Seamless Handover In High Performance Enterprise Ieee 802.11 Networks Using Central Control M-Sdn-Nfv Technologies

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Abstract : IEEE 802.11 Enterprise networks needed to provide strong network execution to control overwhelming numbers of clients such as PCs, PDAs and tablets as well as hungry capability and delay novel, delicate apps such as portable HD video and better QoS / QoE are obviously needed for such devices and apps. However, existing solutions will offer either high performance in the network or seamless mobility. Generally speaking, the vast majority of WLAN relies exclusively on sign quality for handover that is not sufficiently respectable for a reasonable access point (AP) decision. We tend to display a totally unique mobility management system for WLANs to upset management issues with mobility and advance load balancing through software-defined network (SDN) and Network Function Virtualization (NFV). We've performed a M-SDN and NFV worldview. Many studies were targeted to evaluate the efficiency of M-SDN and NFV. Experimental findings show that with no adjustment on mobile phones, M-SDN and NFV effectively reduces the impact of data connection Layer handover and professional cloud storage. Moreover, mobility support.

Index Terms: Mobility Management; IEEE 802.11, Handoff management, Software Defined Networks (SDN).

1. INTRODUCTION

WIRELESS local area networks (WLANs) are conveyed comprehensively in different types of environments like Work Places, colleges, airplane terminals, shopping centers, and homes. The IEEE 802.11 standard, generally known as local area network, is transforming into a great deal of prevalent and pervasive. In particular, the traffic request of WiFi networks is expanding a result of the rise of high-definition video streaming, internet of Things (IoT), on-line playing, Mobile information offloading, and Virtual reality. The expansion inside the quantity of WiFi-empowered devices and their developing traffic request needs a thick establishment of APs to upgrade spatial reuse and improve network Capability. AP desiccation, however, intensifies channel rivalry, increases the amount of interference between APs and their related customers, and exacerbates User handoff difficulties among APs. Successful association and obstruction control are accordingly both essential to meet customers ' QoS requirements in terms of performance, delay, reliability and power effectiveness. Once WLANs are used for mission-critical applications such as industrial procedure control, manufacturing plant computerization, and therapeutic perception, meeting these prerequisites is even a ton of significant and hard. In particular, these apps require a limited delay in the shipment of packets and high reliability in connection with energy efficiency could be a basic performance metric also.To address the difficulties of dominant advanced wired networks (such as ISPs and data centers), software-defined networking (SDN) is planned to simplify and improve network control technique Framework and advancement by decoupling control and information plane. Technique operating distributive network control systems on Routing systems, a controller Designs the switches to be controlled in accordance with central choices. Subsequently, these processes will benefit from the controller's worldwide perspective of the network in addition to simplifying the execution of network control systems as apps operating on the controller. For wired networks, yet in addition for SDN gained quality for the design of WLANs and cellular networks also.

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1.1 Objective

SDN should allow performing the handoff process in IEEE 802.11 without network disconnection, i.e., seamless handoff, without any modifications to the MU and completely controlled by the network. Fast and seamless handover is crucial for maintaining sufficient service quality especially in case of delay critical scenarios, e.g. VoIP, video streaming and online gaming and case of network congestion. Software-Defined Networking (SDN) introduces mechanisms to solve client's mobility, load balancing and 802.11 network management. In order to improve network performance in mobile environment it is necessary to integrate handover management over the wireless network to SDN.

1.2 Scope

SDN should empower the handoff method in IEEE 802.11 to be completed without network detachment, for seamless handoff, with any progressions to the mu and completely network controlled. Quick and consistent delivery is critical to keeping up the nature of the spare service, particularly in the event of critical delay situations, for instance. VoIP, video streaming, online gaming, and congestion of the network. Software-Defined Networking (SDN) presents procedures to fix the mobility, load balancing and network management of users 802.11. So as to improve network performance in the mobile setting, SDN handover management must be integrated into the wireless network.

1.3 Background

Low handover effectiveness is the huge downside of information delivery under 802.11 norms. The execution of the handover is mainly limited due to the fact that at any given time a client can only be associated with one access point (AP), and each time the signal strength falls below the threshold, the client performs a new association with the AP. In case of the provision of delay critical services in the mobile environment (user movements in a wider area between multiple 802.11s APs), such preconditions affect the quality of user experience (QoE) negatively. In addition, the handover choice is assigned to the customer by 802.11 norms. Only standards 802.11r and 802.11k mitigate the problem of handover, but the client still has to decide.

