ENERGY AND MOBILITY CONSCIOUS MULTIPATH ROUTING PROTOCOL FOR ROUTE STABILITY AND LOAD BALANCING IN MANET-IoT NETWORKS

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Universiti Malaysia PAHANG
Engineering • Technology • Creativity

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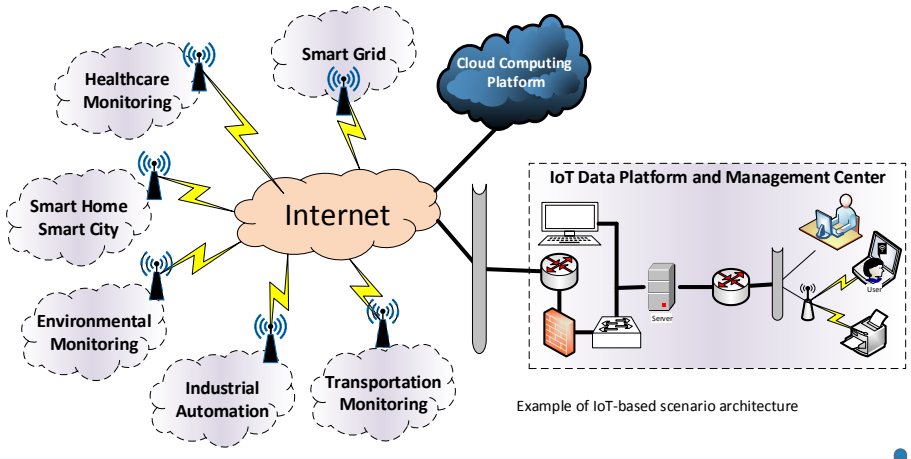
PRODUCT BACKGROUND

- Internet of Things is the key technology and enabler of Industrial Revolution **IR 4.0**
- The recent advances of smart devices with embedded sensors will enable global connectivity of **MANET-IoT** scenarios with heterogeneous devices in terms of energy resources and mobility.
- **Routing protocols** play crucial roles in providing effective and efficient communication for data transmission to successfully implement the IoT networks.



Example of IoT-based scenario architecture

NOVELTY / INVENTIVENESS

In MANETs and IoT, the efficient and reliable data routing between source- destination pairs is a critical issue due to:

- Unbalanced load distribution among nodes and congested networks
- Nodes are battery-powered and have limited processing capabilities
- Nodes mobility which causes frequent network topological changes and increases control overhead

These challenges can be tackled by:

- Transmitting data over multiple paths to balance load and increase reliability
- Simultaneous consideration of energy, mobility and QoS-related metrics
- Optimizing topological information flooding

NEED TO PROPOSE A NEW ROUTING ALGORITHM

- HYBRID (Reactive and Proactive)
- MULTIPATH
- Multi-Criteria-Node Rank (MCNR) metric
- Energy and Mobility -Aware Flooding Mechanism (EMA-MPR)
- Link Cost Function
- Route Computation Algorithm
- Route Recovery & Loop Detection mechanisms

MBMA-OLSRv2

The MBMA-OLSRv2 can rank the nodes based on their battery energy and mobility and assess links quality accordingly to select the nodes with the highest rank for constructing multiple routes to the destination as well as flooding topological information using a new EMA-MPR mechanism.

BENEFITS/USEFULLNESS

- The MBMA-OLSRv2 contributes towards IR4.0 by making the communication stack in the IoT more precise and energy-efficient towards Green IoT.
- A new, unified, and efficient GUI-based Exata simulation model for analyzing and investigating the energy consumption and QoS of routing protocols in the IoT

MARKETABILITY

- The potential market for the developed scheme includes and not limited to IoT Networking Industry, Networks Simulator Developer, Smart City Applications.

