Application-based optimization of multi-level clustering in ad hoc and sensor networks

ABSTRACT

- Multi-level clustering offers the scalability that isessential to large-scale ad hoc and sensor networks in addition to supporting energy-efficient strategies for gathering data. The optimality of a multi-level network largely depends on two design variables: 1) The number of levels, and 2) The number of nodes operating at each level.
- We characterize these variables within a multi-hop, multi-level hierarchical network of variable size that gathers and aggregates data at each level. Our network communication cost model (EEHC-VA) is parameterized by the size of the data forwarded at each level. We minimize the communication cost to obtain the optimal probabilities of distributed and independent selection of level-(n+1) nodes from level-n nodes.

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- Interestingly, we have identified intervals—based on the number of nodes and aggregated data sizes—within which single- or two-level hierarchies are optimal.
- The results have been numerically verified for a wide range of parameters and validated with network simulations. Finally, the impact of these results on the network architectures is discussed for selected applications and aggregation schemes.

EXISTING SYSTEM

- Energy efficiency is critical to the design of sensor network clusters that are limited by their battery reserves. Existing cluster optimization studies such as EEHC and LEACH consider "full aggregation", where a unit of data gathered from all the nodes within a cluster is aggregated at the Cluster head, resulting in a single unit only.
- The resulting unit is forwarded to the next higher level cluster head or the processing center.

PROPOSED SYSTEM

- Extension of the EEHC data gathering communication model to include independent data sizes up through the levels of hierarchy along with the generalizations of the shape of the deployment area and the location of the processing center.
- Analytical results on the optimal clusterhead election probabilities for multi-level networks. Derivation of thresholds on the number of nodes that determine the optimal number of levels in multi-level hierarchical clusters.

Hardware requirements

- Processor - Pentium-IV
- Speed - 1.1 Ghz
- RAM - 256MB(min)
- Hard Disk - 20 GB
- Key Board - Standard Windows Keyboard
- Mouse - Two or Three Button Mouse
- Monitor - SVGA

SOFTWARE REQUIREMENTS

- Tool - Network Simulator-2
- Operating system - LINUX
- Front end - OTCL (Object Oriented Tool Command Language)

REFERENCES

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