1.4 Our Approach
It is fundamental to fuse handover management into SDN over the wireless network so as to improve network execution in the mobile setting. Considering that SDN introduces processes to upgrade the mobility, load balancing and network the executives of Users.The design of the SDN network enables control and information planes to be decoupled. Routers and switches become easy forwarding instruments as the control logic is moved to the SDN Controller main computer. There are two interfaces to the SDN Controller; Southbound and Northbound. The interface Southbound is standardized and regulates the network's data plane. The Northbound interface is characterized as the top of the SDN Controller for services as applications.These applications are autonomous of network devices and infrastructure. The idea of SDN simplifies architecture design in particular. The SDN therefore provides better wireless network management

1.5 Contribution
We are proposing a novel design structure for seamless handoff in this Journal. Contributions of the dissertation are summarized as follows

1.5.1 An architectural framework between networks for seamless transfer
The first commitment of the exposition proposes a loosely coupled and intra-ISP-based network architecture called' Intermediate Switching Network' (ISN), which is combined among UMTS and WLAN networks just as information services (Internet) to provide consistent mobility without afar. This ISN is based on a' Mobility Label Based Network' (MLBN) outlined in O.Berzin's IETF draft. In the MLBN network, using' Multi-Protocol Label Switching' (MPLS) and' Multi-Protocol Border Gateway Protocol' (MP-BGP), traffic can be shifted between any amount of networks. Within the MLBN, each network connects to' Label Edge Routers' (LER), which are associated with a' Mobility Support Function' (MSF). The MLBN is utilized as an' Intermediate Routing Network' and is embedded with the networks UMTS and IEEE 802.11 to promote a Gentle transfer. The mobile node is regarded to be a high-end device fitted with two interfaces (e.g. PDA or Smart Phone). One interface is utilized to connect to the UMTS network, while the other interface is used to connect to the IEEE 802.11 network. The interfaces can be used concurrently by the mobile hubs.The ISN structure is free of mobile IP and, owing to triangular routing, wipes out delay and packet losses, leading in better results. Using ISN enables customers to experience greater information rates throughout the WLAN network and involves minimal modifications in current systems. This systems primary benefit is that it decreases handover delay and wipes out sub-optimal routing intrinsic in mobility the board plans dependent on mobile IP.Simulation results demonstrate that this ISN based joining structure functions admirably with UDP and TCP data traffics. Subsequently this MPLS and MP-BGP based architecture furnishes us with an proficient procedure for handoff between heterogeneous networks, enables the user with the chance to experience better information rates as contrasted with mobile IP based frameworks, and limits handover latency. Examination of the above scheme demonstrates that it supports norms of multimedia data service requirements in terms of delay requirement. Thus the proposed ISN-based approach provides an efficient technique for seamless handoff when contrasted with the mobile-IP based frameworks.

1.5.2 End-to-end Assessment of TCP Execution
Multiple types of wireless remote access networks have been executed in latest years and have become inseparable components of the Internet. TCP was originally designed for wired stationery hosts, the most broadly utilized transportation decorum on the Internet, yet it faces serious difficulties when users move around in various networks and hence handoff happens intermittently. Most Internet traffic uses TCP for dependable end-to-end packet delivery. Be that as it may, TCP sees packet loss as the consequence of network clog, making it unfit for mobile wireless networks where sporadic and temporary packet losses are usually caused by shadowing, fading, hand-off, and other radio impacts. The issue of end-to-end connectivity and reliability management for TCP turns out to be more serious during the vertical hand-off between distinct wireless systems.In the second commitment of the proposition, we are proposing a fresh TCP version, called ISN-TCP, which handles typical TCP issues, for example, packet reordering, spurious timeouts, packet losses and under / over use of network for TCP associations during transfer. It presents an extra cross layer between the transport and the network layer at both the mobile node and the respective node (the other end of the TCP stream), which is utilized to activate TCP for associated actions to be transferred. ISN-TCP needs freezing to keep link consistency during handover, but it introduces additional network delay. Freezing delay for the UMTS network is additionally not tolerable.Furthermore, ISN-TCP is extended and an enhanced TCP variant ISN-TCP-PLUS is proposed. For link maintenance used by ISN-TCP, this system does not involve freezing. ISN-TCP-PLUS considerably increases TCP efficiency during handover by filtering out duplicate acknowledgments (dAcks) and calculating the fresh flying network's retransmission timer (RTT), the suggested system utilizes a congestion window approximation (CWnd) calculation comparable to the methods used for equation-based TCP congestion control. ISN-TCP-PLUS performance was evaluated using simulation outcomes and it demonstrates that the suggested version works much better than standard wireless TCP (WP-TCP) and ISN-TCP.

