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Automatic
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Faculty



Computer
Science
Department

Energy-Aware Social-based Routing in Opportunistic Networks

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Presenter

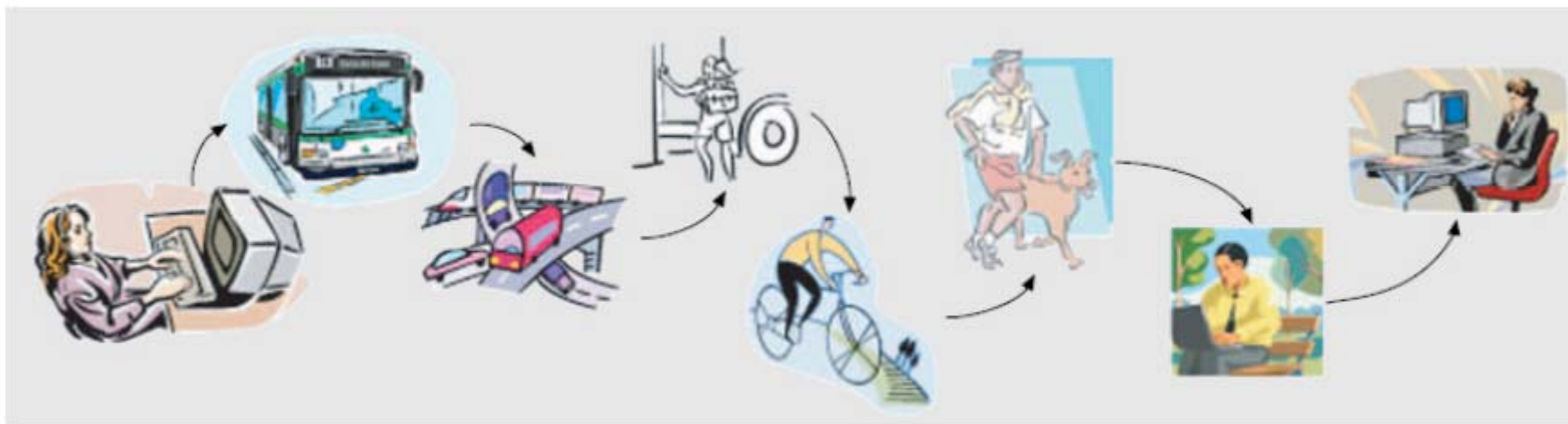
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Opportunistic Networks

- Evolution of MANET
- Networks composed of mobile devices
- No assumption made on the existence of paths between nodes
- Store-carry-and-forward
- Connectivity opportunities when no direct access to the Internet is available





Challenges

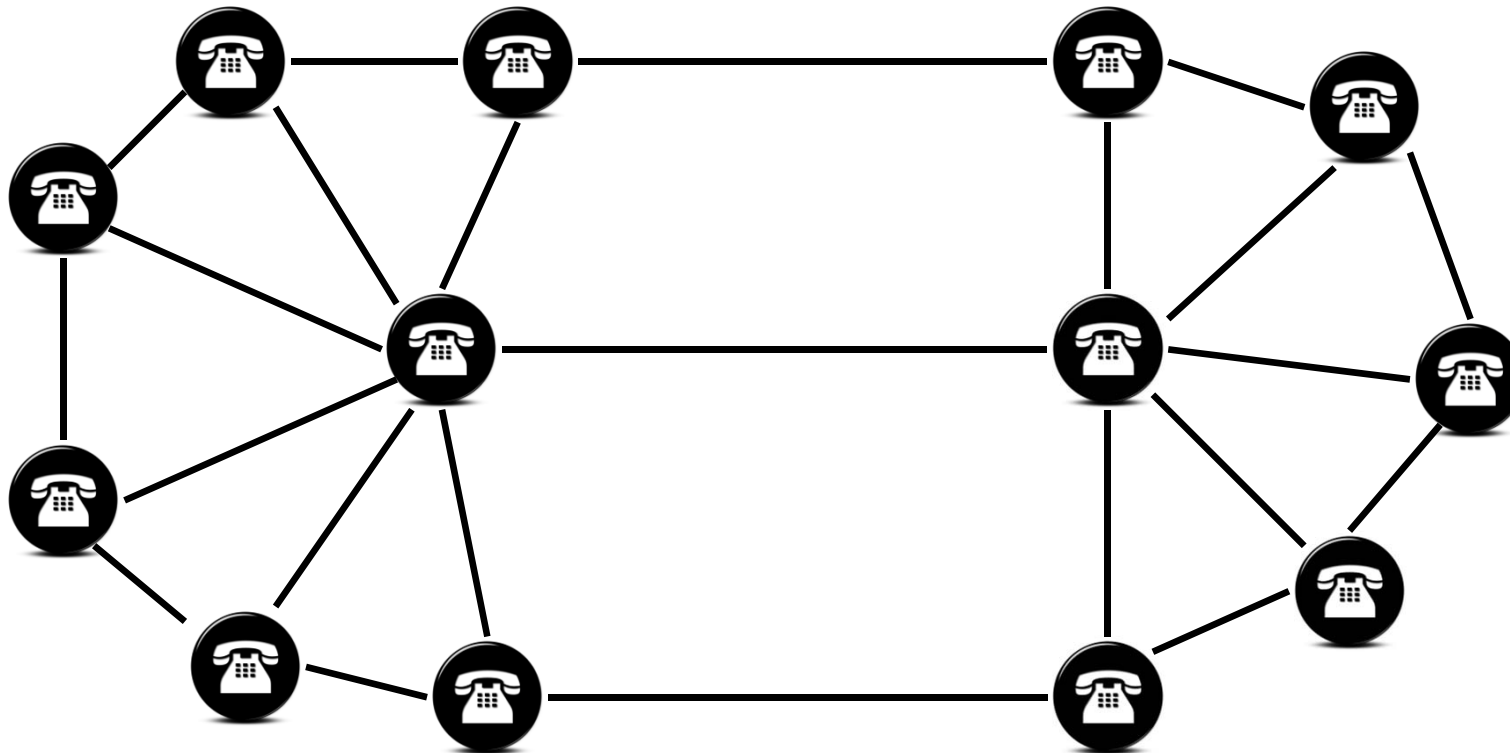
- Lack of connectivity → lack of end-to-end paths
 - How to select next hop?
 - Congestion, traffic overhead → energy consumption
 - Long and variable delay
 - Asymmetric data rates
 - Reliability
 - Privacy and security
 - Only use locally collected knowledge
 - **Achieve real “mobile computing” without the need for a connected network**
-



