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Centralized Demand-Aware Traffic Scheduling in Wireless LAN's for Better throughput and End to End Delay

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Abstract: **Deployment of large number of AP's with the limitation of the orthogonal channel lots of AP's faces overlapping regions, which causes the increase in the interference of AP's and Station. To overcome the degradation in the performance due to the interference, in this paper a centralized architecture for Wi-Fi which effectively coordinates with the downlink transmission by the AP's which improves the performance of the network in terms of end-to-end delay and throughput.**

I INTRODUCTION

IEEE 802.11 Wireless LAN (WLAN) is one of the most popular wireless communication technologies developed so far. Its tremendous success has led to the dense deployment of WLANs almost everywhere. A wireless LAN (WLAN or WiFi) is a data transmission system designed to provide location-independent network access between computing devices by using radio waves rather than a cable infrastructure In the corporate enterprise, wireless LANs are usually implemented as the final link between the existing wired network and a group of client computers, giving these users wireless access to the full resources and services of the corporate network across a building or campus setting.

The widespread acceptance of WLANs depends on industry standardization to ensure product compatibility and reliability among the various manufacturers. The 802.11 specification [**IEEE Std 802.11 (ISO/IEC 8802-11: 1999)**] as a standard for wireless LANS was ratified by the Institute of Electrical and Electronics Engineers (IEEE) in the year 1997. This version of 802.11 provides for 1 Mbps and 2 Mbps data rates and a set of fundamental signaling methods and other services. Like all IEEE 802 standards, the 802.11 standards focus on the bottom two levels the ISO model, the physical layer and link layer (see figure below). Any LAN application, network operating system, protocol, including TCP/IP and Novell NetWare, will run on an 802.11-compliant WLAN as easily as they run over Ethernet.

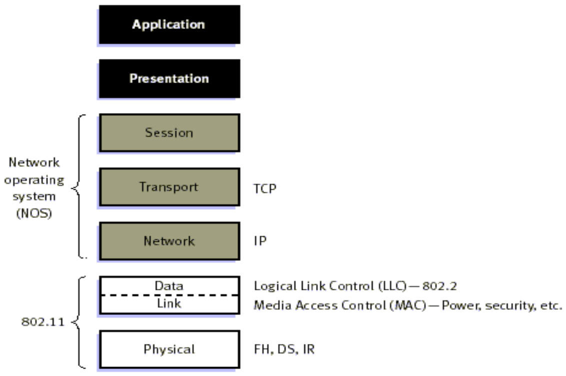

Fig 1: IEEE 802.11 and the ISO Model

The major motivation and benefit from Wireless LANs is increased mobility. Untethered from conventional network connections, network users can move about almost without restriction and access LANs from nearly anywhere. The other advantages for WLAN include cost-effective network setup for hard-to-wire locations such as older buildings and solid-wall structures and reduced cost of ownership- particularly in dynamic environments requiring frequent modifications, thanks to minimal wiring and installation costs per device and user. WLANs liberate users from dependence on hard-wired access to the network backbone, giving them anytime, anywhere network access. This freedom to roam offers numerous user benefits for a variety of work environments, such as:

- Immediate bedside access to patient information for doctors and hospital staff
- Easy, real-time network access for on-site consultants or auditors.
- Improved database access for roving supervisors such as production line managers, warehouse auditors, or construction engineers.
- Simplified network configuration with minimal MIS involvement for temporary setups such as trade shows or conference rooms.

- Faster access to customer information for service vendors and retailers, resulting in better service and improved customer satisfaction.
- Location-independent access for network administrators, for easier on-site troubleshooting and support.
- Real-time access to study group meetings and research links for students.

However, the high density also incurs interferences more frequently among wireless Access Points (APs) and devices (or stations). Hence, more APs may do more harm than good, and hamper the optimal performance of WLANs.

II PROPOSED ARCHITECTURE

A. Problem Statement

In dense deployment of Wireless LAN using IEEE 802.11, AP's interference increases and due to this quality of service degrades. To improve the quality of service in terms of throughput and end to end effective scheduling of channels must be done.

B. Objectives

- To implement a solution for scheduling for timeslots in Wireless LAN.
- To reduce the contention.
- To reduce the channel interference.
- To improve the throughput of the Wireless LAN system.
- To reduce the average end-to-end delay for packets in Wireless LAN system.

C. Proposed Solution

We propose Centralized Coordinated Wi-Fi that achieves high throughput and low scheduling complexity in WLANs administered by a single authority. CO-FI is designed in a way that a centralized controller computes frame transmission schedules for each AP, and APs run a hybrid MAC protocol called CoMAC that can select DCF and Time Division Multiple Access (TDMA) modes flexibly. CoMAC runs in TDMA mode to transmit traffic in a batch fashion scheduled by the controller whereas it runs in DCF mode for transmitting low-volume traffic. Our scheme only schedules downlink traffic as the volume of downlink traffic takes a dominant portion in WLANs.

