IETF 89 ROLL

Routing over Low-Power And Lossy Networks

Chairs:
Michael Richardson
Ines Robles

Thursday 03/06/2014 - 15:20
Viscount Room
London

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Meeting Materials

- Remote Participation
  - Jabber Room: roll@jabber.ietf.org
  - Meetecho: http://www.meetecho.com/ietf89/roll
- Etherpad:
  - http://tools.ietf.org/wg/roll/minutes
- Audio Streaming: http://ietf89streaming.dnsalias.net/ietf/ietf898.m3u
- Minutes taker:
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Agenda

- State of all drafts (5min)
  - Related Internet-Drafts
- State of all Issues (3min)
- Updates to Milestones, Schedule and Practice (5min)
- Updates on: draft-ietf-roll-applicability-home-building (10min)
- Updates on: draft-ietf-roll-applicability-ami (10min)
- Updates on: draft-ietf-roll-applicability-template. (4min)
- MPL Issue: draft-roux-roll-mpl-eval-00 (15min)
- MPL Issue: draft-doi-roll-mpl-parameter-configuration (10min)
- New Work: draft-ajunior-roll-energy-awareness (15min)
- Detail the resolution: draft-ietf-roll-rpl-industrial-applicability (3min)
- Open floor (12 minutes)

State of Active Internet-Drafts

draft-ietf-roll-applicability-ami-08	Some sections to be completed	Tickets to solve: #135, #136, #137
draft-ietf-roll-applicability-home-building-02	New version February 2014 need feedback from wg	Tickets to close:#142, #144
draft-ietf-roll-applicability-template-04	New version January 2014 - Are all the applicability statements I-D following this model? (needs review by WG)	
draft-ietf-roll-rpl-industrial-applicability-02	Proposed to abandon this document: no responses in WG mailing list. Unclear how to read silence on this. http://www.ietf.org/mail-archive/web/roll/current/msg08458.html	
draft-ietf-roll-security-threats-06	WG Last call ended	Tickets:#150, #151, #152, #153, #154, #155, #156
draft-ietf-roll-trickle-mcast-07	Submitted to IESG for Publication	
draft-ietf-roll-terminology	Published as **RFC 7102**	

Related Internet-Drafts

draft-ajunior-roll-energy-awareness-01	Energy-awareness metrics global applicability guidelines	Slides Today
draft-doi-roll-mpl-nan-requirements-00	Neighborhood Area Network Requirements for MPL	Future Discussion
draft-doi-roll-mpl-parameter-configuration-04	MPL Parameter Configuration Option for DHCPv6	Slides Today
draft-ko-roll-mix-network-pathology-04	RPL Routing Pathology In a Network With a Mix of Nodes Operating in Storing and Non-Storing Modes	Future Discussion
draft-roux-roll-mpl-eval-00	Preliminary results about MPL performance evaluation	Slides Today
draft-thubert-roll-forwarding-frags-02	LLN Fragment Forwarding and Recovery	Not Proceeding
draft-tripathi-roll-reactive-applicability-02	Why Reactive Protocols are Ill-Suited for LLNs	Not-suitable for WG.
draft-vanderstok-roll-admin-local-policy-00	MPL forwarder policy for multicast with admin-local scope	Where to adopt?
draft-wang-roll-data-robustness-00	Network Coding for Enhancing Data Robustness in Low-Power and Lossy Networks	Not in scope for WG in present charter? -Future Discussion
draft-zhang-roll-rpl-intrusion-defence-00	Intrusion Detection System for Low-Power and Lossy Networks	Not in scope for WG in present charter? -Future Discussion

Open Tickets

Ticket	Summary
applicability-ami	
#135	Point to the Security Considerations section of RFC 6550
#136	Add a section of the Security Considerations for each instance where the RPL security mechanism are not to be used
#137	Incorporate a model for initial and incremental deployments
applicability-home-building	
#142	Clarification of secure key distribution
#144	Missing discussion of link encryption and group keys

Open Tickets (cont.)