- Opportunistic networks
 - Human-carried mobile devices that communicate with each other in a store-carry-and-forward fashion
 - Generally, members of the same community interact with each other more often than with members of outside communities
- Solution
 - Energy consumption considered in routing decision
 - We implement an Energy Aware alternative for BUBBLE Rap
 - Tests conducted on UPB2012 and Cambridge-iMote traces

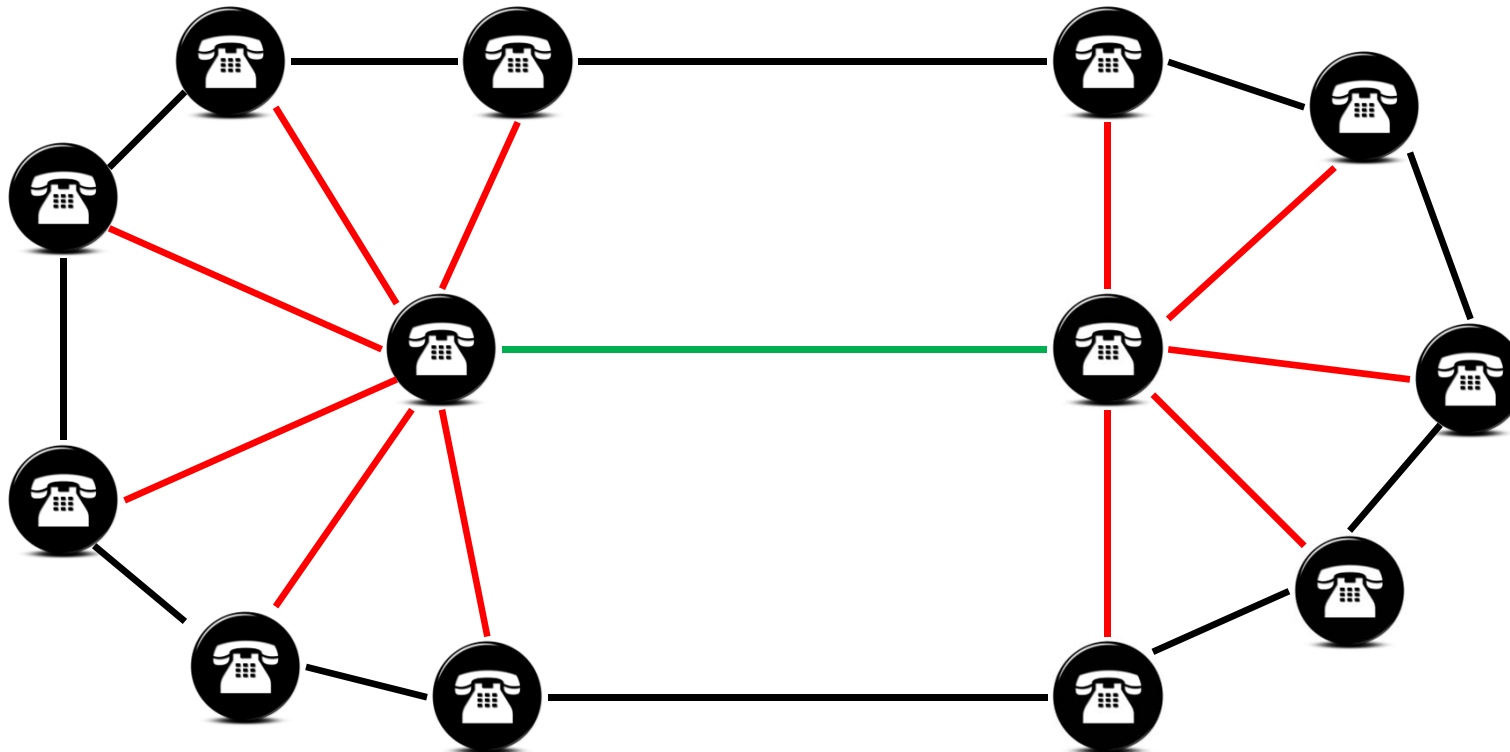


BUBBLE Rap



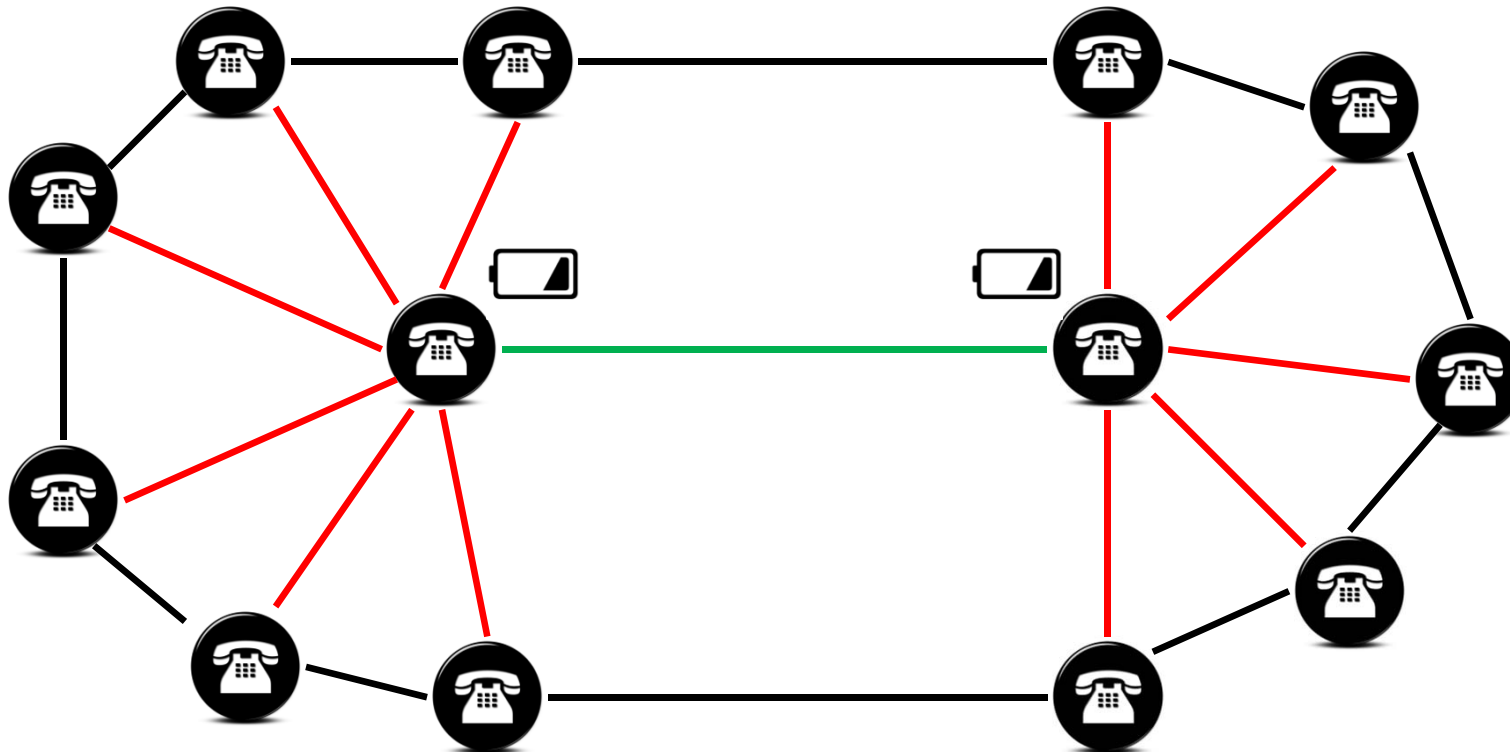


