



Multimetric OLSR and ETT

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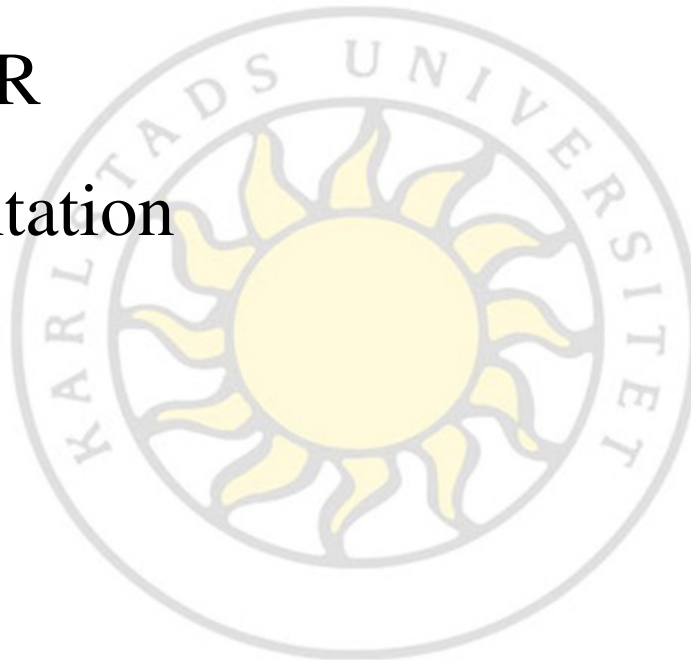
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Table of Contents

- Background
- Multimetric OLSR
 - Implementation
 - Usage
- ETT
- Summary
- Sample Run
- Questions





Background

- KAUMesh
 - Wireless broadband mesh network testbed
 - Custom network monitoring solution
 - 802.11a/b/g
 - 20 mesh nodes
 - Multi-radio, multi-channel
 - XScale ARM processors

[http://www.cs.kau.se/cs/prtp/pmwiki/pmwiki.php?
n=Resources.MeshTestbed](http://www.cs.kau.se/cs/prtp/pmwiki/pmwiki.php?n=Resources.MeshTestbed)



Background (cont'd)

- MF-OLSR
 - Metric framework for Olsrd
 - Developed by Thomas Aure at University of Oslo
 - Provides capability to route on arbitrary metric

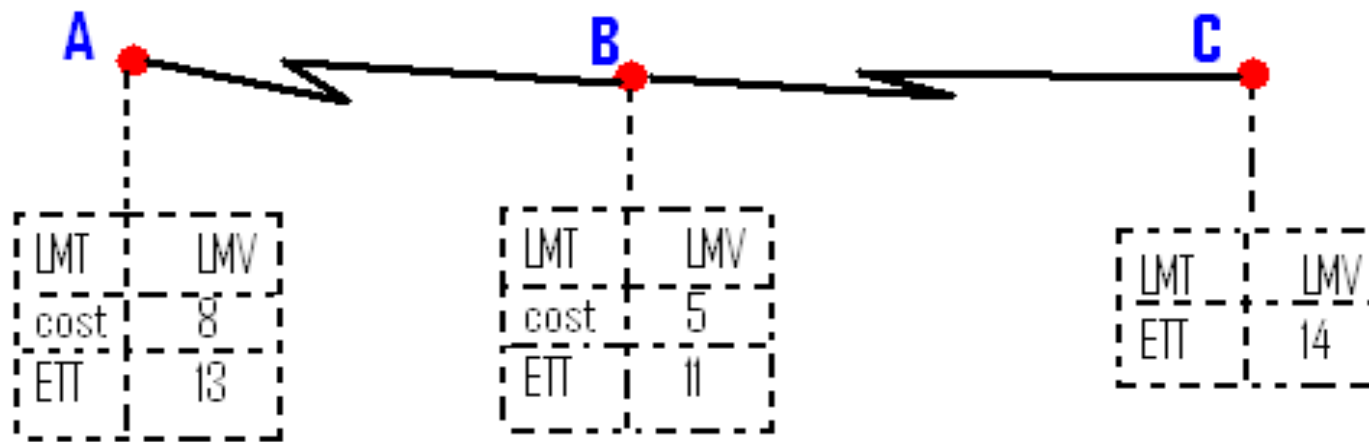


Multimetric OLSR

- Based on MF-OLSR
- Idea
 - Make OLSR include an arbitrary number of metrics
 - One is selected for the routing algorithm
 - Implement several additional routing metrics



Example





Implementation

- Upgraded the OLSR version from 0.5.3 (used in MF-OLSR) to 0.5.6
 - Two years of bugfixes
 - Major advantage is the built-in linkcost variable



