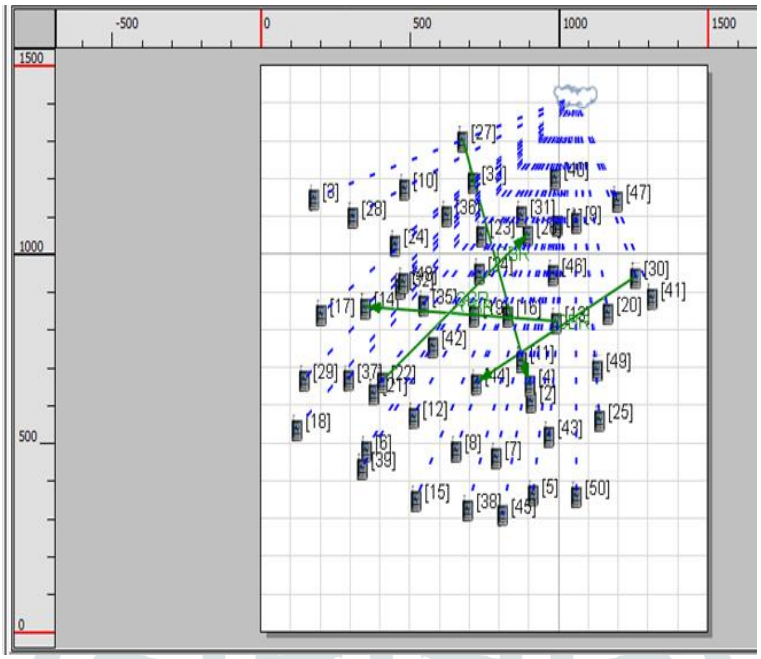

Fig.3 Network Design in Qualnet canvas.

V. RESULTS

In this part we discuss the simulation1results of Ad-hoc network routing protocols. The Performance is done on Qualnet simulator by considering fading, shadowing and inter-channel interference. Results are considered on the basis of measurements such as Average Jitter, Throughput, Average End to End delay, Packet Delivery Ratio. Then compared the final simulation results.

1. ANALYSIS OF FADING EFFECTS:

A. Throughput and End To End Delay

For Fast Rayleigh fading model, AODV & DYMO has the highest throughput while DSR,OLSR, ZRP and FSR has lowest throughput as seen in fig 4. For Rayleigh Fading, AODV, DYMO protocols has the higher throughput followed by the DSR & OLSR routing protocols, while ZRP and FSR performance is still poor. In Ricean Fading condition, the performance is same as the Rayleigh Fading model.

For all three fading effects, routing protocols like, AODV, DYMO,OLSR,FSR and ZRP has lesser delay except the DSR routing algorithm as seen in the Fig 5. Lesser delay means good performance.