BUBBLE Rap



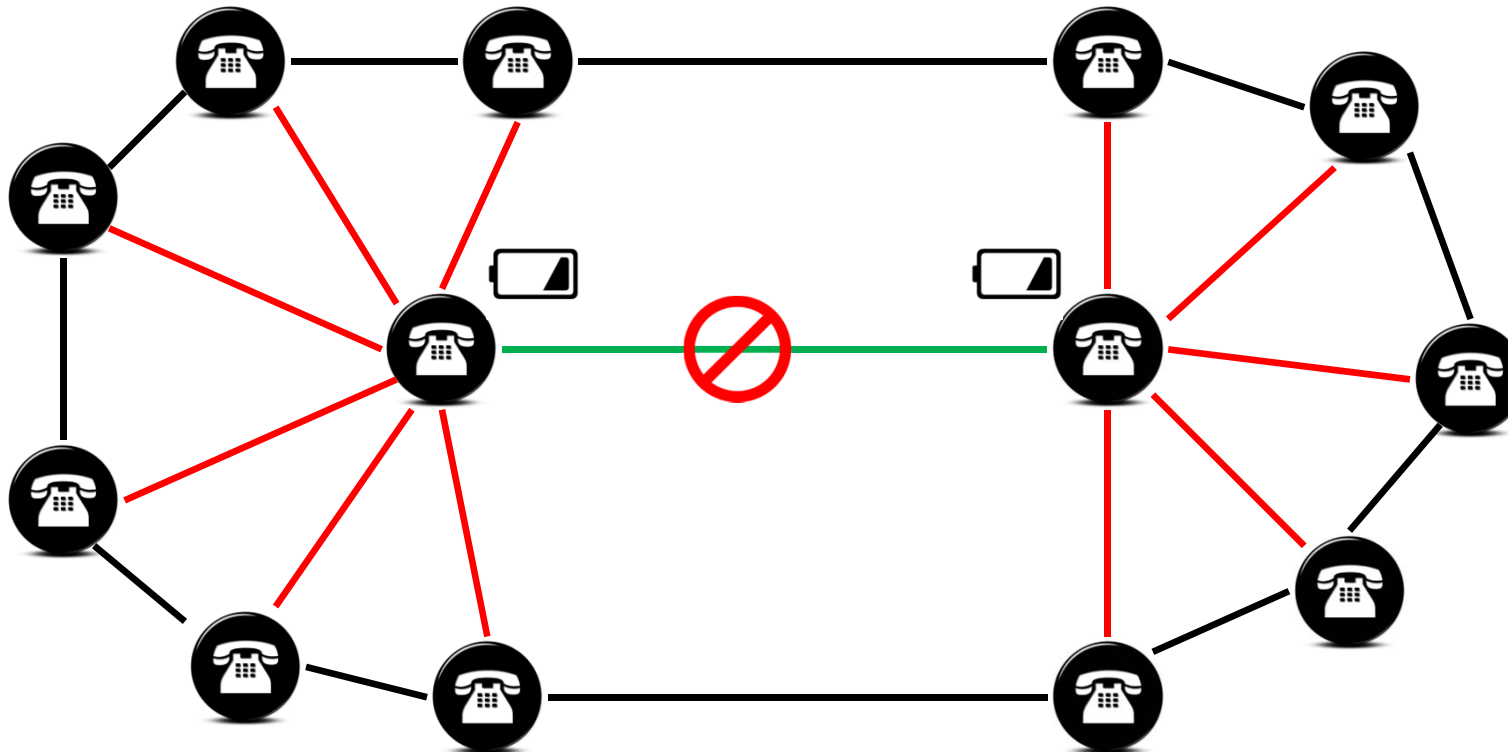


BUBBLE Rap



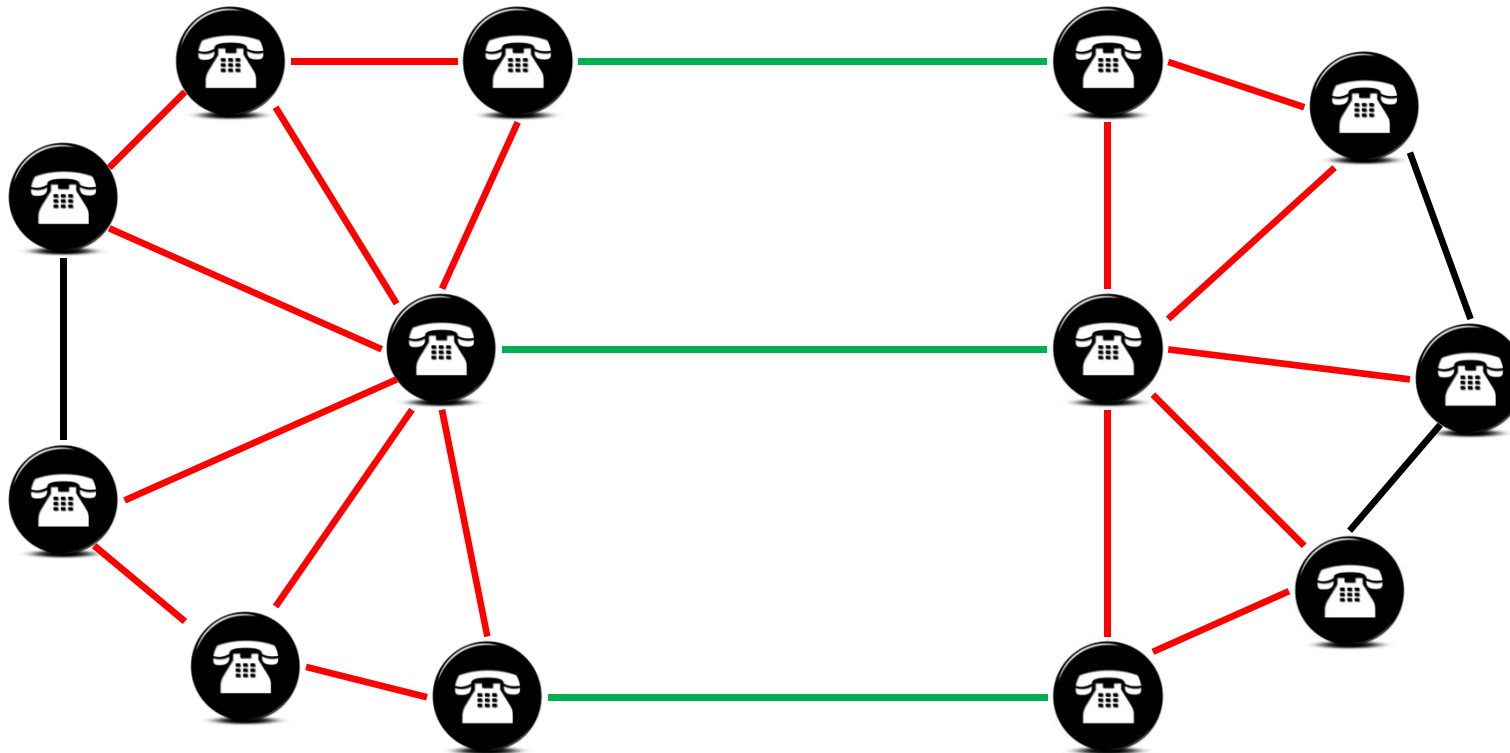


BUBBLE Rap





EA - BUBBLE Rap





How we calculate it?

$$f(bat) = K \exp \left\{ \ln \varepsilon \cdot \frac{bat}{bat_{\max}} \right\}$$