Implementation (cont'd)

- Internal metrics
 - Handled internally by Multimetric OLSR
 - E.g. ETX
- External metric
 - Handled externally by plug-ins
 - E.g. ETT



Usage

- Add metric
 - Define an identifier
 - Name the metric for pretty print output and metric name lookup
 - Change config file for distribution

ActiveMetrics “metric1” “metric2” “metric3”



Usage (cont'd)

- Select metric for routing
 - Config file

RoutingMetric “metric_name”



Parameters

- **MetricFrameworkLevel**
 - Enables multimetric framework
- **RoutingMetricDefCost**
 - Default cost for links
- **Cost**
 - Value for cost metric



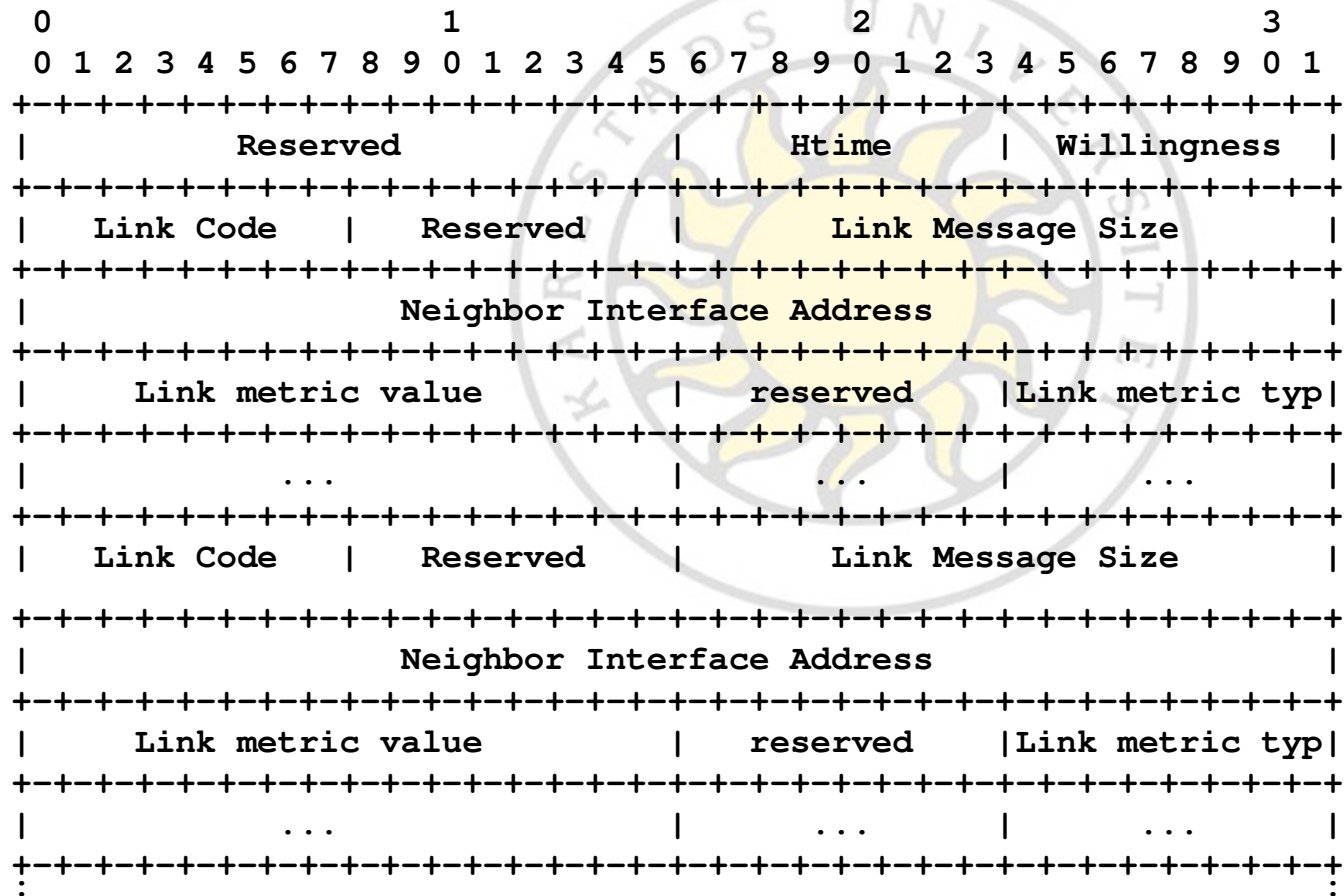
Comparison

- Differences Multimetric OLSR vs MF-OLSR
 - Multiple metrics
 - MF-OLSR: LQ, NLQ, one extra
 - Fewer changes in original OLSR
 - No extra AVL-tree, linked list
 - No changes to routing algorithm
 - Cleaner code



