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Stream Data Gathering in Wireless Sensor Networks with Expected Lifetime

Motivation

Some applications do not need sensor networks with a long lifetime, such as monitoring an erupting volcano or hazardous conditions in a few hours. These applications generally expect that sensor networks can provide stream data as much as possible by working continuously during a short expected lifetime.

Approach

- Maximizing stream data gathering (MSDG) within an expected lifetime;
- Minimizing transmission delay (MTD) for stream data gathering within an expected lifetime;
- Optimal greedy forwarding bypassing hole routing.

Solutions to Typical Problems

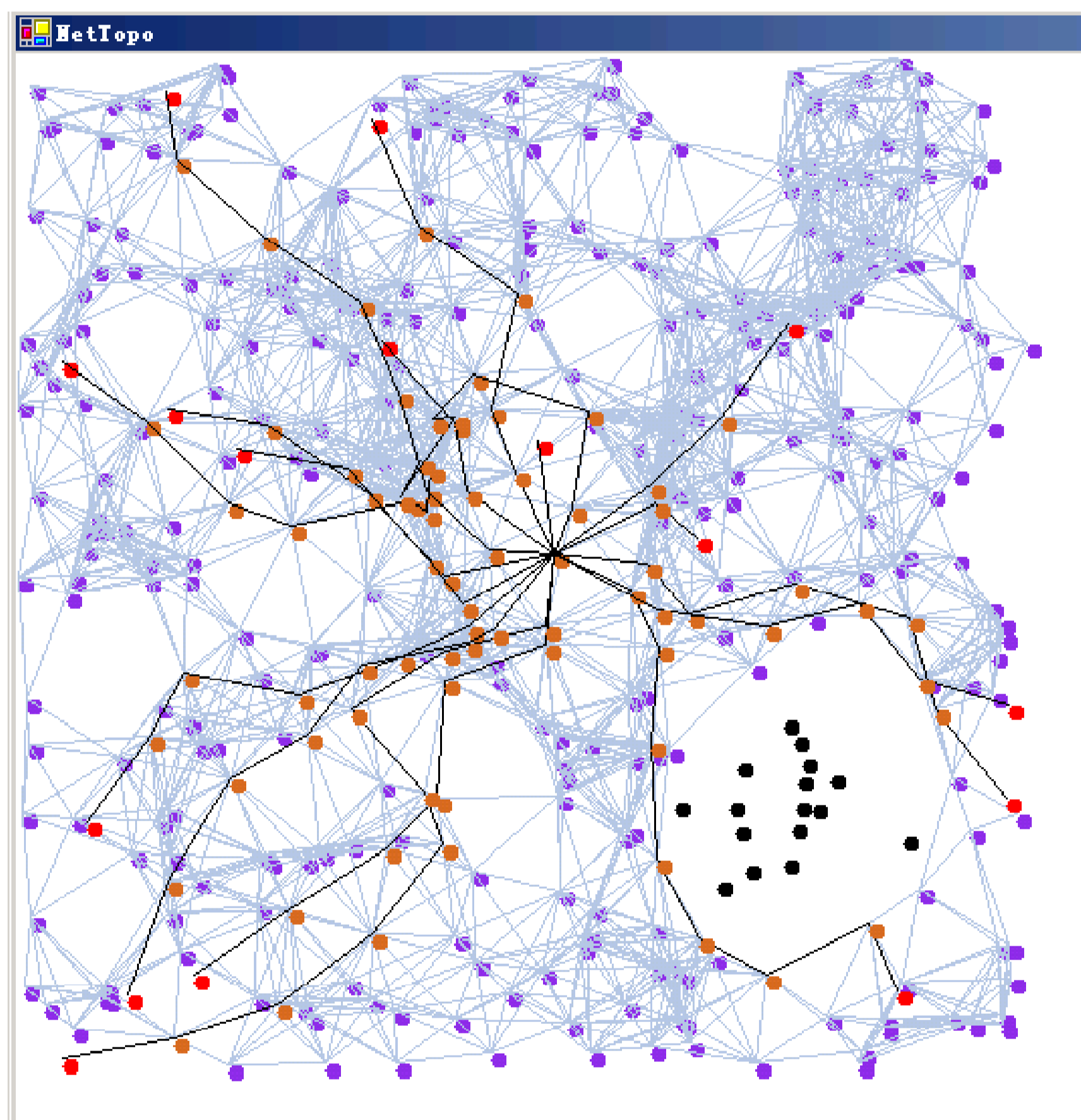


Figure.1. Q: How to gather stream data from multiple source nodes when sensor nodes use maximum transmission bandwidth and some of them are dead
A: Node disjoint routing for stream data gathering with dead sensor nodes