SCALABLE NETWORK TECHNOLOGIES favoriot ERICSSON NATIONAL INSTRUMENTS

COLLABORATORS

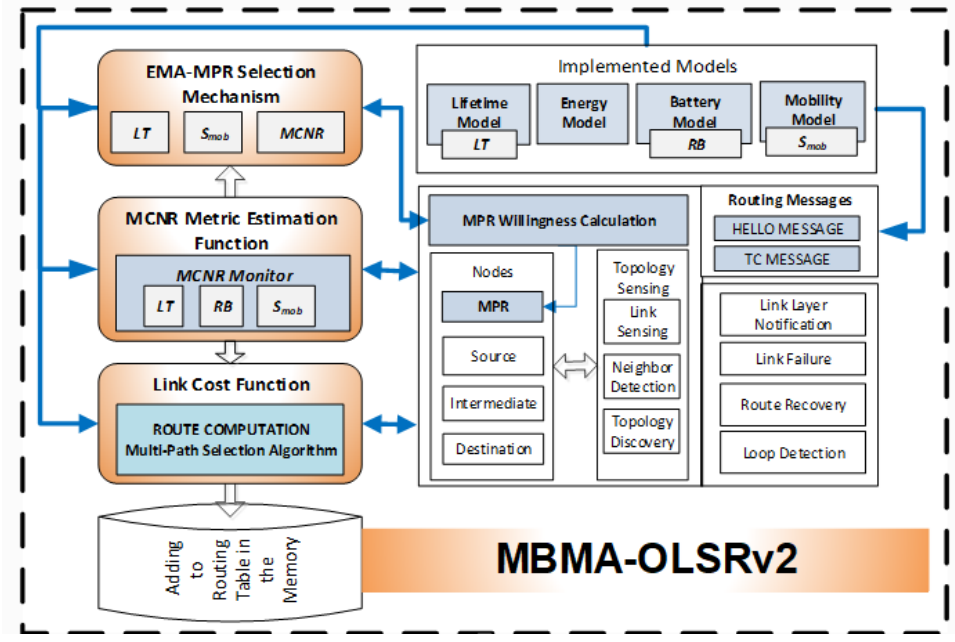
Universiti Malaysia PAHANG

Universiti Kebangsaan Malaysia

PATENT

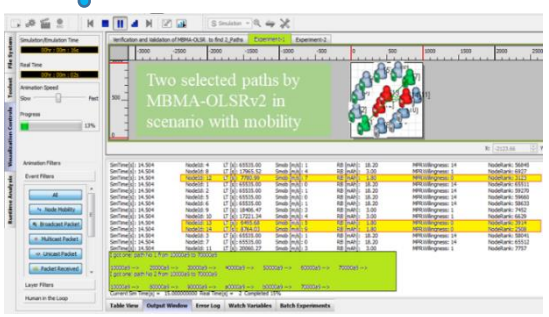
- **Copyright**: LY2018001780, Filed: 24 APR 2018
- **Copyright**: LY2018000787, Filed: 20 FEB 2018
- **PATENT**: "Methods and Systems for Energy Efficient and QoS-Aware Multipath Data Routing in Convergence Scenarios of IoT Wireless Networks" (Applied and it is under processing)

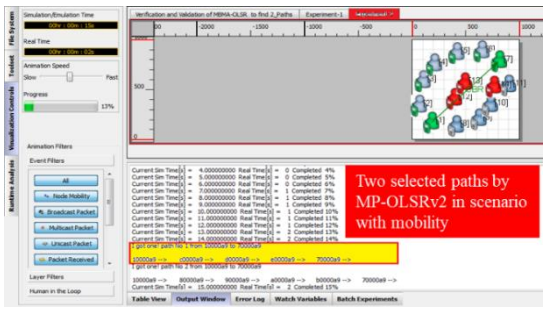
STATE OF THE ARTS /METHODS

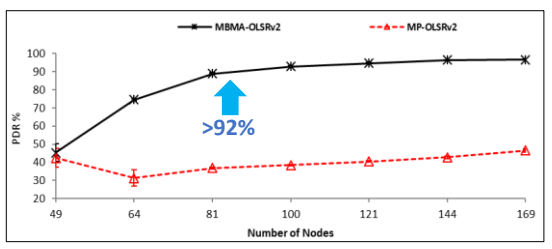


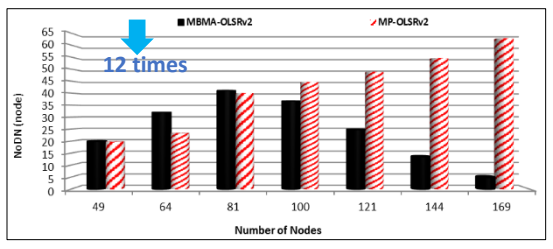
MBMA-OLSRv2 structure and processing model