1.5.3 Vertical Handover over Intermediate Switching Framework: Assuring Service Quality for Mobile Users
To further reinforce our structure by integrating QoS in separate QoS parameters into the handover system. A critical problem is ensuring the growing need for consumers to remain' always best linked' to economically subscribed elevated information rates regardless of their mobility and geographic place. We ought to have the option to guarantee continuity of links and the QoS perceived by customers by moving a continuous information session starting with one channel then onto the next in order to obtain such flexibility in communication. The conventional handover system based on the' Received Signal Strength Identifier' (RSSI) as the handover metric for QoS-based alternatives is not appropriate.We are proposing a QoS-based handover system between UMTS and WLAN networks based on the ISN framework in the third contribution of the thesis. Depending on

the financial subscription of the mobile nodes to the service provider used for possible handover, a per-node bandwidth reservation is suggested. Furthermore, if the QoS for a mobile node degrades, the decision on the transfer is taken jointly by the mobile node and its present attachment point. To prevent QoS degradation during handover, a pre-handover bandwidth booking system is suggested to reserve bandwidth at alternative link points. In addition, pre-reservation of bandwidth enables prioritize the transfer from one WLAN network to another WLAN network over the transfer from UMTS to the WLAN network. Using simulation outcomes, the efficacy of the suggested system is also evaluated.

1.5.4 vAP abstraction
In the suggested architecture, each AP includes an agent allocated by SDN controller to execute local network duties. The officer is accountable for providing SDN control layer with local network data to minimize the SDN controller burden. In addition, we are building virtual APs (vAPs) with the assistance of SDN and NFV to release AP's leadership complexities. Such as transferring the IEEE 802.11 protocol stack activities to the application management layer, establishing the link abstraction between MT and AP, handling MT migration across various APs without resetting the link. Our technique promotes MT link in the signals overlapping region with various APs concurrently to handle the seamless transfer. We design seamless mobility implementation at the top of the controller with the presentation of agent and vAP abstraction.

2 SYSTEM STUDY

2.1 Existing System
Software Defined Networking (SDN) introduces network architecture innovations that can enhance wireless network performance. SDN distinguishes the data plane from the control plane, simplifying the control network and improving network management in order to improve network control. In IEEE 802.11 networks in particular, SDN allows the network to take control of the handover process through the abstraction of the Light Virtual Access Point (LVAP) and allows seamless handover that is not possible in traditional IEEE 802.11 networks. SDN enables the IEEE 802.11 handoff process to be carried out without disconnecting the network, i.e. seamless handoff. The above is done without any changes to the MU and is fully regulated by the network. By experimenting with real network devices, we show that in IEEE 802.11 traditional networks, the handover delay in SDN networks is in the millisecond scale versus one second or more.

2.1.1 Disadvantages
- ✓ ·Migration of LVAP to APs running on various channels or when migration to a busy resource is carried out.
- ✓ LVAP abstraction allows a network-controlled handoff, creating fresh triggers where network data (traffic categories, load balancing) can be regarded.

2.2 Proposed System
In the present study work, we are proposing a Logical AP-based Mobility Management (LAPM) system for WLAN in the SDN setting with the NFV's additional features, describing how to better design an optimal mobility management environment for WLAN. We build the logical AP (LAP) with an expanded abstraction of SDN / NFV that releases the multifaceted nature of the IEEE 802.11 protocol stack to forward the activities to the Unified controller. Each LAP corresponds to an MT-associated user / mobile terminal.The $_L$AP acts as the Virtual AP ($_V$AP), a physical AP ($_P$AP) abstraction that offers supporting network features. The $_L$AP has the ability to maintain the same $_V$AP for each associated MT with adjacent $_P$APs simultaneously to enable the seamless transfer that can be achieved when MT in the signal overlapping range is associated with several PAPs. We are also testing both standard handover efficiency and our suggested LAPM algorithm. A focus of this study is also load balancing among APs that have a prevalent region of signal interference. To evaluate PAP's features, we create a testing environment based on SDN and NFV techniques. Following the implementation of the LAPM system in a test bed, with actual user traffic, it is apparent from the assessment outcomes that the suggested system could considerably decrease the latency in WLAN transfer. Furthermore, the LAPM system retains the load balance with the seamless handover at the same time. This experimental study enables to assess the efficiency of installed PAPs in order to further improve the QoE.

