

**Greenput: A Power-Saving Algorithm That Achieves Maximum Throughput in Wireless Networks**

**Abstract:**

The dynamic frame sizing algorithm is a throughput-optimal algorithm that can achieve maximum network throughput without the knowledge of arrival rates. Motivated by the need for energy-efficient communication in wireless networks, in this paper, we propose a new dynamic frame sizing algorithm, called the *Greenput* algorithm, that takes power allocation into account. In our Greenput algorithm, time is partitioned into frames, and the frame size of each frame is determined based on the backlogs presented at the beginning of a frame. To obtain a good delay-energy efficiency tradeoff, the key insight of our Greenput algorithm is to reduce transmit power to save energy when the backlogs are low so as not to incur too much packet delay. For this, we define a threshold parameter *T*max (for the minimum time to empty the backlogs with maximum power allocation), and the Greenput algorithm enters the (mixed) power-saving mode when the backlogs are below the threshold. Using a large deviation bound, we prove that our Greenput algorithm is still throughput optimal. In addition to the stability result, we also perform a fluid approximation analysis for energy efficiency and average packet delay when *T*max is very large. To show the delay-energy efficiency tradeoff, we conduct extensive computer simulations by using the Shannon formula as the channel model in a wireless network. Our simulation results show that both energy efficiency and average packet delay are quite close to their fluid approximations even when *T*max is moderately large.

**Existing System:**

Issues of power allocation and channel states (of transmitting links) were also taken into account. In particular, a Dynamic Routing and Power Control (DRPC) policy was proposed in to stabilize the queues by solving a joint routing and power allocation problem. Most of these works assumed infinite buffers. The effect of finite buffer-size on the performance of a network of queues was addressed. A standard approach to prove the stability of the MWM

algorithm is to first consider a Lyapunov function and then show the existence of a negative drift of the Lyapunov function when the MWM algorithm (with back-pressure routing) is used. Another interesting approach is to use the carrier-sense multiple access (CSMA)-type random access algorithm to achieve the maximum throughput in ad hoc wireless networks. This approach usually requires a timescale separation assumption that assumes the CSMA Markov chain converges to its steady-state distribution instantaneously compared to the timescale of adaptation of the CSMA parameters.

**Proposed System:**

Motivated by the need for energy-efficient communication in wireless networks there has been tremendous interest in the study of various tradeoff mechanisms to achieve energy efficiency in each protocol layer. One of the main objectives of this paper is to study the delay-energy efficiency tradeoff in wireless networks by using the DFS algorithm. For this, we propose a new dynamic frame sizing algorithm, called the *Greenput* algorithm, that takes power allocation into account. To obtain a good delay-energy efficiency tradeoff, the key insight of our Greenput algorithm is to reduce transmit power to save energy when the backlogs are low and this should not incur too much packet delay.