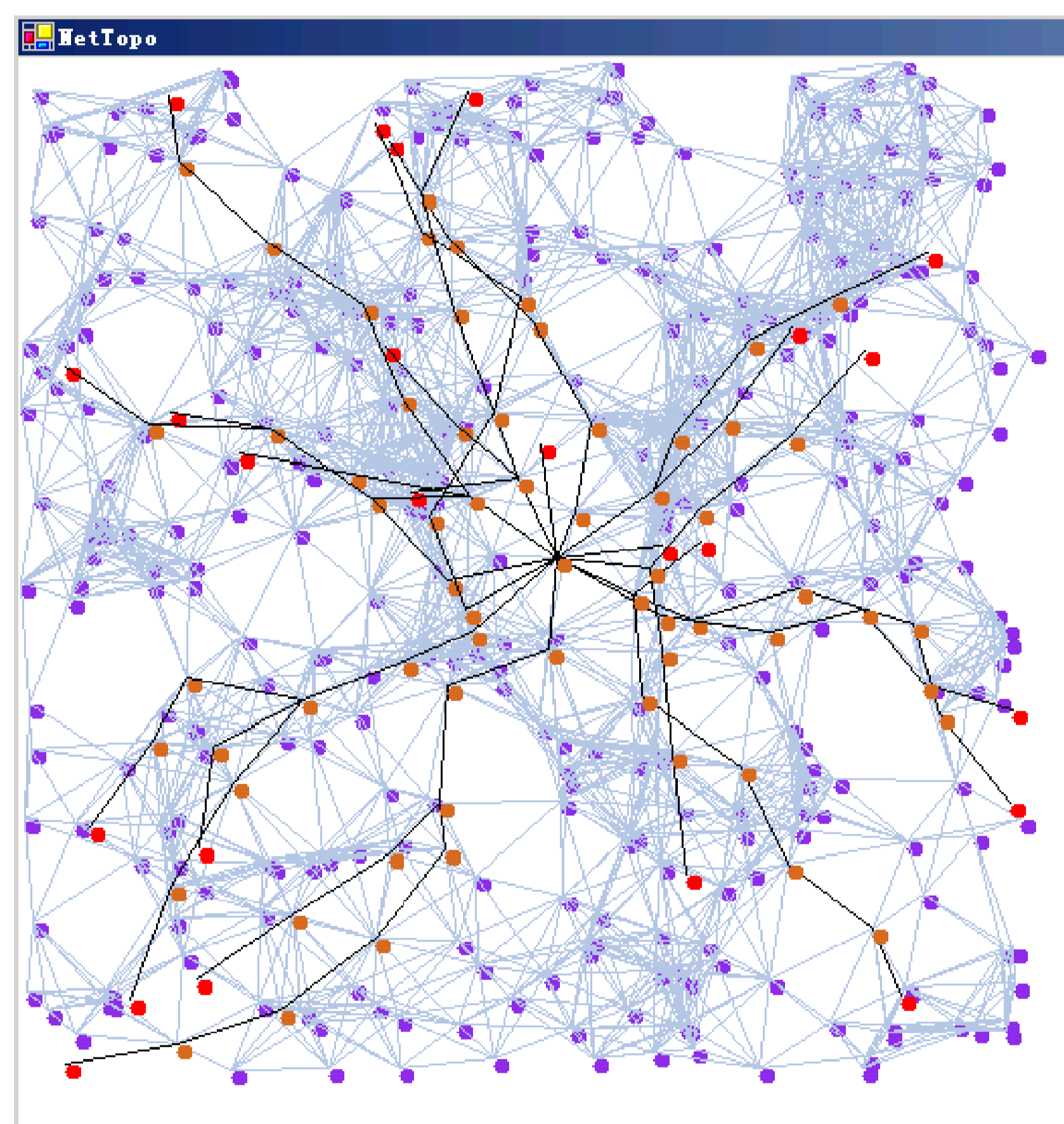


Figure.2. Q: How to gather stream data from multiple source nodes when sensor nodes do not use maximum transmission bandwidth
A: Tree topology based multi-source stream data gathering