2.2.1 Advantages
- ✓ The software-defined network (SDN) concept is a promising wireless network personification solution capable of delivering programmable control plane and information plane to AP. These characteristics increase the fine grained packet control WLAN efficiency and provide an interface for setup using OpenFlow.
- ✓ The OpenFlow-based switch can conduct multiple tasks that the controller characterizes dependent on predefined regulations, e.g. it can function as a switch, NAT, firewall, or other client characterized capacities
- ✓ In current apps, the OpenFlow may integrate handover parameters that could prompt smooth results for handover activity.
- ✓ The OpenWRT helps reconfigure wireless protocols to allow the IEEE 802.11 AP SDN programmable control plane to improve the standard wireless network handover process.
- ✓ In addition, the advent of the Network Virtualization Function (NFV) is strongly inspired to introduce various advantages for service providers and user / mobile terminals (MT) within the SDN platform.
- ✓ The NFV was regarded a useful abstraction of hardware features to decrease infrastructure costs and also to minimize power consumption.
- ✓ It is therefore obvious that SDN and NFV techniques have the ability to create a planned WLAN condition by implementing mobility management characteristics including seamless exchange, wireless resource optimization, unified administration and fine-grained controllability.

3 SYSTEM ARCHIRTECTURE

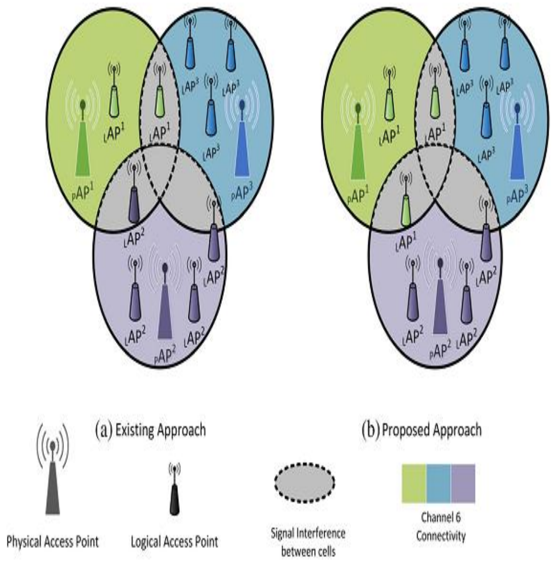

Figure 1 Architecture Diagram

Our suggested system considerably increases the efficiency of the APs and MTs with no customer-side changes. This also provides seamless mobility so that during the handoff session the $_L$AP can relocate from the source PAP to the destination $_P$AP. The traditional association method based on RSSI could produce the network atmosphere of load imbalance. As shown in Fig. 1a, $_P$AP2 linked to the four MTs through individual LAPs and $_P$AP3 linked to three MTs, while $_P$AP1 linked to two portable terminals. The $_L$AP2 additionally exists in the $_P$AP1 inclusion zone, but due to the less RSSI rather than $_P$AP2 it does not associate.Contrary to this, our suggested strategy involves $_P$AP workload data that guarantees a healthy network while the MT association. As shown in Fig. 1b, $_L$AP2 can be combined with $_P$AP1 which can decrease the $_P$AP2 load and also improve the related MT throughput.The conventional IEEE 802.11 PAP does not allow monitoring of the related MTs ' motion that interrupted the continuity of the established connection, thus degrading the provision of administration. Accordingly, we Develop a logical access point (LAP) to Ideal the connection, MT related with AP as a virtual AP (VAP) The physical of physical AP (PAP) provides a platform to facilitate the programmable control plane and the functions of mobility management. The LAP is a consistent substance living in the PAP with an expanded SDN / NFV abstraction that releases stack complexity of the IEEE 802.11 protocol to forward activities to the centralized controller. In addition, AP functions as the SDN officer responsible for carrying out the various activities produced by either the SDN controller or the local network. In particular, the first job is to assign per client a distinctive BSSID that produces beacon and recognition. Second, it sets the underlying design parameters for the MT for example, IP address, MAC address, and SSID and contains the related module information in the OpenFlow tables. Every PAP can host various LAPs with distinct BSSIDs to allow its related users to abstract a particular handover operation. At the same time, LAP also holds the same VAP for each neighboring MT, To allow a seamless transfer that can be done while MT is in the signal overlapping range associated with several PAPs.LAP migration between neighboring PAPs can be accomplished without a re-affiliation phase and furthermore avoided the extra MAC layer processes which provide an illusion of the user-side coherent association. Third, it detects PAP load utilizing the OpenWRT mwan package that contains data on the outbound traffic load.