Ticket	Summary
rpl-industrial-applicability	
#138	Update reference to draft-ietf-roll-security-threats
#139	Add information for deployments
#140	Describe how RPL security services there can be replaced
#141	Complete Security considerations during initial and incremental deployment

Open Tickets (cont.)

Ticket	Summary
draft-ietf-roll-security-threats	
#150	Editorial comments
#151	Add further clarification/information - Section 1-4
#152	Add further clarification/information - Section 5
#153	Add further clarification/information - Section 6
#154	Add further clarification/information - Section 7
#155	LLN Device Security Model
#156	RPL control message are broadcast

Milestones: Done

WG to adopt RPL applicability statement for Industrial applications - draft-ietf-roll-rpl-industrial-applicability
WG to adopt RPL applicability statement Home for Automation applications -draft-ietf-roll-applicability-home-building
WG to adopt RPL applicability statement(s) for AMI networks - draft-ietf-roll-applicability-ami

Milestones (cont.)

Milestone	Schedule	Practice
Resolve question of whether to keep this in roll or 6tisch draft-ietf-roll-rpl-industrial-applicability	Jan 2014	March 2014
Submit REVISED thread-analysis document based upon security directorate review to IESG. draft-ietf-roll-security-threats	Jan 2014	Feb 2014
Submit first draft of RPL applicability statement for Home Automation applications to the IESG to be considered as an Informational RFC	Feb 2014	Feb 2014
Evaluate WG progress, recharter or close	Jun 2014	
MPL was never in charter… should it be?		

draft-ietf-roll-applicability-home-building

Status March 2014

E. Baccelli, A. Brandt, R. Cragie, P. van der Stok

Home and Building Control

Shared aspects:

1. May be disconnected from ISP; mostly local control
2. Timeliness maintained during link failures

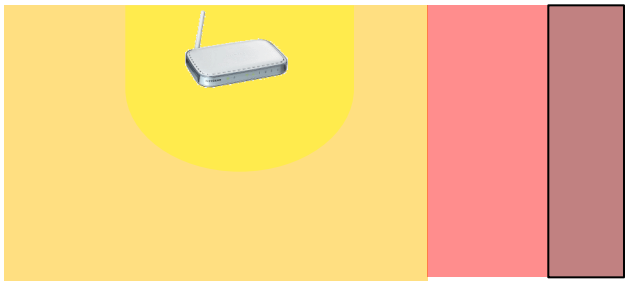
Difference:

1. Commissioning and control interface

Goal of document:

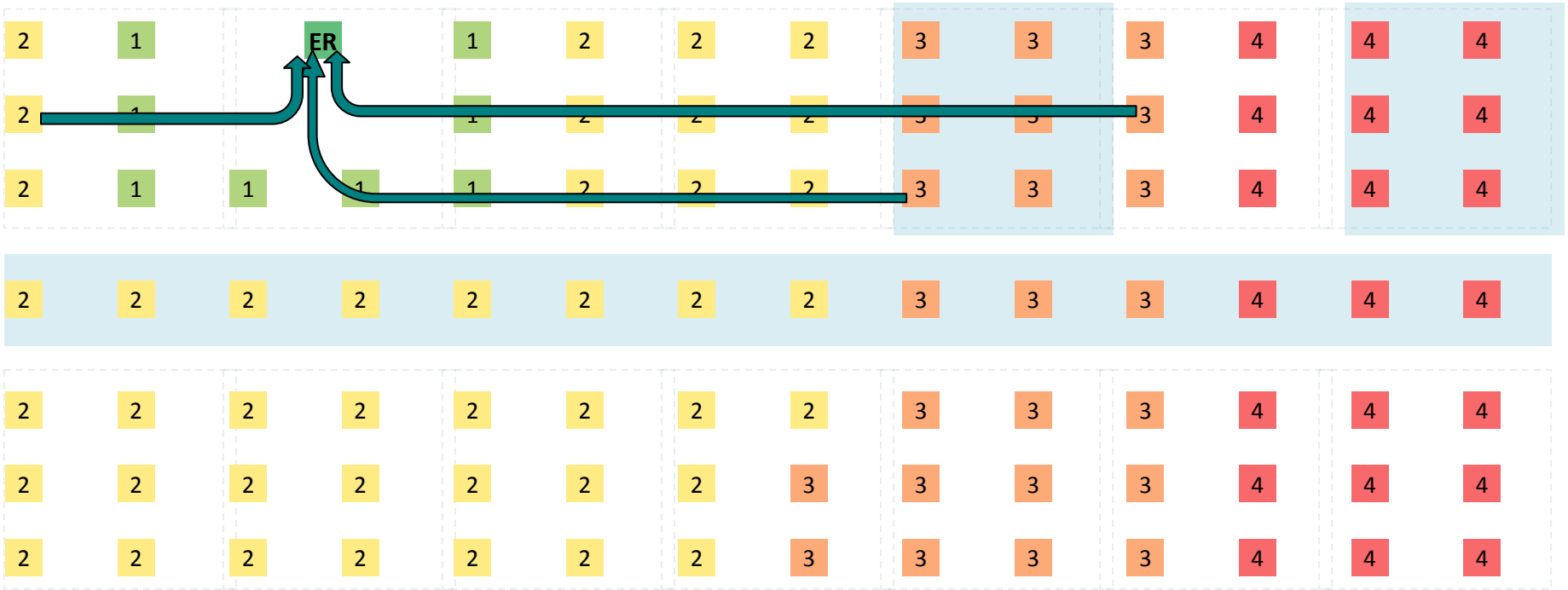
Guidance in use of RPL protocol suite deployed for
Control in buildings and home
Involving reliability, timeliness and local routing

Sporadic Traffic

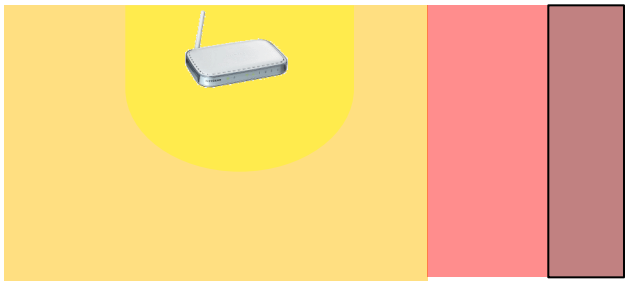


from nodes to edge router

X Node; X indicates the number of hops a node is away from the ER (i.e. the rank of the node in the ER-rooted DAG)