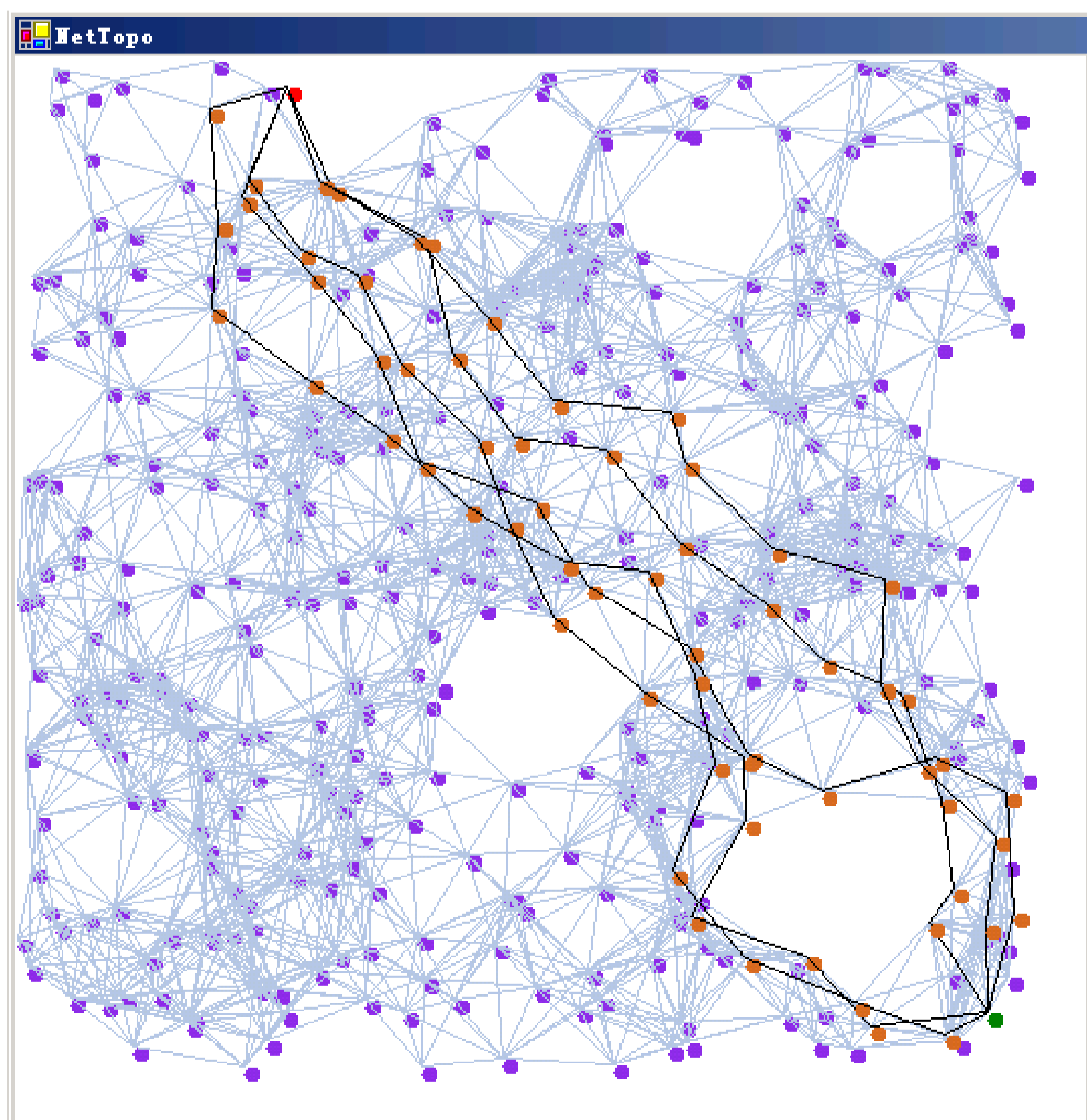


Figure.3. Q: How to gather stream data from single source node when data producing speed of source node several times larger than sensor node's maximum transmission bandwidth
A: Stream data multi-path transmission with holes