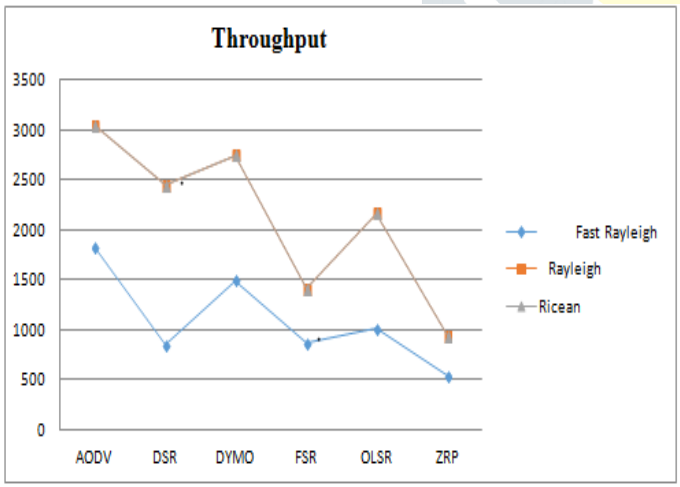

FIG 4. Throughput analysis on Fading models

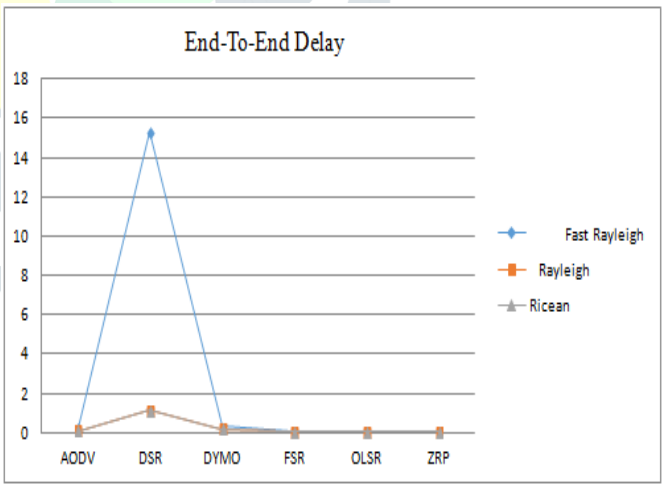

FIG 5. Delay analysis on Fading models

B. Average Jitter and Packet Delivery Ratio

For Fast Rayleigh Fading effects, all routing protocols except DSR has the lowest jitter values. For Rayleigh and Ricean fading effects, jitter decreased for all routing algorithms when compared to the Fast Rayleigh Fading effects as shown in Fig 6.

For Fast Rayleigh Fading effects, the PDR is highest in the case of AODV and DYMO routing protocols, while DSR, FSR, OLSR and ZRP routing protocols has a lesser PDR. For both Rayleigh and Ricean fading models, the AODV,DYMO,DSR and OLSR routing algorithms with highest PDR, However the FSR & ZRP has lowest PDR. Here the ZRP has the worst packet delivery ratio for all fading models shown in Fig 7.

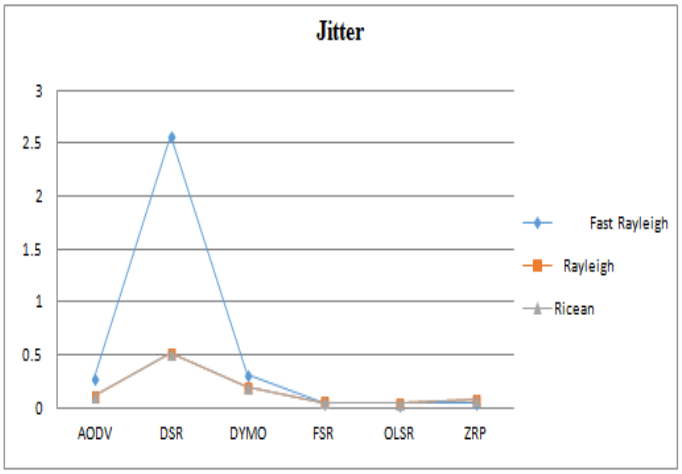

FIG 6. Average jitter analysis on Fading models

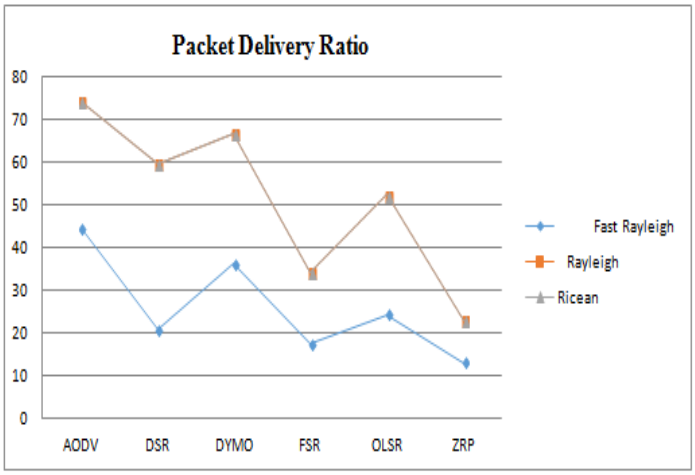

FIG 7. PDR analysis on Fading models

2. ANALYSIS OF SHADOWING EFFECTS:

A. Throughput and End To End Delay

When we consider the Constant Shadowing model, Throughput is higher in the case of AODV & DYMO protocols, while for the remaining DSR, OLSR, FSR and ZRP protocols throughput will be lesser. The same thing is repeated in the case of Lognormal Shadowing model, where the performance of AODV and DYMO is better than the other routing protocols as shown in Fig 8.

