

Opportunistic WiFi Mesh Infrastructure for Broadband Wireless Internet Access (OMESH)

Develop a demonstration prototype of the OMESH architecture to:

- enable the cost-effective WiFi (IEEE 802.11) broadband Internet access over massive geographic areas, accommodating real-time services such as voice and video over Internet (VoIP);
- enable the way of drop-and-play deployment, such that the mesh WiFi stations of consumers (enterprise or home users) can seamlessly be interconnected with those of service providers, achieving ubiquitous service coverage
- enable a low power mesh, such that the mesh stations can be using solar power in outdoor environments, and thereby be mounted wherever needed with little costs.

The OMESH infrastructure will allow anyone with a WiFi equipped device (i.e. laptop, PDA, iPhone, Zune, among others) to download video, or talk over Internet, anywhere, anytime, without paying expensive cellular phone service.

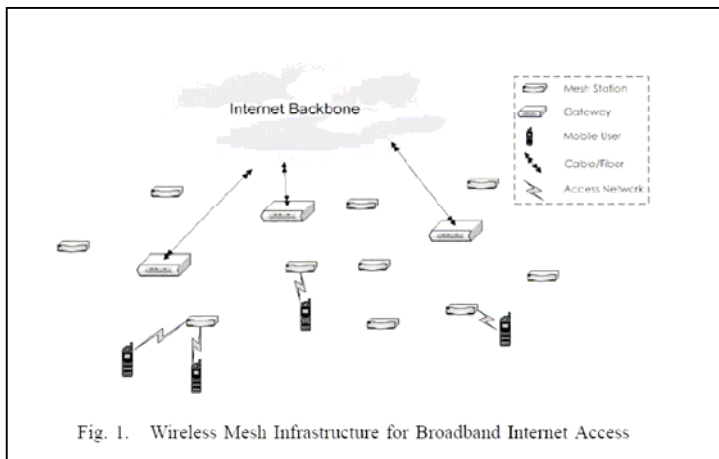


Fig. 1. Wireless Mesh Infrastructure for Broadband Internet Access

Recent Publications:

1. Liang Song, and Dimitrios Hatzinakos, "Energy Efficiency Limits of Broadcasting in Wireless Networks," IEEE Trans. on Wireless Communications, revised in Aug 2006.
2. Liang Song, and Dimitrios Hatzinakos, "Architecture of Wireless Sensor Networks with Mobile Sinks: Sparsely Deployed Sensors," IEEE Trans. on Vehicular Technology, vol. 56, no. 4, July 2007.

Challenges

- Scalability
- Data Management
- Sustainability
 - Node Energy constraints
 - Node Control
- Security and Privacy

Our approach

- Opportunistic data forwarding and aggregation
- Embedded Wireless Interconnect (EWI)
 - low power, low delay cross layer architecture
 - cognitive radio approach
- Biometrics, user centric, data level security