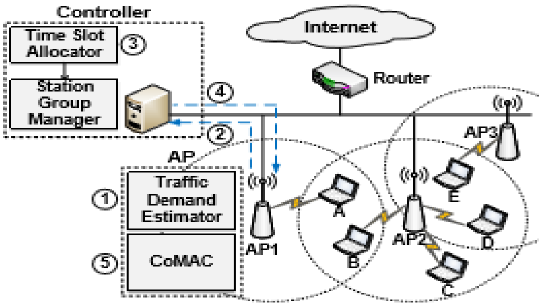

Fig 2: Overview of Centralized Wi-Fi

III System Analysis

Analysis is the process of finding the best solution to the problem. System analysis is the process by which we learn about the existing problems, define objects and requirements and evaluates the solutions. It is the way of thinking about the organization and the problem it involves, a set of technologies that helps in solving these problems. Feasibility study plays an important role in system analysis which gives the target for design and development.

Depending on the results of the initial investigation the survey is now expanded to a more detailed feasibility study. "FEASIBILTY STUDY" is a test of system proposal according to its workability, impact of the organization, ability to meet needs and effective use of the resources.

Eight steps involved in the feasibility analysis are:

- Form a project team and appoint a project leader.
- Enumerate potential proposed system.
- Define and identify characteristics of proposed system.
- Determine and evaluate performance and cost effective of each proposed system.
- Weight system performance and cost data.
- Select the best proposed system.
- Prepare and report final project directive to management.

Three key considerations involved in the feasibility analysis are

A. ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

B. TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

C. SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

IV PROPOSED DESIGN

Design is a creative process; a good design is the key to effective system. The system "Design" is defined as "The process of applying various techniques and principles for the purpose of defining a process or a system in sufficient detail to permit its physical realization". Various design features are followed to develop the system. The design specification describes the features of the system, the components or elements of the system and their appearance to end-users.

Input Design: The input Design is the process of converting the user-oriented inputs in to the computer-based format. The goal of designing input data is to make the automation as easy and free from errors as possible. Providing a good input design for the application easy data input and selection features are adopted. The input design requirements such as user friendliness, consistent format and interactive dialogue for giving the right message and help for the user at right time are also considered for the development of the project. Input design is a part of overall system design which requires very careful attention. Often the collection of input data is the most expensive part of the system, which needs to be route through number of modules .It is the point where the user ready to send the data to the destination machine along with known IP address; if the IP address is unknown then it may prone to error.

Output Design: A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other systems through outputs. It is most important and direct source information to the user. Efficient and intelligent output improves the systems relationship with source and destination machine. Outputs from computers are required primarily to get same packet that the user has send instead of corrupted packet and spoofed packets. They are also used to provide to permanent copy of these results for later consultation.

For the development method, we are choosing the waterfall model due to the following reasons:

- Clear project objectives.
- Stable project requirements.
- Progress of system is measurable.
- Strict sign-off requirements.
- Helps you to be perfect.
- Logic of software development is clearly understood.
- Production of a formal specification.
- Better resource allocation.