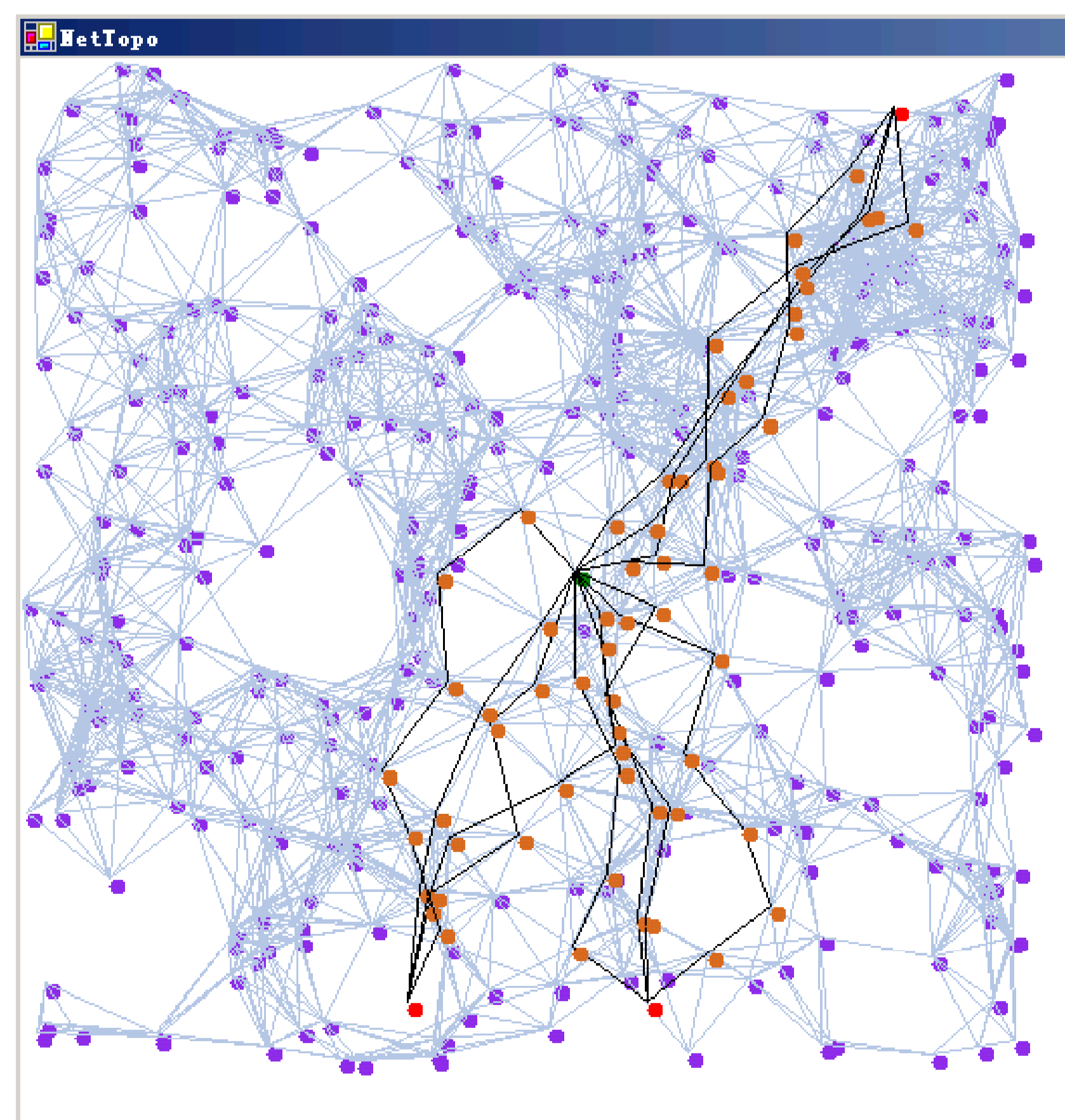


Figure.4. Q: How to gather stream data from multiple source nodes when data producing speed of source nodes several times larger than sensor node's maximum transmission bandwidth
A: Stream data multi-source multi-path transmission with holes