4. ALGORITHMS

A LAPM controller running the Ubuntukylin-14.04 and Floodlight version 1.2 on the computer (dual four-core CPU, 16 GB RAM). The Floodlight is an open source controller that offers multiple features for example, dealing with the network, monitoring packet stream control, empowering packet header alteration, and sending incoming packets to particular port(s) as determined by the guidelines. In addition, we create certain modules in the Floodlight controller to conduct various tasks such as acquiring original PAP data including RSSI and CS data by performing algorithms1, and the LAPM controller additionally performs preparing to permit additional MAC layer highlights. Subsequently, algorithm2 is accountable for performing PAP-related mobility functions such as disabling LAP or LAP connection, mapping LAP to neighboring PAP, and migrating LAP to PAP when load is imbalanced.

Algorithm 1: LAPM scanning phase for obtaining

Initialization: set {A} $S_p AP1, S_p A$
While (1)
Thread.sleep (60s)
for
for MT_n is co then
Get from LAP
count MT ++
V_R
count CSA ++
count CSp ++
end for
compute NLAP using equation (1)
end for
T = as per equation (3)
end while

Algorithm 2: LAPM Mobility Phase

for p then
if ( )
if Balanced=False then
Min(NLAP) ⇒ p
← Associate → p
end if
else ( )
if HandoverState=True then
Max (NLAP) → p
← Associate → P
end if
end if
end for

5. RESULT AND IMPLEMENTATION

5.1. IMPLEMENTATION

5.1.1 Handoff.

Mobility is one of a wireless network's most significant characteristics. Two or more access points (APs) generate an Extended Service Set (ESS) in these networks. An ESS comprises of at least two Basic Service Sets (BSS) that show up as a solitary BSS to the client. The customer station (STA), the purported Received Signal Strength Indicator (RSSI), continually measures the sign quality got from the APs. The STA may choose to move inside the equivalent ESS and partner with another AP dependent on the RSSI or the quantity of retransmissions. This is known as the handoff procedure