Message Types

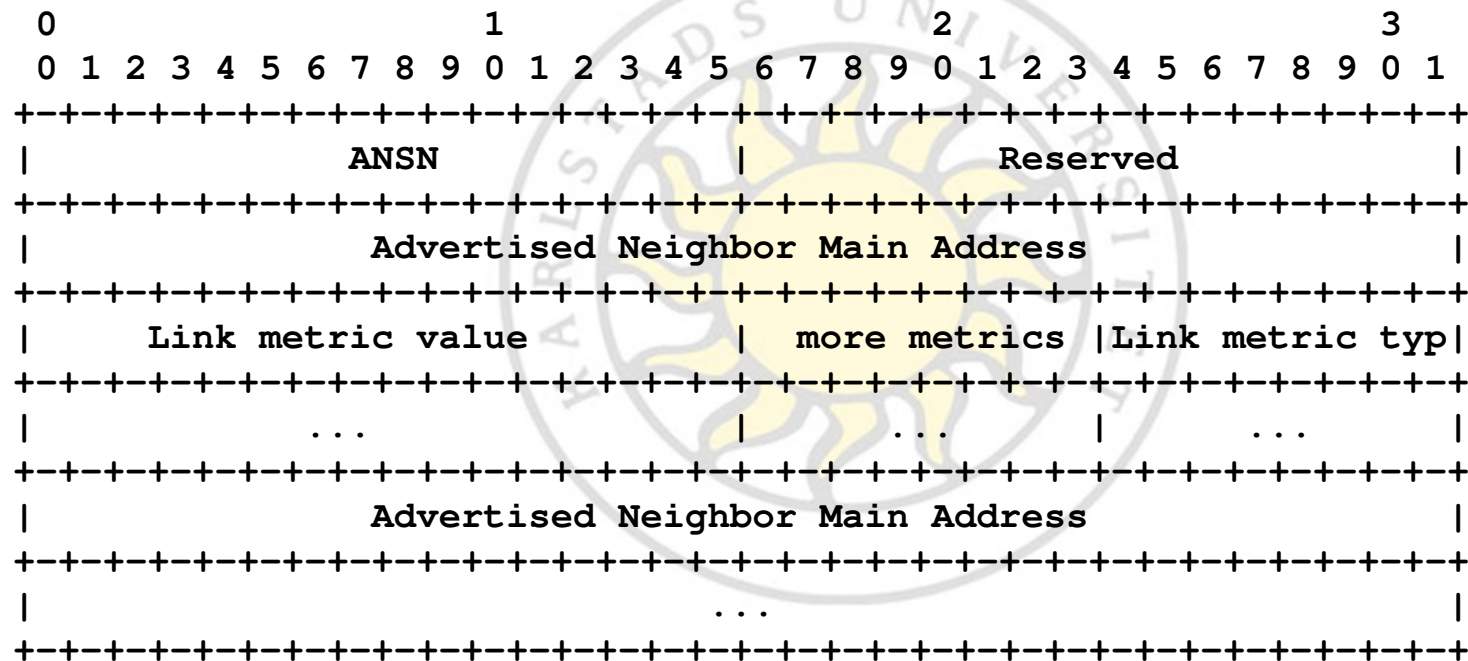
- Hello messages (type 203)





Message Types (cont'd)