Results

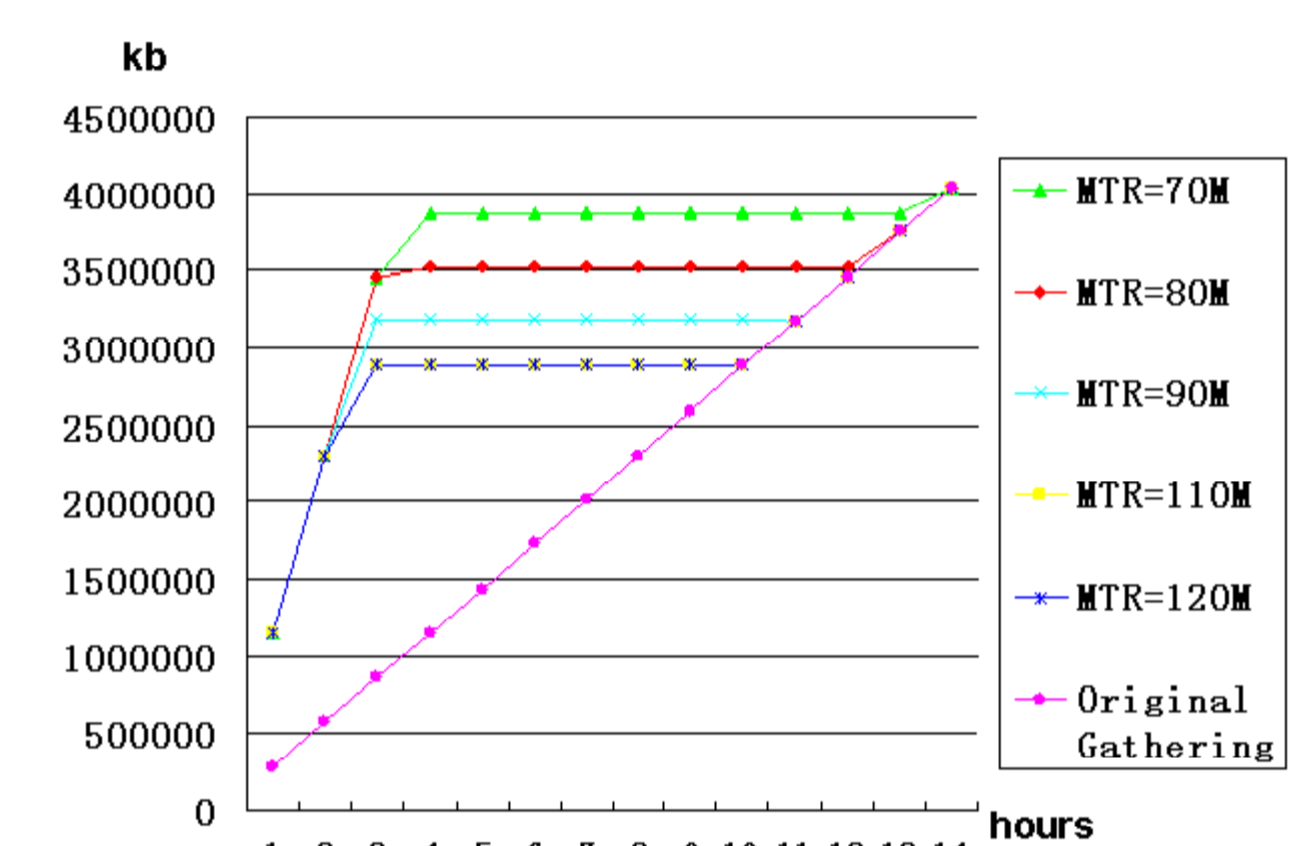


Figure.5. MSDG: Stream data gathering vs expected lifetime