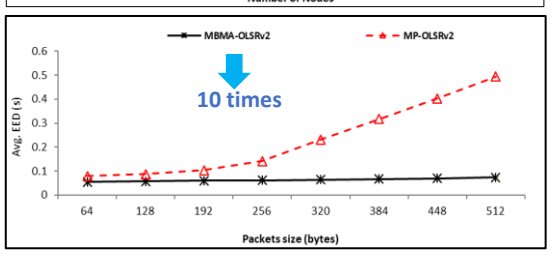
PRODUCT CHARACTERISTICS

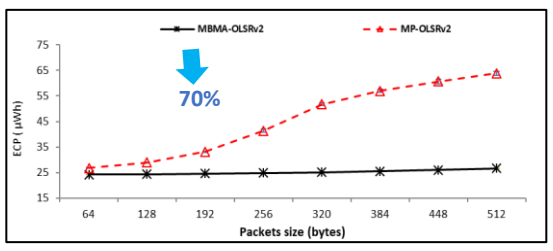


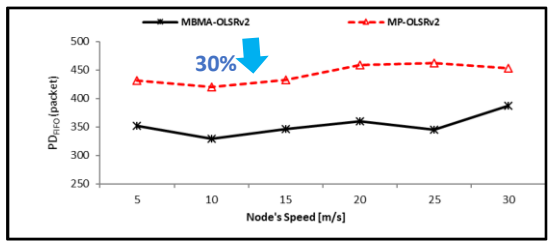


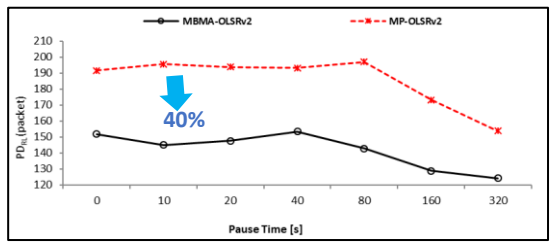












PUBLICATIONS

- WA Jabbar and Mahamod Ismail, Energy and mobility conscious multipath routing scheme for route stability and load balancing in MANETs, *Simulation Modelling Practice and Theory*, 77 (2017) 245–271. (**ISI Q2 journal, IF: 1.954**).
- WA Jabbar, Mahamod Ismail, Rosdiadee Nordin and Suki Arif, Power Efficient Routing Schemes for MANETs: A Survey and Open Issues, *Wireless Networks*, 2017, Volume 23, Issue 6, pp 1917–1952. (**ISI Q3 journal, IF: 1.584**).
- WA Jabbar, Mahamod Ismail, and Rosdiadee Nordin, Multi-Criteria Based Multipath OLSR for Battery and Queue-Aware Routing in Multi-Hop Ad Hoc Wireless Networks, *Wireless Networks*, 21.4 (2015): 1309-1326 (**ISI Q3 journal, IF: 1.584**).
- WA Jabbar, M. Ismail, Rosdiadee Nordin, and Roshahliza M. Ramli, EMA-MPR: Energy and Mobility-Aware Multi-Point Relay Selection Mechanism for Multipath OLSRv2, IEEE 13th Malaysia International Conference on Communications (MICC-2017).
- WA Jabbar, M. Ismail, Rosdiadee Nordin, and Roshahliza M. Ramli, Traffic Load-Based Analysis of MBQA-OLSR Routing Protocol in Wireless Ad Hoc Networks, 2017 IEEE TENCON – IEEE Region Ten Conference, Penang, MALAYSIA.

ACHIEVEMENTS

- **GOLD MEDAL** in in Creation, Innovation, Technology & Research Exposition (CITREx 2018) UMP.
- **GOLD MEDAL** in CITREx 2017, UMP.