When we consider Constant Shadowing model, the delay are almost similar and lesser for the AODV, DYMO, OLSR and ZRP protocols whereas, the DSR and FSR has the highest-delay. In Lognormal Shadowing model, the delay is lower in all routing protocols except the DSR protocol. The analysis is as shown in the below Fig 9.

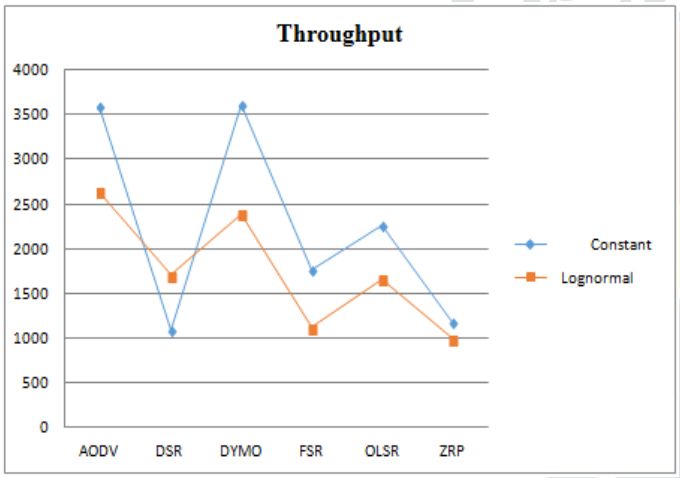

FIG 8. Throughput analysis on Shadowing models

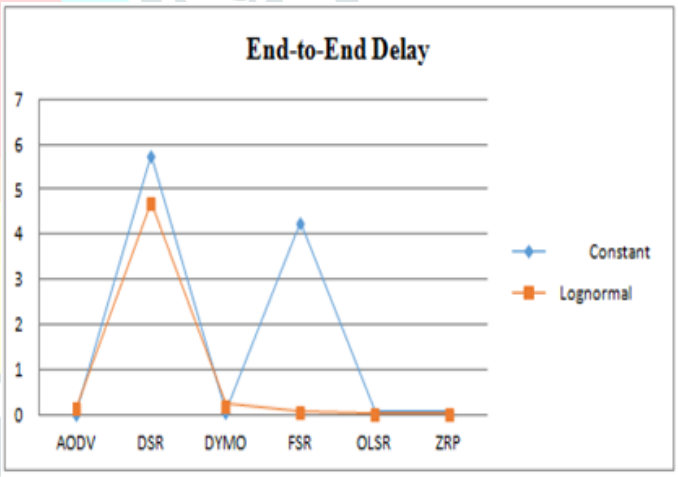

FIG 9. Delay analysis on Shadowing models

B. Average Jitter and Packet Delivery Ratio

When we consider the Constant Shadowing model, AODV, DYMO, OLSR and ZRP has the lowest Jitter values, while the FSR and DSR has the highest Jitter values. In Lognormal Shadowing model, OLSR, ZRP has least Jitter values followed by the AODV, DYMO and FSR has the average Jitter values, but those values are also minimum i.e., values of DYMO and AODV are little more than OLSR & ZRP . The DSR routing protocols has highest Jitter . DSR is the worst in case of both the Shadowing models . The analysis is as shown in the below Fig 1 .

For Constant Shadowing model, the AODV and DYMO has the highest Packet Delivery Ratio while the other protocols has the minimum PDR. For Lognormal Shadowing model, analysis is as same as to the Constant Shadowing model, where AODV & DYMO has the highest PDR. The DSR, FSR, OLSR and ZRP has the Average PDR. The simulation results is as shown in the below Fig 11.