K and ε are constants

bat is available battery

bat_{\max} is maximum battery

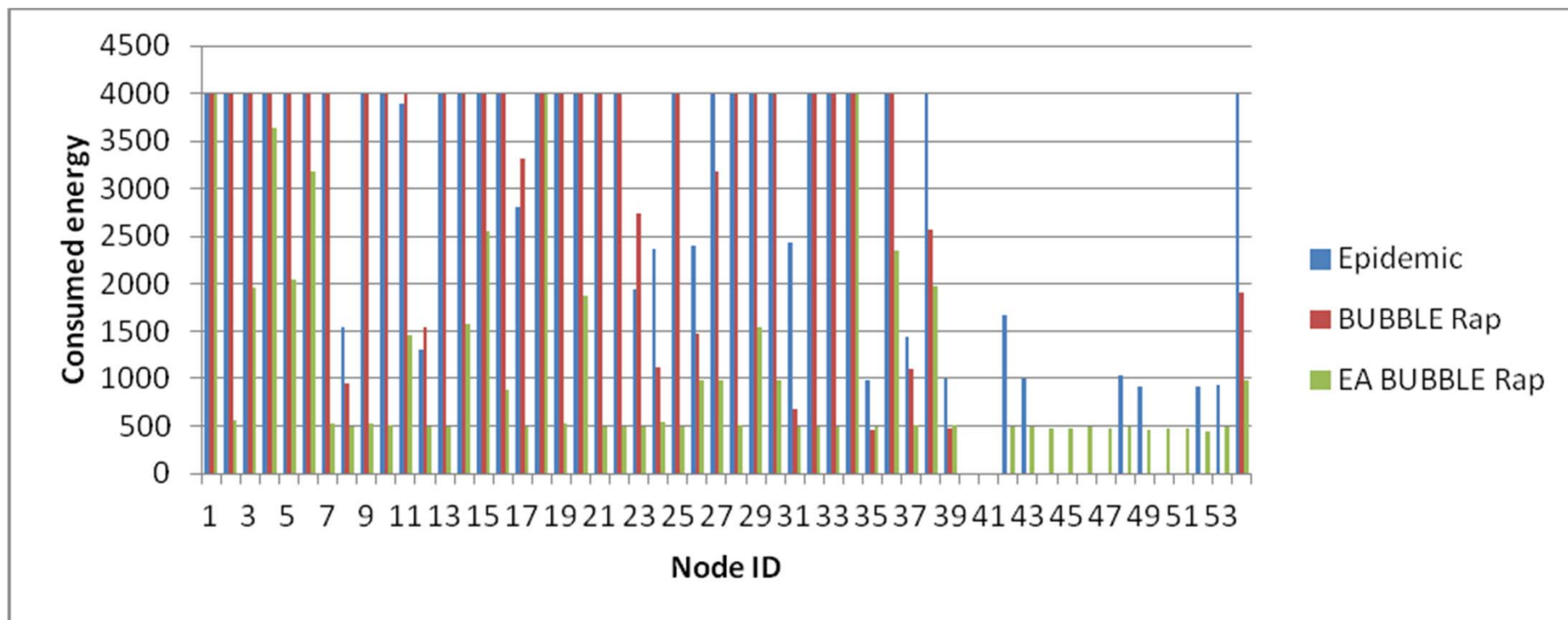


EA BUBBLE Rap

```
1 begin EABubbleProcedure ()
2   if ( LabelOf ( currentNode ) == LabelOf ( destination ) ) then
3     if ( LabelOf ( EncounteredNode_i ) == LabelOf ( destination ) )
4       and ( NewLocalRankOf ( EncounteredNode_i ) >
5         NewLocalRankOf ( currentNode ) )
6     then
7       EncounteredNode_i . addMessageToBuffer ( message )
8   else
9     if ( ( LabelOf ( EncounteredNode_i ) == LabelOf ( destination ) )
10      or ( NewGlobalRankOf ( EncounteredNode_i ) >
11        NewGlobalRankOf ( currentNode ) ) )
12   then
13     EncounteredNode_i . addMessageToBuffer ( message )
14   end
```