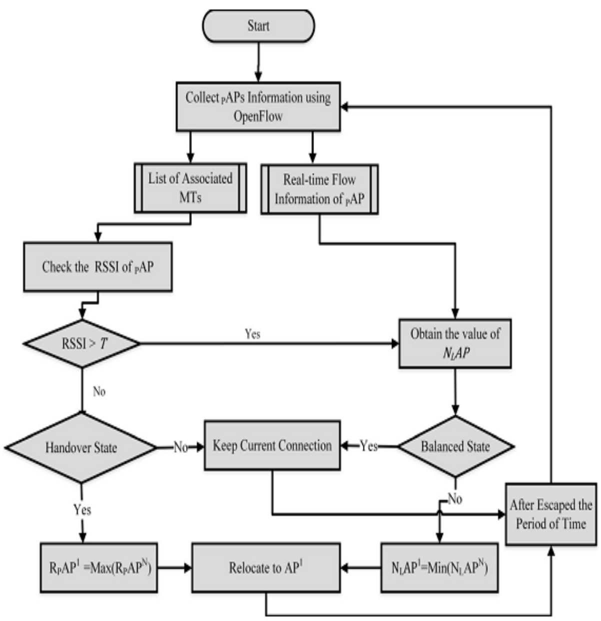

Figure 2 *Data Flow Diagram*

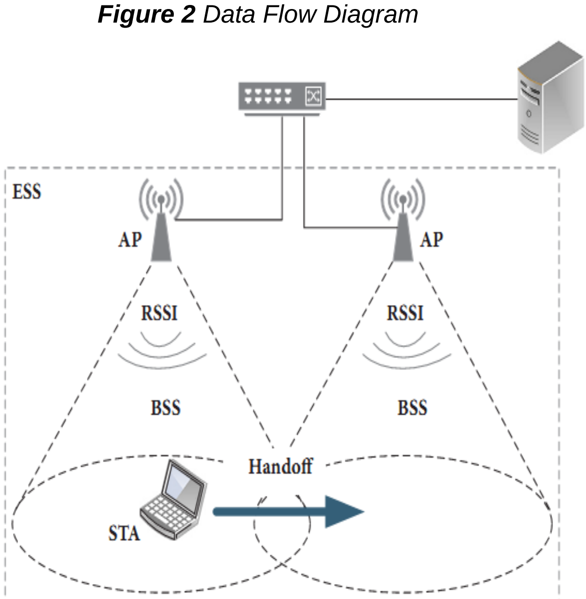

Figure 3 *Example of Handoff*

5.1.2 SDN Controller

The primary key element that conducts network management is the SDN controller. It includes apps that execute network services. The top of the SDN controller is these apps. The application depends on the SDN controller.

5.1.3 SDN Forwarder

SDN forwarder is a conventional, unchanged OpenFlow forwarder.

5.1.4 Wireless Termination Point

It reflects an access point containing an expanded OpenFlow protocol and in IEEE 802.11 networks it does not have complete logic of normal access point logic. Access to Split-MAC is used.

1.5.5 Mobile station

It reflects an unmodified terminal station in any manner.

1.5.6 OpenFlow

This protocol assumes that segments of the data scheme are easy instruments for packet forwarding and their operation is dictated by the controller's forwarding regulations. Whenever a fresh flow enters a switch, to find a corresponding forwarding rule, the switch's forwarding table is queried. If no forwarding rule is discovered, either the packet will be dropped or the controller will be sent an investigation to obtain the action needed.

1.5.7 VAN.

Virtualized Access Network (VAN) offers a core residential network control architecture. The architecture comprises of: I private APs, (ii) a controller that is piece of the ISP, and (iii) content administration servers that are piece of the network of content providers (e.g., Netflix). The controller offers a number of APIs that control home networks by content providers. These APIs are appropriate for various categories of traffic such as video streaming and transfer of documents. For example, the content provider communicates with the controller when a content provider gets a client's solicitation and stores assets for the information stream mentioned.

1.5.8 Network Function Virtualization

Split-MAC, which is primarily implemented via VAP, is the most prevalent use of NFV in SDWLANs. Time-critical activities operate on APs using the split-MAC approach, while the controller handles other MAC activities. This approach allows remote computing platform resources to be exploited and streamlines MAC and safety updates without having to substitute APs as it requires either no or insignificant acclimations to APs. In spite of the advantage of VAPs, it is fundamental to strike a harmony among adaptability and overhead correspondence in light of the fact that the overhead and delay of the appropriation plan increments when greater usefulness is moved to a controller. For instance, the significance of using queuing policies with OpenFlow switches was proved even for tiny networks. Studies are therefore needed to demonstrate the tradeoffs between centralization and scalability.

5.2 RESULT

Simulation parameters setup

Parameter	Values
Channel Type	Channel/Wireless Channel
Radio-propagation Model	Propagation/Two Ray Ground
Network Interface Type	Phy/WirelessPhy
MAC Type	Mac/802_11
Interface Queue Type	Queue/DropTail /PriQueue
Antenna Model	Antenna/Omni Antenna
Max Packet in ifq	50
Number of Mobile Nodes	28
Routing protocol	AODV
X dimension of Topography	2000
X dimension of Topography	900
Time of simulation end	150