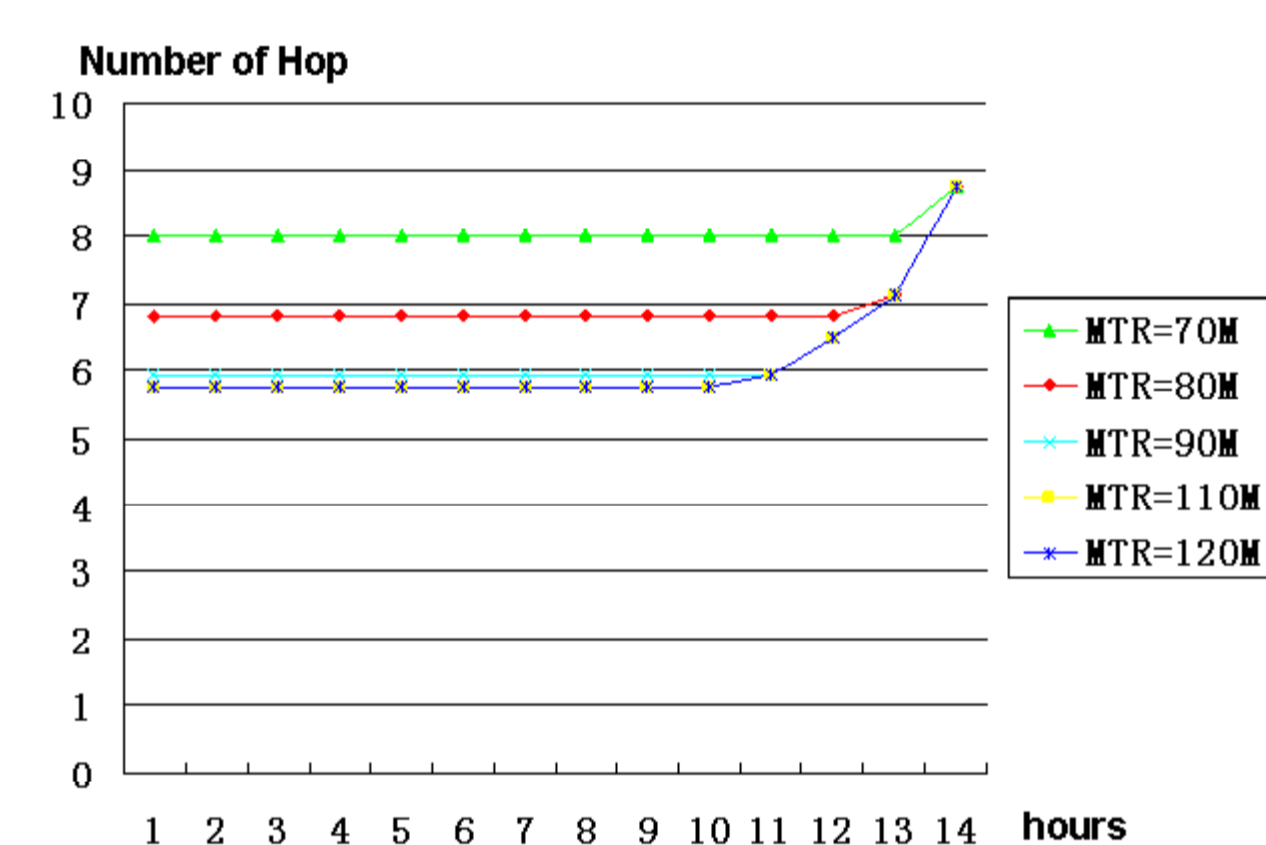


Figure.6. MSDG: Average delay vs expected lifetime

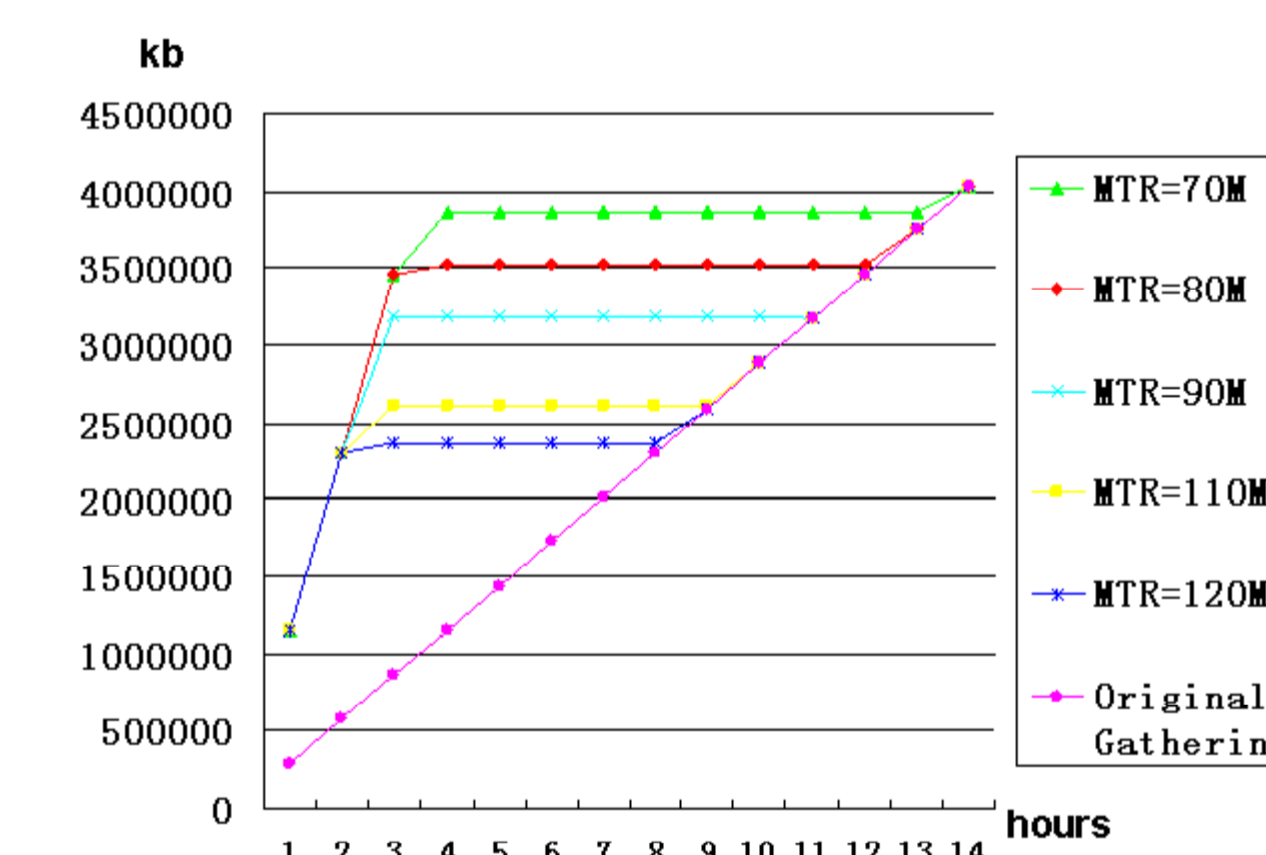