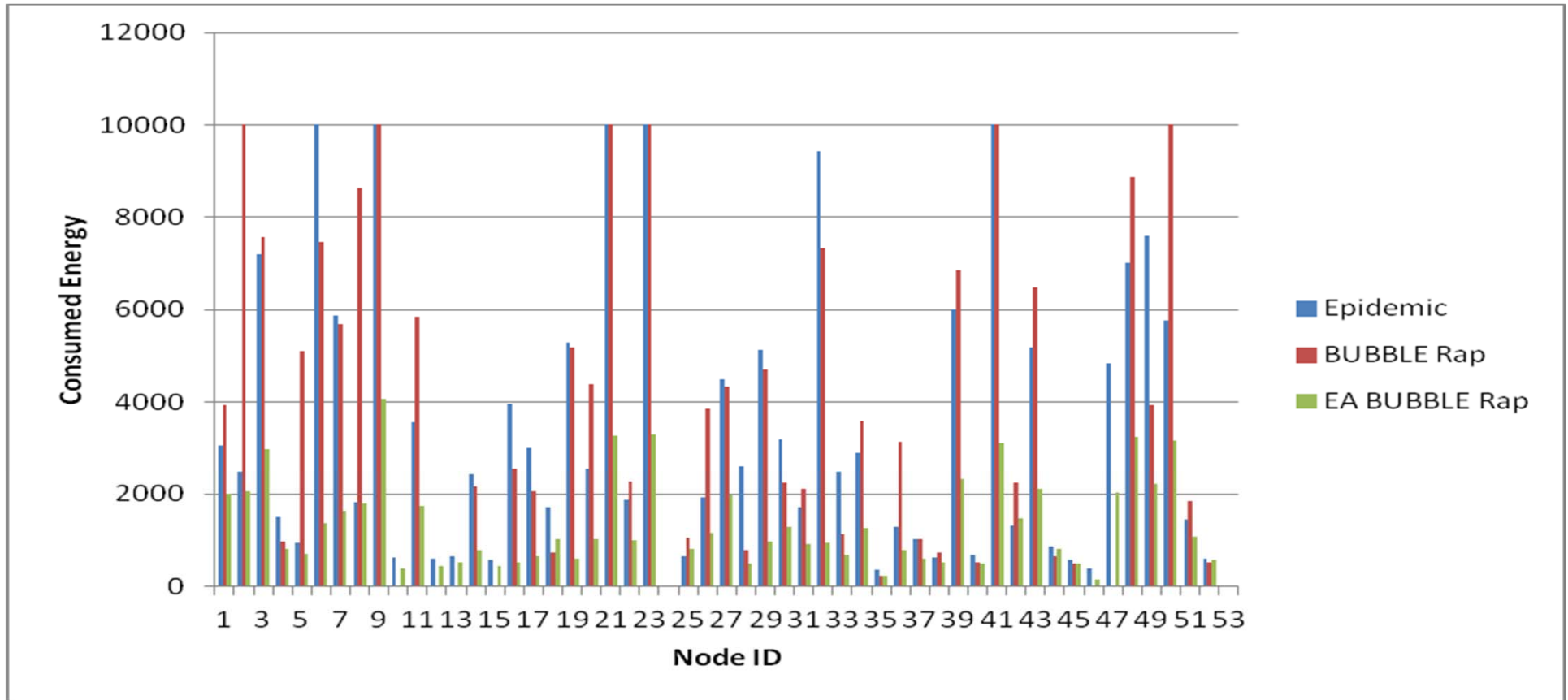


Cambridge-iMote - 4,000 Maximum Battery



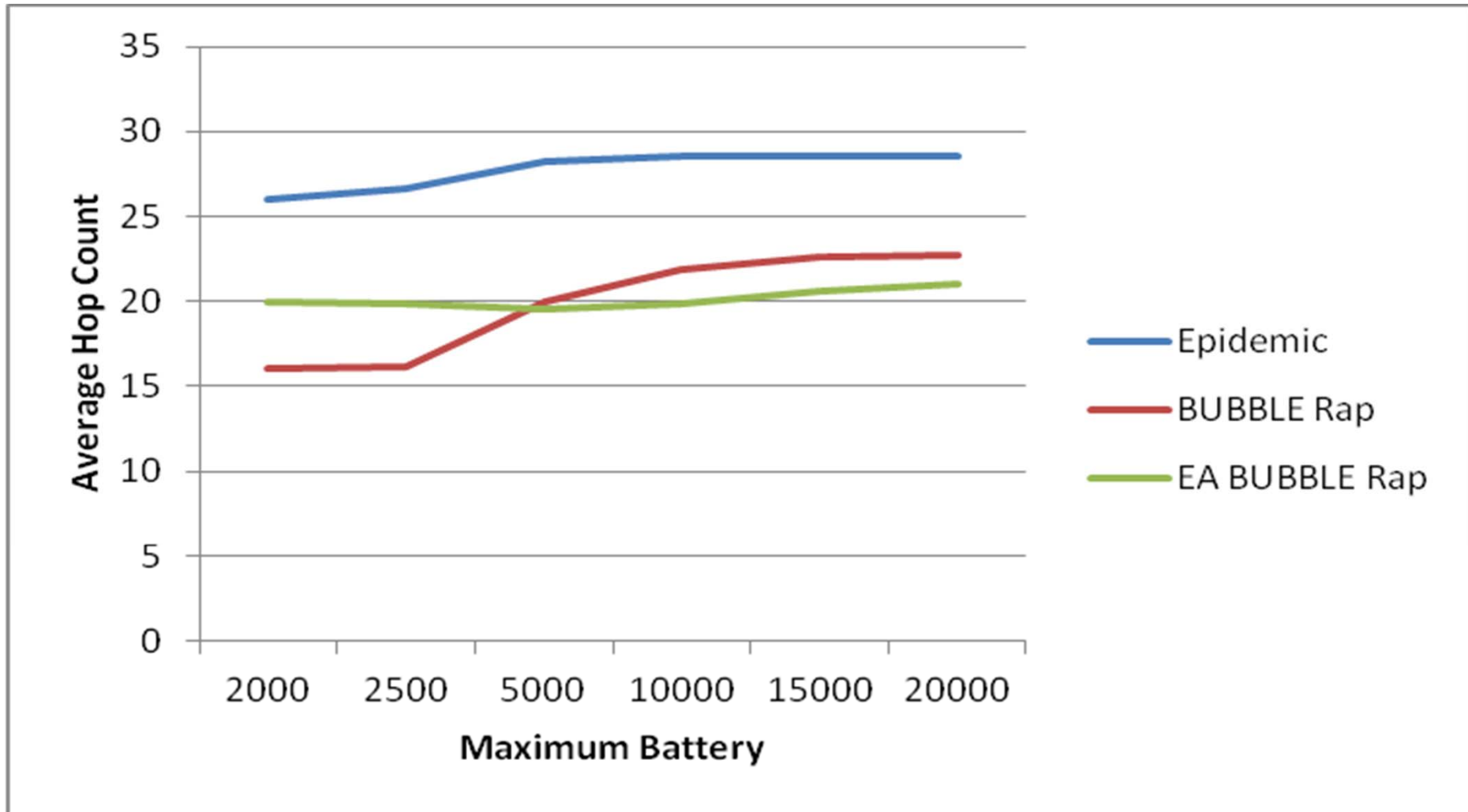


UPB2012 - 10,000 Maximum Battery



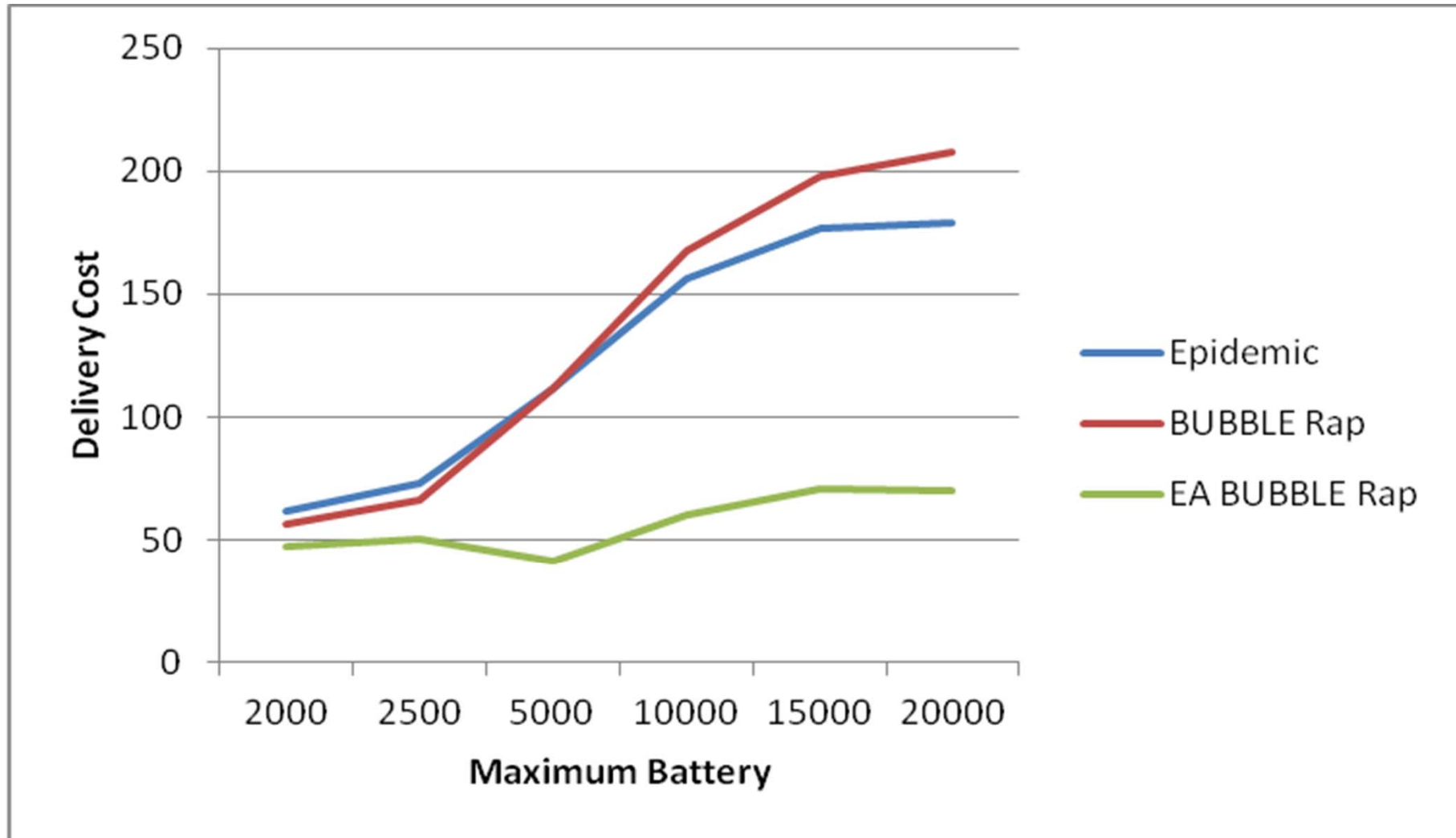