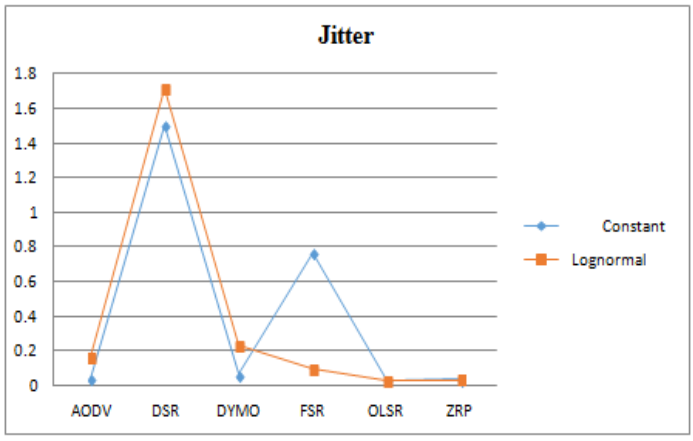

FIG 1 . Average jitter analysis on shadowing models

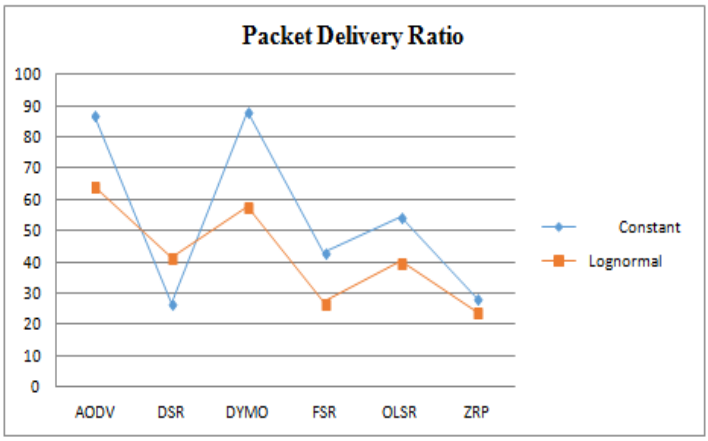

FIG 11. PDR analysis on shadowing models

3. ANALYSIS OF INTER-CHANNEL INERFERENCE EFFECTS:

A. Throughput and End To End Delay

When the effects of Inter-channel-interference are considered, AODV protocol has the highest Throughput along with the DYMO routing protocol. While FSR, DSR, OLSR and ZRP has the Average Throughput value as shown in Fig 12. The throughput of routing protocols decreases when inter-channel interference is enabled.

When we enable the Inter channel interference, AODV, DYMO, FSR, and OLSR has lesser delay, but it is little bit more in the case of DSR . For ZRP protocol the delay is very much higher and it shows the worst performance as shown in the Fig 13.

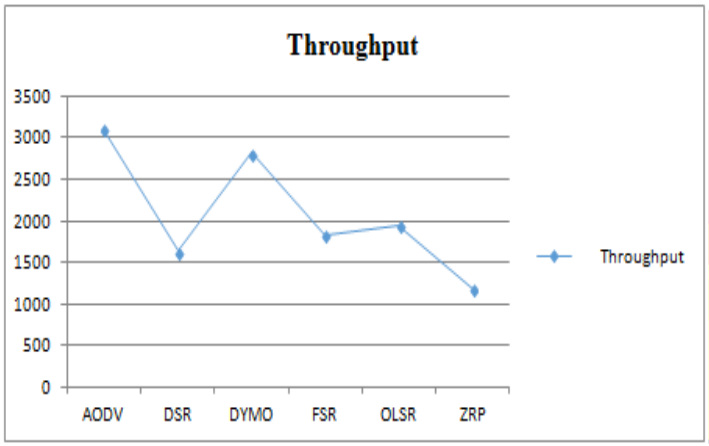

FIG 12. Throughput analysis on Inter-channel-interference

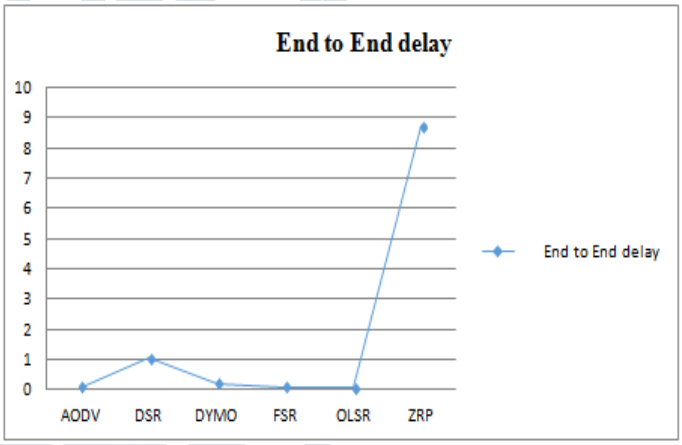

FIG 13. Delay analysis on Inter-channel-interference

B. Average Jitter and Packet Delivery Ratio

As shown in the Fig 14 OLSR has the least jitter values followed by AODV & FSR, both protocols has minimum Jitter values when the effects of Inter channel-interference are considered . DSR and ZRP has the highest jitter values and those two protocols shows the worst performance among six protocols.

