# Scheduler Design for Wireless Triple-Play Service Delivery

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## Ideology

Recently, wireless technologies have been heavily used to reduce or eliminate wired infrastructure in both the home and business environments. In this project, a triple-play service delivery system is designed to provide television, telephone and data service delivery wirelessly to the home from a cable hub. In order to accomplish this, a Quality of Service (QoS) enabled scheduler was designed to address the challenges associated with delivery of theses services.

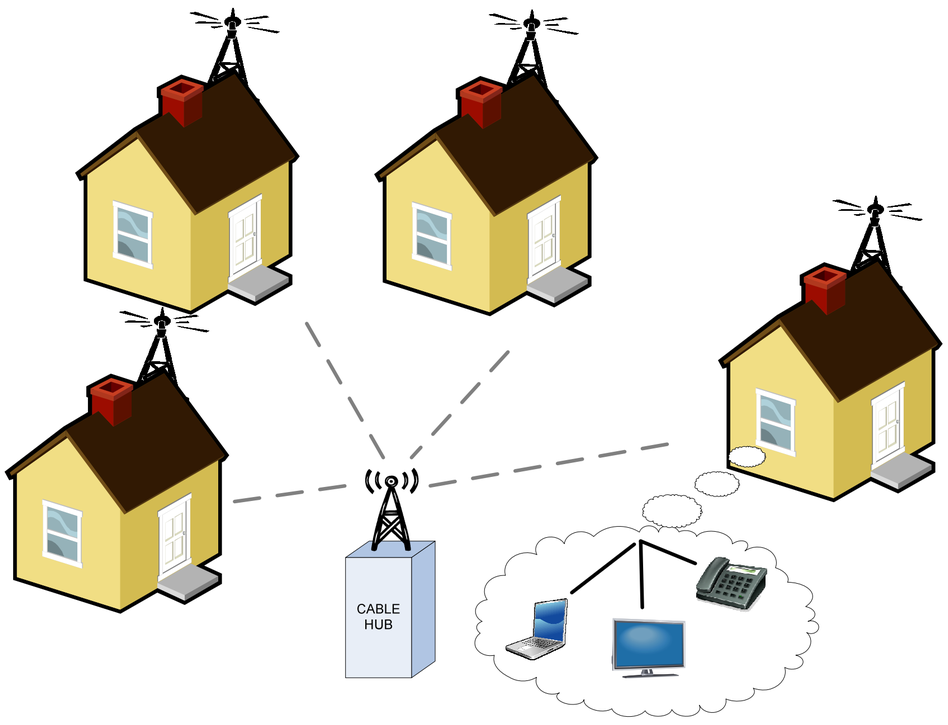


Figure 1: Example of Point-To-Multipoint Configuration of Last-Mile Connection using Wireless Technology to deliver Video, Voice and Data Services

In order to meet these requirement, a QoS enabled multipoint scheduler was designed. The purpose of the scheduler is to manage the wireless channel resource by servicing individual arrival queues based on traffic priority. Design was broken up into three stages:

1. System Requirement Analysis and Theoretical Design
2. Software Simulation of Design
3. Hardware Prototyping of Design

Following system requirement analysis, a theoretical design of the scheduler was done. A Time-Division Multiple-Access scheme was designed with fixed location scheduling for voice traffic in addition to a proportionally-exhaustive algorithm for video traffic. Other data services are allocated each frame based on available wireless channel resources.

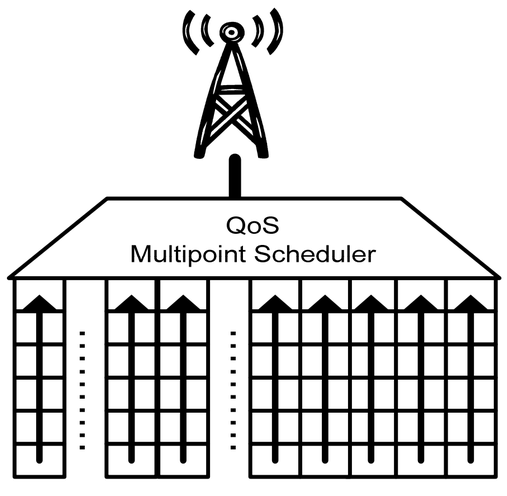


Figure 2: Queue structure of QoS Multipoint Scheduler. Independent queue streams feed into a single scheduler which determines transmission priority.

## Testing and Evaluation

Evaluation of the scheduling algorithm was performed in the ns-2 simulation environment. This allows rapid evaluation of algorithms with little development time.

The proposed algorithm was compared with existing QoS and non-QoS algorithms in their ability to deliver triple-play services. The new mechanism met system requirements and offered improvements performance in

- Providing lower bounded delay for video traffic by a factor of 4
- Reduced jitter requirements for voice streams
- Higher best-effort throughput by use of the dynamic allocation scheme
- Provides Downlink/Uplink best-effort admission control capabilities

## Prototyping

The third development stage involves rapid prototyping or “proof-of-concept” development utilizing existing hardware. The Multi-band Atheros Driver for Wireless Fidelity (or MADWiFi) is available for Atheros chipset based 802.11x card. By utilizing off-the-self consumer hardware, both development time and cost have been dramatically reduced. In this stage, the scheduling algorithm was implemented over the existing 802.11 Medium Access Control (MAC) scheme by selectively disabling and/or configuring various hardware and driver features.


Figure 3: D-Link DWL-AG630 Wireless Card (Image from: http://www.dlink.com). Utilizes Atheros AR5212 Chipset; compatible with MADWiFi

## Future Development

The next step of this work will be to design and develop wireless hardware that utilizes the design scheduler to provide service delivery. The proposed hardware will allow better control granularity than implementation of existing hardware, In addition, by designing custom hardware, cross-layer mechanisms can be incorporated to provide enhancement performance via real-time channel measurements. This capability is currently unavailable when utilizing off-the-shelf hardware

## Summary

In this era, the need to reduce infrastructure cost is clear. Delivering services wirelessly over the last-mile to the home allows service providers to reduce cost associated with installation and maintenance synonymous with cabled connections. Such a system however must be properly designed to meet the requirements. For this reason, appropriate scheduling algorithms are paramount. In the work to-date, a scheduling algorithm has been designed, tested and prototyped to demonstrate its effectiveness in delivering these services without wires.

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