UPB2012 - Average Hop Count



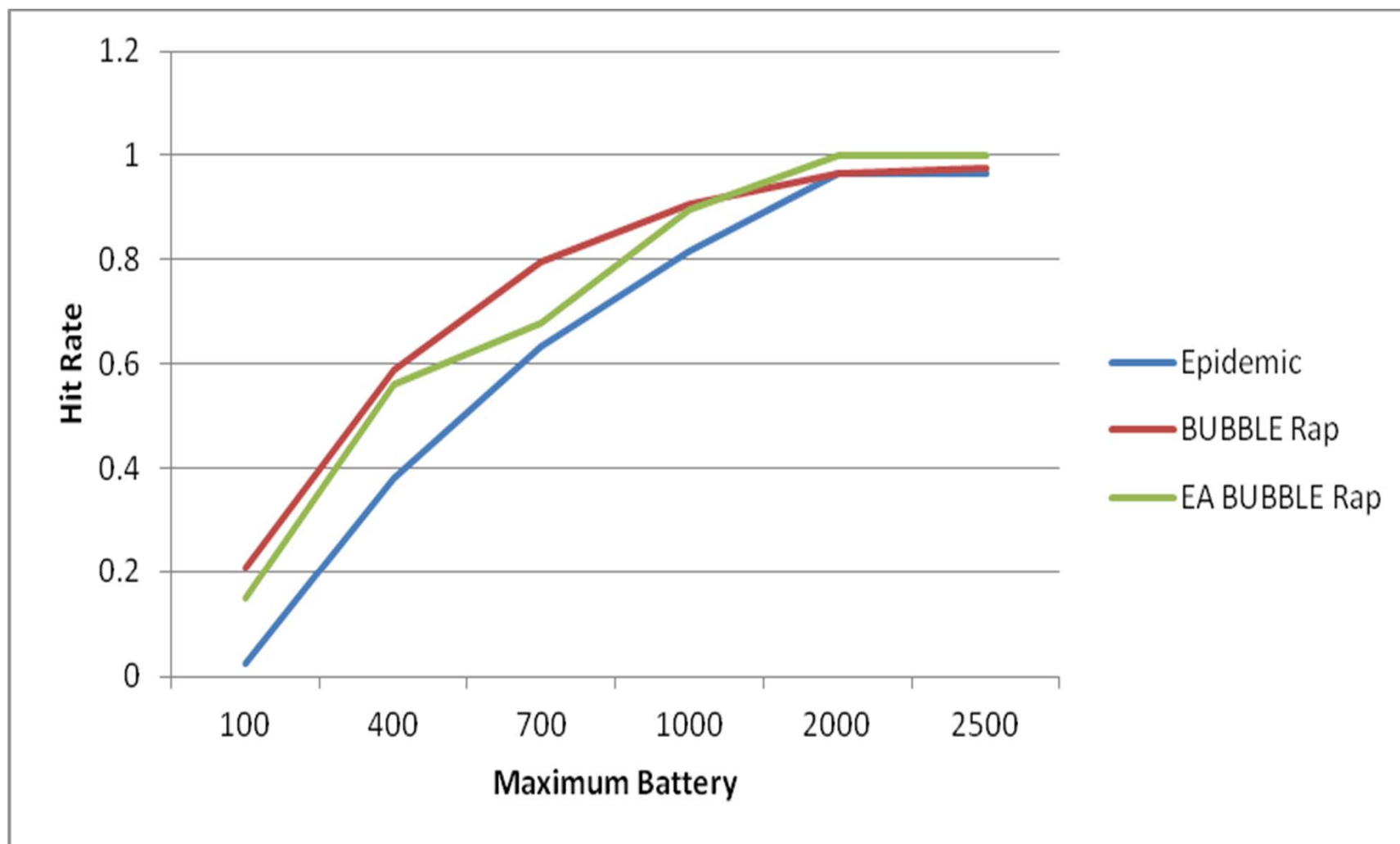


UPB2012 - Delivery Cost



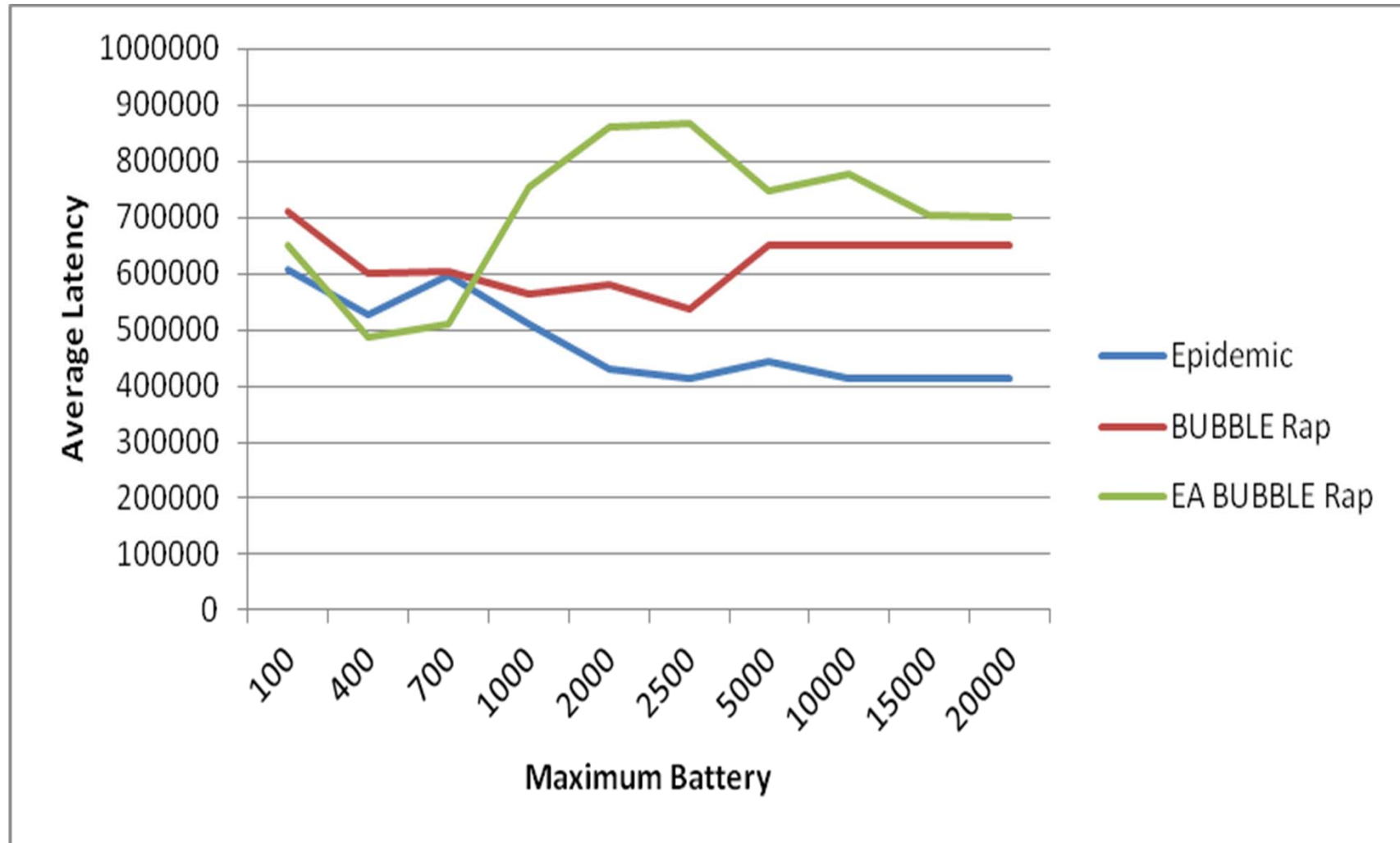


UPB2012 - Hit Rate





UPB2012 - Average Latency





- Social-driven routing algorithm for Ons
 - energy important in routing decision
- Experimental results show performances similar to BUBBLE Rap, whilst balancing the energy consumption between nodes in the network



Thank you