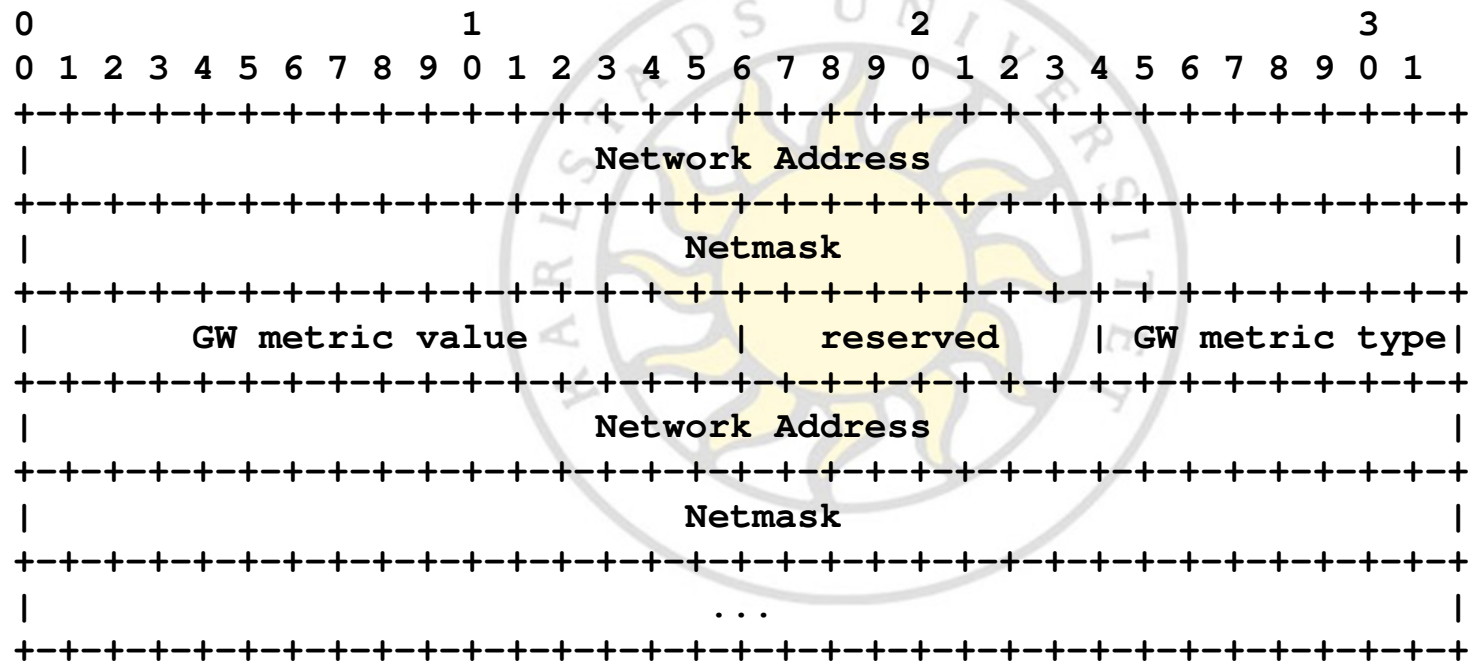
- TC messages (type 204)





Message Types (cont'd)

- HNA messages (type 205)





Alternative Applications

- Multimetric OLSR may also distribute:
 - Channel information
 - Bandwidth statistics
 - Available, used, total etc



ETT

- Expected Transmission Time
- Built on code implemented at
 - Universidade Federal do Rio de Janeiro
 - Universidade Estado do Rio de Janeiro
- Idea
 - Metric using link capacity



ETT: Algorithm

- $ETT = ETX * S/B$, where
 - ETX is Expected Transmission count
 - $1 / (LQ * NLQ)$, where LQ is Link Quality and NLQ is Neighbor LQ (V: 0-255)
 - S is the packet size
 - Measured in bytes
 - B is the link capacity
 - Measured using packet-pair technique



ETT: Packet-pair technique

- Two back-to-back probes
 - One small packet followed by a larger
- Inter-arrival time measured (and reported back)
- Link capacity estimated
 - Dividing size of large packet by the smallest delay sample (out of a predefined number of samples)



Summary

- Made Olsrd easy to extend with more metrics
 - Internal metrics
 - External metrics
- Integrated Multimetric OLSR with the ETT plug-in
 - Link capacity considering metric



Sample Run

```
*** olsr.org - 0.5.6-r4 (2009-09-28 12:31:12 on kaumesh-server) ***
--- 10:04:33.158679 ----- LINKS
IP address      hyst      LQ      ETX      LMV
192.168.30.12   0.000    1.000/1.000  1.000    1

--- 10:04:33.159241 ----- TWO-HOP NEIGHBORS
IP addr (2-hop) IP addr (1-hop) Total cost

--- 10:04:33.159327 ----- TOPOLOGY
Source IP addr  Dest IP addr      LQ      ETX
192.168.30.12  192.168.30.13    1.000/1.000  1.000
192.168.30.13  192.168.30.12    1.000/1.000  1.000

ROUTING TABLE
192.168.30.12/32, via 192.168.30.12, best-originator 192.168.30.12
    from 192.168.30.12, cost 1.000, hops 1, via 192.168.30.12, bond0, v 44

--- 10:04:33.161458 ----- MultiMetric
Source IP addr  Dest IP addr      ETX      ETT      LQ      NLQ      COST      CHAN
192.168.30.12  192.168.30.13    1        1618     255     255     15        64

--- 10:04:33.162602 ----- CHACHA
IP address      Chan Next  Cnt  Demand
192.168.30.13  64  ----  ----  ----
192.168.30.12  36  ----  ----  ----
```



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Questions