The performance of routing protocols decreases when we considered the Inter-channel interference. The PDR is highest in the case of AODV & DYMO routing protocols, where the other routing protocols has the average PDR when compared to AODV and DYMO. ZRP protocol has the least PDR and it shows the poor performance in packet delivery ratio as shown in Fig 15.

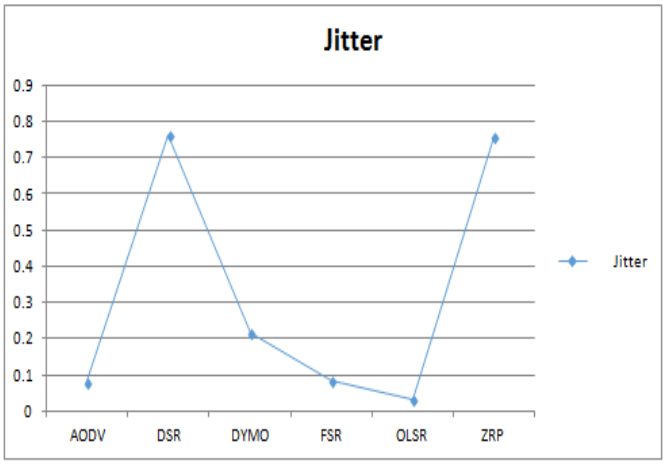

FIG 14. Average jitter analysis on Inter-channel-interference

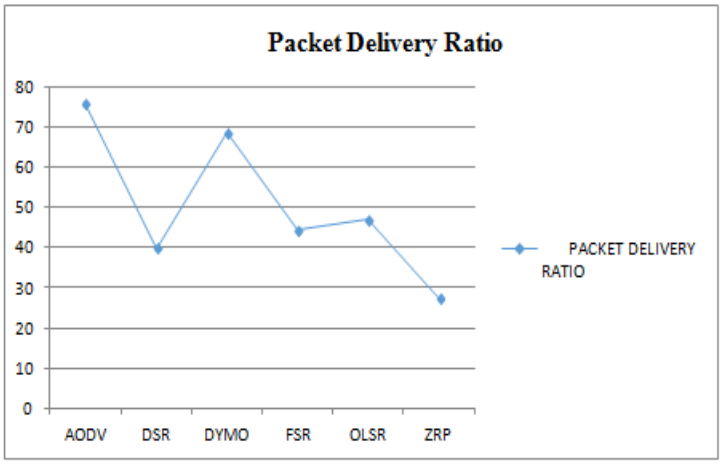

FIG 15. PDR analysis on Inter-channel-interference.

VI. CONCLUSION

The performance of this Mobile Ad-hoc network routing protocols decreases when real world physical effects like shadowing, fading and inter-channel interference are considered especially the proactive protocols are badly affected by these affects. Though it is essential and required to-consider these effects to examine, otherwise the outcome are incorrect in the actual world scenario. It was observed that past the simulation and complete analysis, the AODV routing protocol performance is better than other routing protocols.

It would be fair to comment on certain limitations of our work, which are as follows: The two-ray propagation model is broadly utilized in the simulation of Ad-Hoc network , however this model does not show the real-world network propagation model due to the reason that the surrounding environment condition is continually changing. It is observed that performance of Mobile Ad-Hoc-network decreases rapidly when the shadowing effects are introduced. The decrease in performance is happened due to more variations in the received signal level. Due to the variations in the signal levels the packet reception by the nodes also decreased . This makes issue to the ordinary tasks of a Routing protocols and also for the MAC protocol. These problems would be resolved in the future work. Also, it can be extended to analyze of these effects on-more routing protocols and suggest some-measures to improve their performance.

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