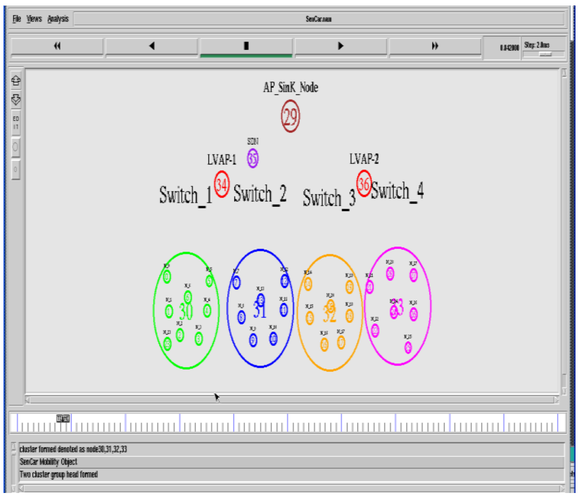

Figure 4 *Cluster formed denoted as 30,31,32,33*

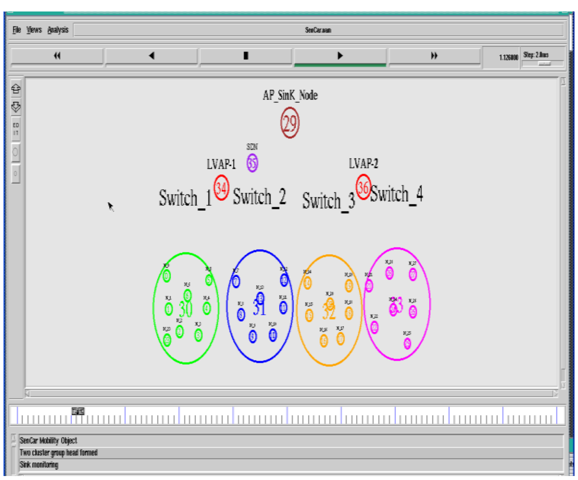

Figure 5 *Based on Mobility Object Two Cluster Group Head Formed*

Figure 6 *from Sink Node Group Heads Selected*

Figure 7 *Clustering Group Monitoring Suborders for Data Transmission*

Figure 8 *Select Group Heads via Sink Node*

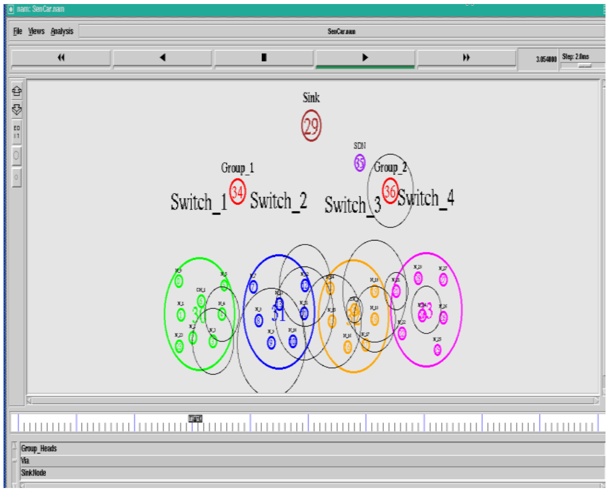

Figure 9 *Initializing Group Node*

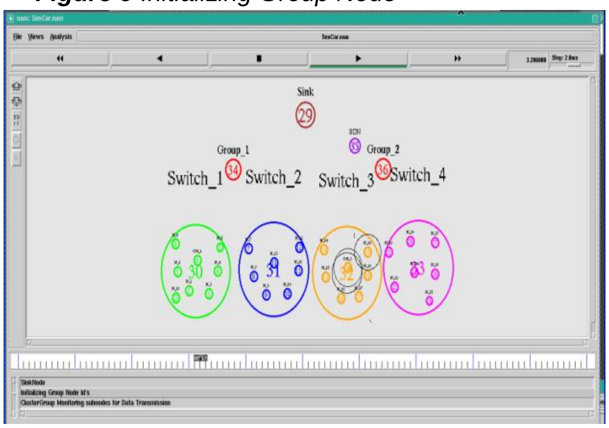

Figure 10 *Cluster Group Monitoring Subnodes for Data Transmission*

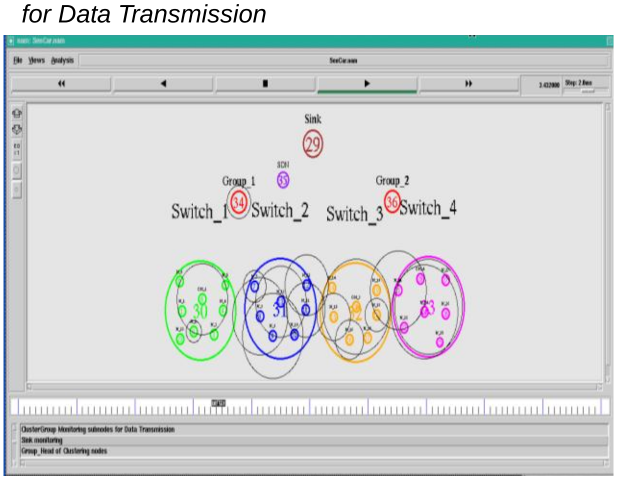

Figure 11 *Sink Monitoring Group Head of Clustering Node*

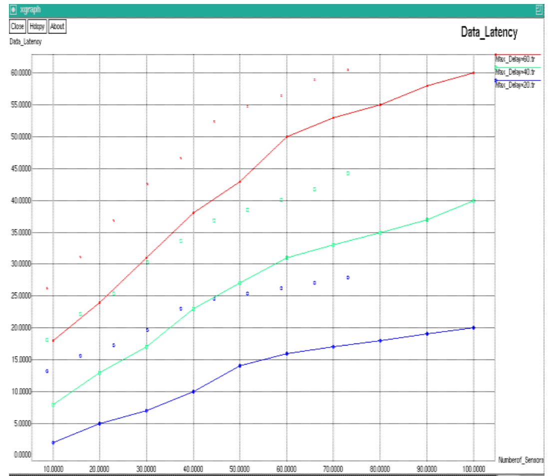

Figure 12 *Data latency Vs Maximum Delay*

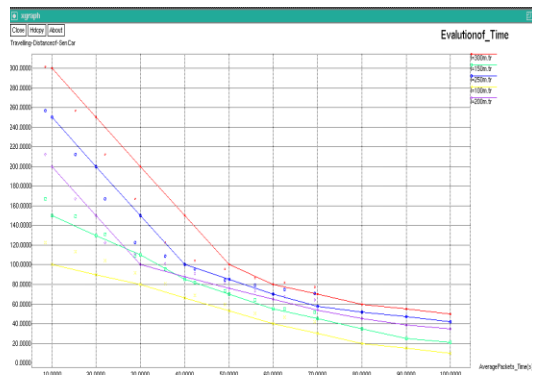

Figure 13 *Time Vs Average Packets*

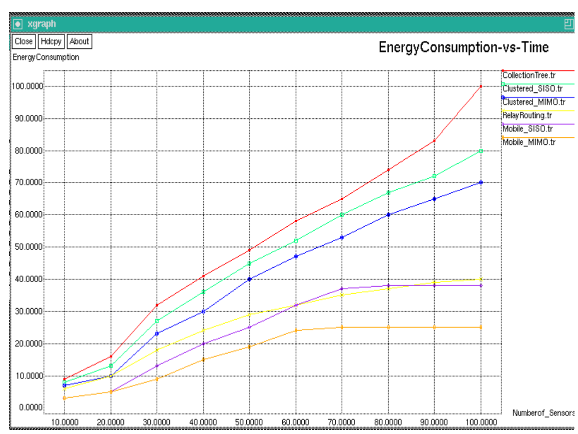

Figure 14 *Energy consumption Vs Time*

6 CONCLUSION

The advent of the M-SDN / NFV paradigm gives us a fresh chain of creative opportunities in the Conventional WLAN to solve mobility problems. In this document, we suggested an embedded mobility management system to solve the issues of seamless handover and MT connection with overloaded APs in the signal overlapping region, taking into account both seamless handover and load balancing. Furthermore, the suggested system can be readily implemented on the client side without any alteration. The suggested system makes connecting with the best accessible AP possible for users. Our tests demonstrate how to create $_L$AP, assign $_L$AP, and relocate $_L$AP according to an algorithm of real-time choice performed on the SDN controller. The assessment findings show that our LAPM-based WLAN framework adequately improves the network's throughput and reduces the packet loss proportion considerably while balancing the network simultaneously

6.1 Future Enhancement

In the future, the mobility management system will be explored for an energy saving module and place consciousness or location-based services and traffic offloading would be incorporated into the present system, LAPM, to give all the more evident mobility later on Internet architecture.

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