Distributed Computing Lab

Research Activities in DCL

A. Broad Objectives

- Fault-Tolerant, Energy-Efficient and Scalable Algorithms for Distributed Systems
- Security Protocols for Computer Networks and Distributed Systems
- Communication Protocol Stack for Ad Hoc and Wireless Sensor Networks
- Energy and Memory Efficient Operating Systems for Embedded Systems

B. Current Focus

- Fault-Tolerant, Energy-Efficient and Scalable Clock Synchronization Protocols for WSNs
- Communication Protocol Stack for WSNs
- Security Protocols for Ad Hoc Networks with Different Membership Models
- Reliable Multicast Transmission for Wireless Networks
- MAC Layer Protocol for Clock Synchronization in WSNs
- Memory and Energy Efficient OS for WSNs with Preemptive Scheduling
- Reliable and Scalable Distributed Storage Systems

C. Some Examples of Our Work

- "An Energy Aware Routing Protocol with Sleep Scheduling for Wireless sensor Networks". Amulya Ratna Swain, R. C. Hansdah and Vinod Kumar Chouhan. In Proc. of the 24th IEEE International Conference on Advanced Information Networking and Applications(AINA 2010), Perth, Australia, pp.933-940, April 20-23, 2010.
- **"**An Adaptive Reliable Transport Protocol Based on Automatic reSend reQuest(ASQ) Technique for Wireless Sensor Networks". M. P. Gilesh and R. C. Hansdah. To appear in Proc. of the 7th International Symposium on Frontiers in Networking with Applications (FINA 2011), Singapore, March 22-25, 2011.

An Energy Aware Routing Protocol with Sleep Scheduling for WSNs

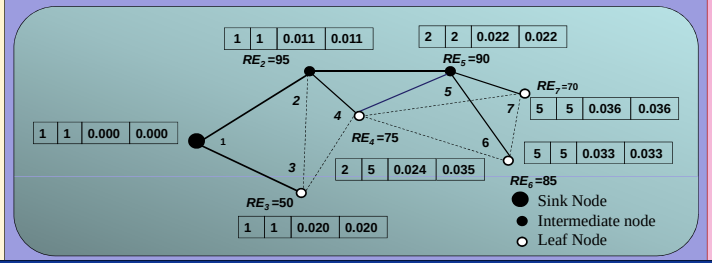
I. Protocol

Phase A

- Sink node **broadcasts an advertisement message (ADV1)**.
- After receiving ADV1 message, a node **sets backoff timer**.
- If the first **ADV1 message comes from the sink node**
  - The node **stores the sink node ID in two parent node fields**, and computes the new cost by adding reciprocal of its remaining energy.
- If the first **ADV1 message comes from any other node**
  - If the new cost is less than the existing cost, then the new cost value and received node ID is stored .
- For further ADV1 message, it computes the new cost in the same way.
- Once the **backoff timer expires,** the node **broadcasts ADV1 message** that contains its own ID, existing cost, and the parent node ID.

Phase B

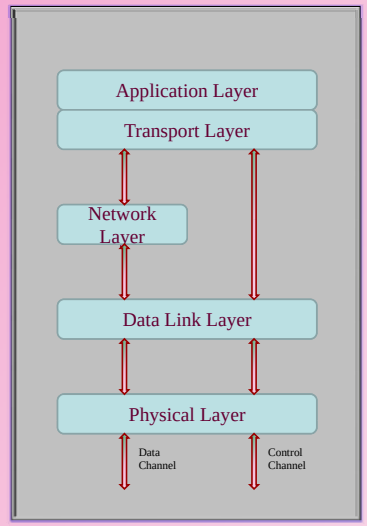
- Sink node **broadcasts an advertisement message (ADV2)**.
- After receiving ADV2 message, a node **sets backoff timer**.
- If the node has **already stored the sink node ID in its parent node fields or the node ID stored in the received ADV2 message is equal to the node ID stored in its first parent node field, then discard the message**.
- If the node **receives the ADV2 message from the sink node, it computes the new cost**, and **stores the sink node ID.**
- If **both the parent node fields of the receiving node are equal, it stores the new cost value in the second cost field**.
- If **both the parent node fields of the receiving node are not equal, it compares the new cost with the cost stored in the second cost field and store the minimum cost**.
- **After receiving the first ADV2 message, if a node has declared itself as an internal node in the phase A , it broadcast its own ADV2 message**.
- **Upon expiry of the backoff timer, if a node has declared itself as a leaf node in phase A, it goes to sleep mode**.



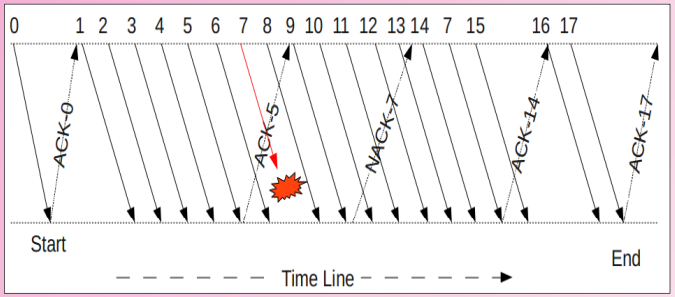
An Adaptive Reliable Transport Protocol Based on Automatic reSend reQuest(ASQ) Technique for WSNs

I. Protocol

- Modified stack with pruned transport layer
- Periodic acknowledgement scheme – hybrid with ACK, NACK and FNACK
- Inherent flow and congestion control
- Reduces ACKs considerably resulting in lower energy & higher throughput.



II. Diagram Illustrating the Protocol



Contact:
NAME : R. C. Hansdah
Name of Lab : Distributed Computing Lab.
Email : hansdah@csa.iisc.ernet.in

Department of Computer Science & Automation
Indian Institute of Science, Bangalore