Figure.7. MTD: Stream data gathering vs expected lifetime

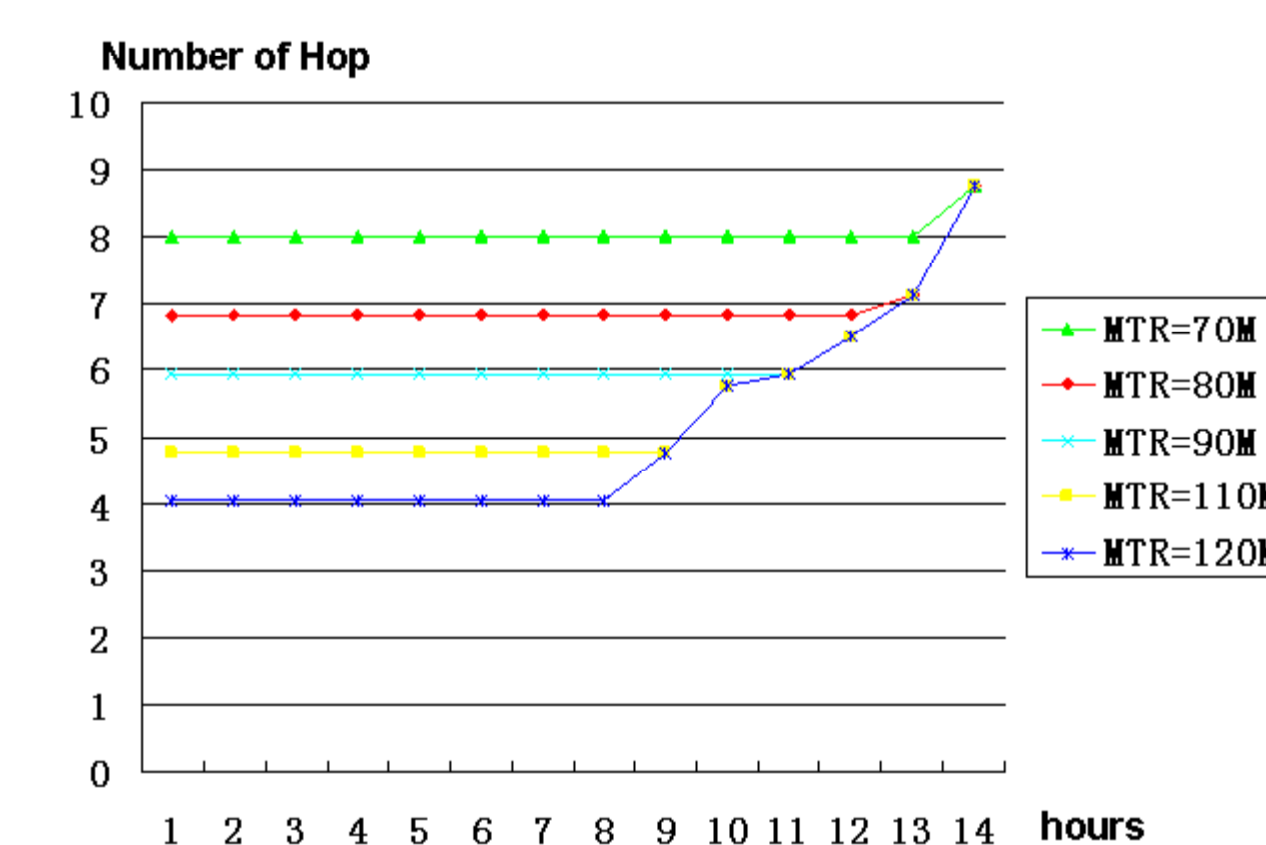


Figure.8. MTD: Average delay vs expected lifetime

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