Fig. 6. Illustration of the Two Sets of Experiments

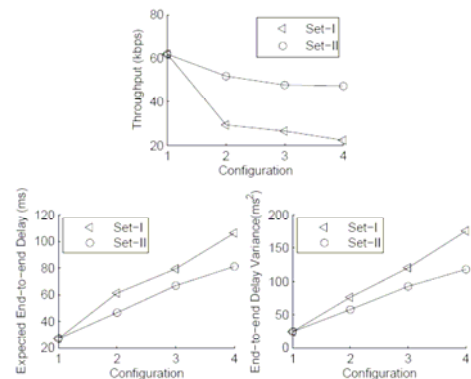


Fig. 7. Measurement Results

3. Liang Song, and Dimitrios Hatzinakos, "Architecture of Wireless Sensor Networks with Mobile Sinks: Multiple Access Case," to appear in International Journal of Distributed Sensor Networks.
4. Liang Song, and Dimitrios Hatzinakos, "A Cross-layer Architecture of Wireless Sensor Networks for Target Tracking," IEEE/ACM Trans. on Networking, vol 15, no. 1, pp. 145-158, Feb 2007.
5. Liang Song, and Dimitrios Hatzinakos, "Cooperative Transmission in Poisson Distributed Wireless Sensor Networks: Protocol and Outage Probability," IEEE Trans. on Wireless Communications, vol. 5, no. 10, pp. 2834-2843, Oct. 2006.
6. Liang Song, and Dimitrios Hatzinakos, "Architecture for Supporting Real-time Traffic in Large Scale Wireless Networks," to appear in ICDCS, Toronto, Canada, 2007.
7. Liang Song, and Dimitrios Hatzinakos, "Embedded Wireless Interconnect for Sensor Networks: Concept and Example," IEEE 4th Consumer Communications and Networking Conference (CCNC), 2007.
8. Liang Song, and Dimitrios Hatzinakos, "Dense Wireless Sensor Networks with Mobile Sinks," IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), vol. 3, pp. 677-680, Philadelphia PA, Mar. 2005.
9. Liang Song, Raviraj Adve, and Dimitrios Hatzinakos, "Matrix Pencil for Positioning in Wireless Ad Hoc Sensor Network," 1st European Workshop on Wireless Sensor Networks (EWSN), pp. 18-27, Lecture Notes in Computer Science 2920 Springer 2004, ISBN 3-540-20825-9.
10. Liang Song and Dimitrios Hatzinakos, "Opportunistic Wireless Mesh for Ubiquitous Voice and Video: An Experimental Study", submitted to IEEE 5th Consumer Communications and Networking Conference (CCNC), 2008.
11. Liang Song, and Dimitrios Hatzinakos, "Opportunistic Data Forwarding over Long Distance in Large Scale Wireless Networks", Submitted to IEEE TNET, Feb. 2006.

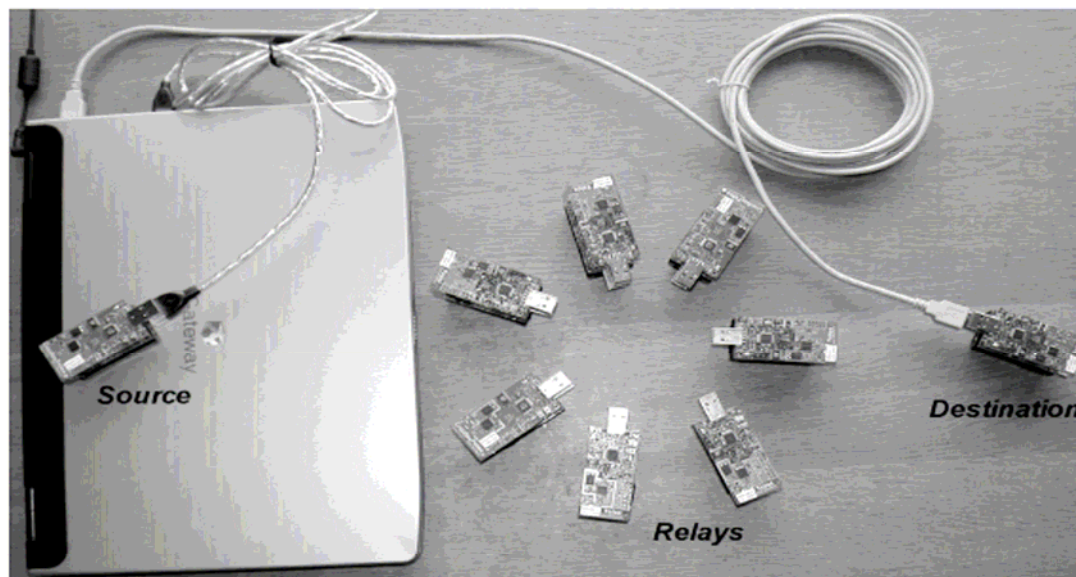


Fig. 5. Test-bed for QoS Metrics Experiments