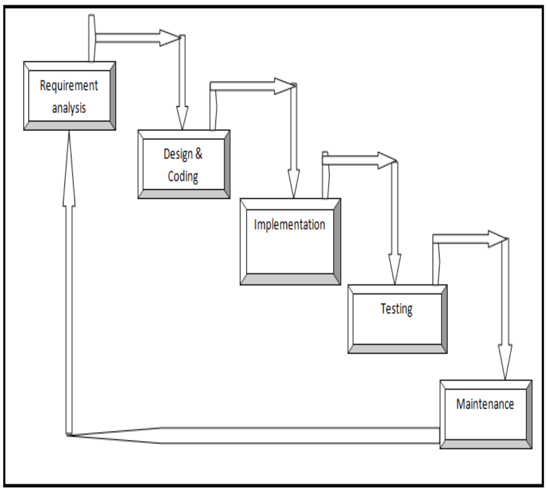

Fig 3: Waterfall Model

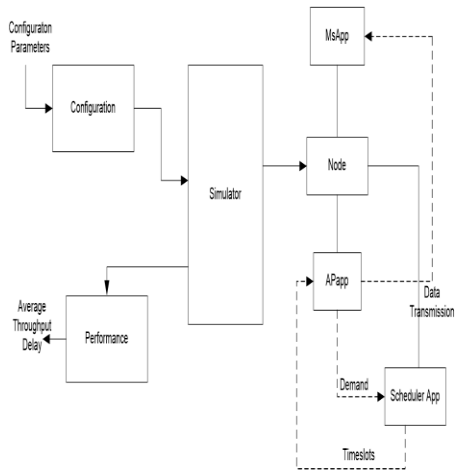

Fig 4: System Architecture

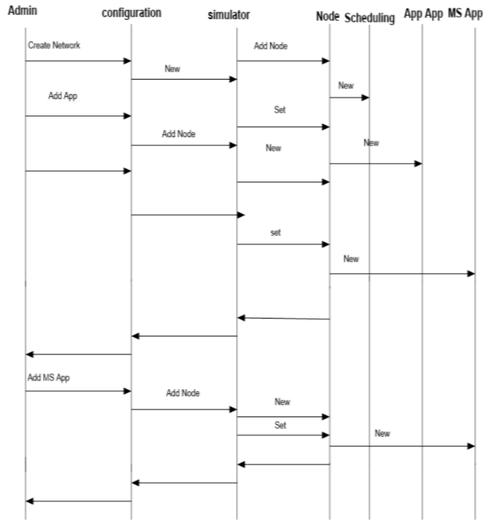

Fig 5: Initialization Flow

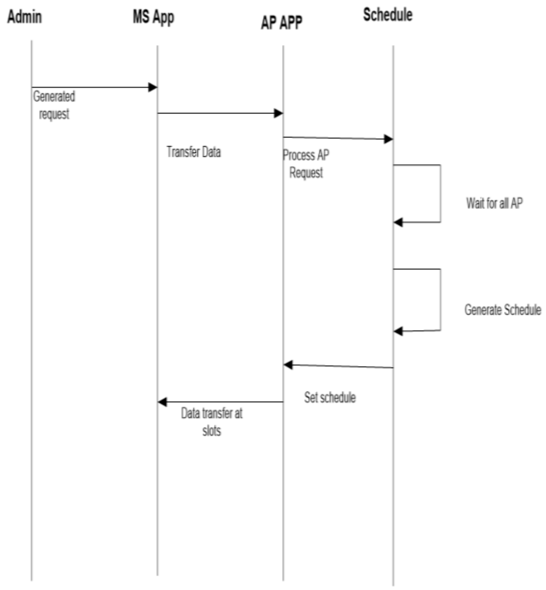

Fig 6: Traffic Flow

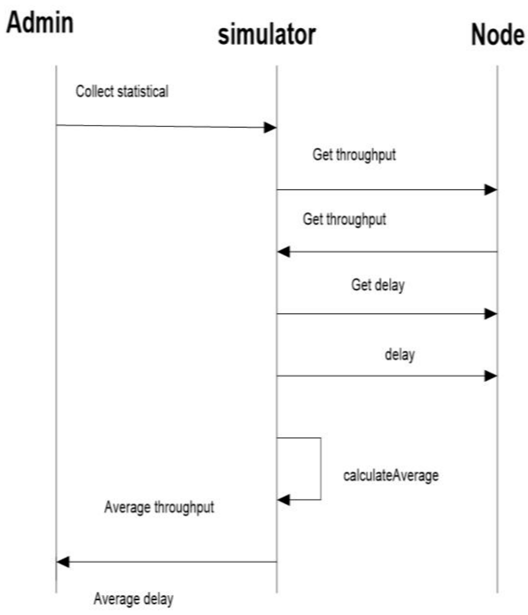

Fig 7: Performance Flow

V CONCLUSION

There has been an escalated level of interference among wireless access points and stations due to dense deployment of IEEE 802.11 Wireless LANs. We introduced a coordinated WiFi architecture, CO-FI, that alleviates interferences and hence boosts up wireless network performance for downlink traffic. In CO-FI, a controller orchestrates access points depending on offered loads and interference types. CO-FI effectively reduces its scheduling complexity and mitigates the effect of time synchronization errors by letting a hybrid MAC protocol—*CoMAC* in the access points use CSMA/CA and TDMA protocols selectively. Our evaluation results demonstrate significantly improved throughput and end-to-end delay gain over existing approaches, especially when wireless devices are densely deployed and the networks are heavily loaded.

V RESULT

The output of the proposed algorithm is as shown below, which provides the better QOS for WLAN.

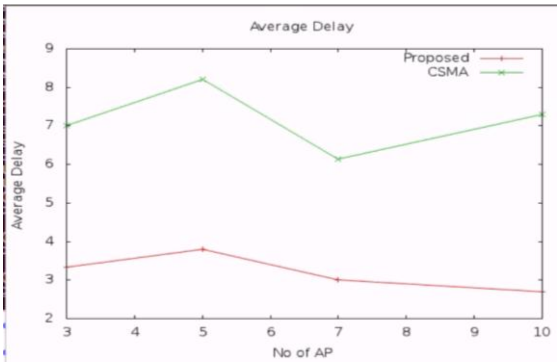

Fig 8: Comparative Delay's

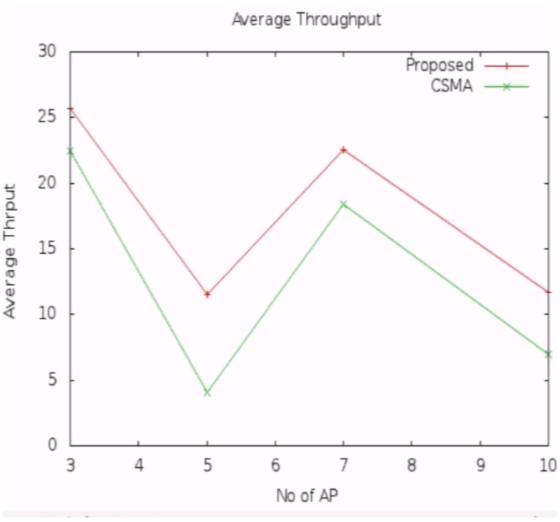

Fig 9: Comparative Throughput

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