Regular Traffic

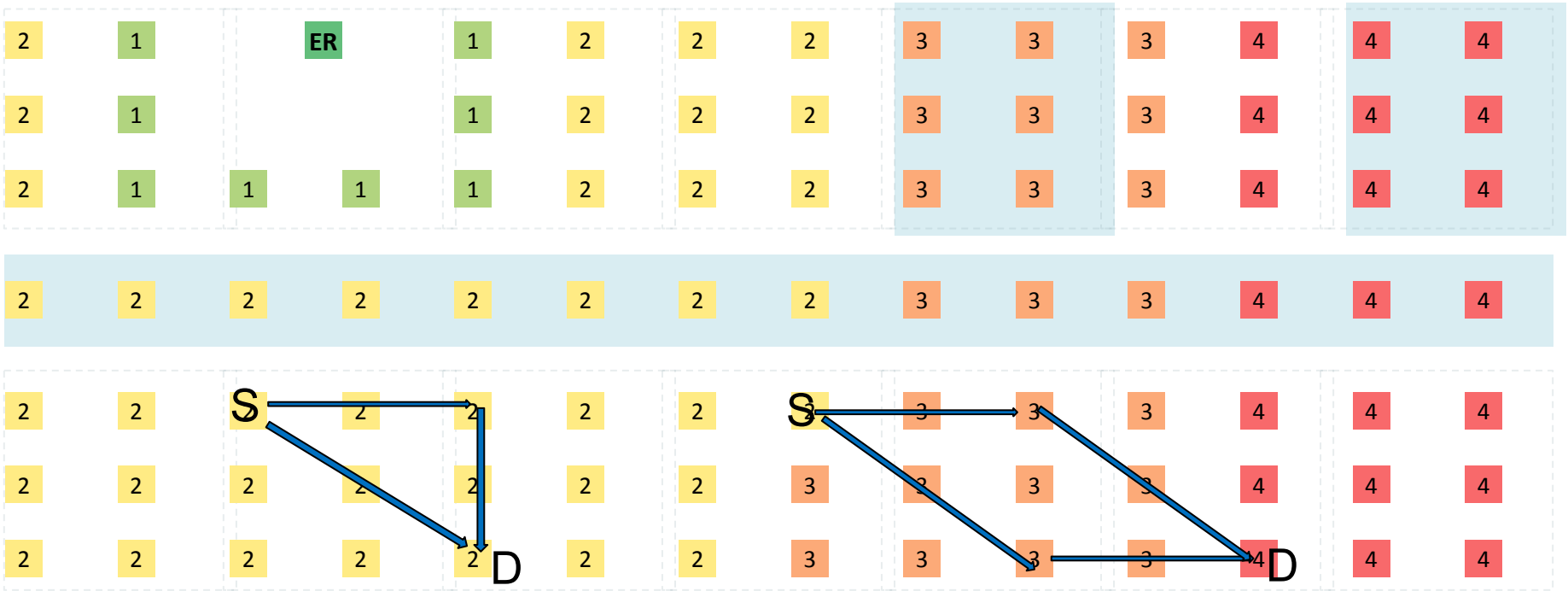


local between nodes

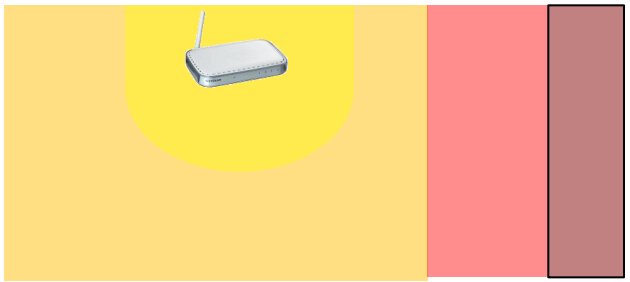
1-2 hops between S and D

Two or more paths:

No path discovery when link fails

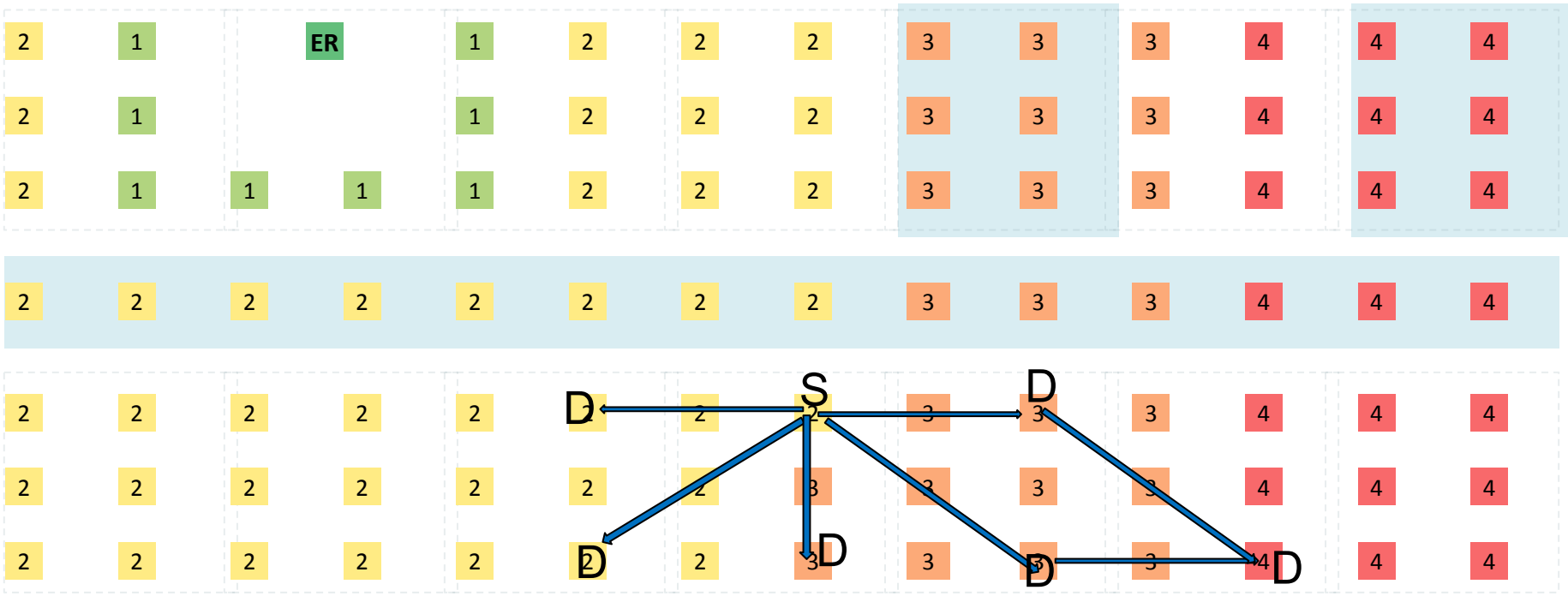


Multicast Traffic



local between nodes

1-2 hops between S and D's



MPL and RPL-P2P are dominant

Shared aspects:

1. Multiple paths, to cater for link failures without path rediscovery
2. Only few hops between source and destination
3. Timeliness
    1. end to end about 200 ms: e.g. lighting
    2. end to end a few seconds to minutes: e.g. hvac
    3. repetition 1 hour to few seconds: closed control
    4. Repetition few 100 ms: remote control

Parameter value recommendations:

1. RPL P2P
2. Trickle
3. MPL

Two appendices

RPL shortcomings

1. Long routes via edge router
2. Traffic concentration at root
3. Battery consumption linear in active routers
4. Slow route repair
5. Disturbed services waiting for route repair

Link behavior:

1. Use links in clear region
2. Experience quality fluctuations
3. Links dead during seconds
4. Asymmetric quality between 2 nodes

Update on AMI RPL applicability statement

draft-ietf-roll-applicability-ami-08

What's changed

- Restructured draft to align with the applicability template
  - **draft-ietf-roll-applicability-template-04**
- Updated description of AMI systems
- Updated Smart Grid Traffic Characteristics
- Added Smart Grid QoS requirements
- Updates Layer 2 features for PLC IEEE 1901.2 & 802.15.4g/e

What’s changed cont.

- Re-scope the applicability statement
  - Only RPL non-storing mode of operation
  - Only AC powered devices
- Updated RPL profile section that includes:
  - How non storing mode is used
  - DAO policy
  - Path metrics
  - Objective Function
  - DODAG repair
  - Multicast
  - Security

What’s changed cont.

- Updated the 6LowPAN Options section
  - Header compression allowed
  - Fragmentation not recommended
- Added descriptions of security features for IEEE 802.15.4e and IEEE 1901.2 links

Remaining Work Items?

- Section 9.1 - Security considerations during initial deployment
- Section 9.2 - Security Considerations during incremental deployment
- Section 10 - Other Related Protocols Section
- Section 7.2.2 - 802.15.4g/e PHY and MAC feature implementation details

Questions?

ROLL Applicability Statement Template

draft-ietf-roll-applicability-template-04

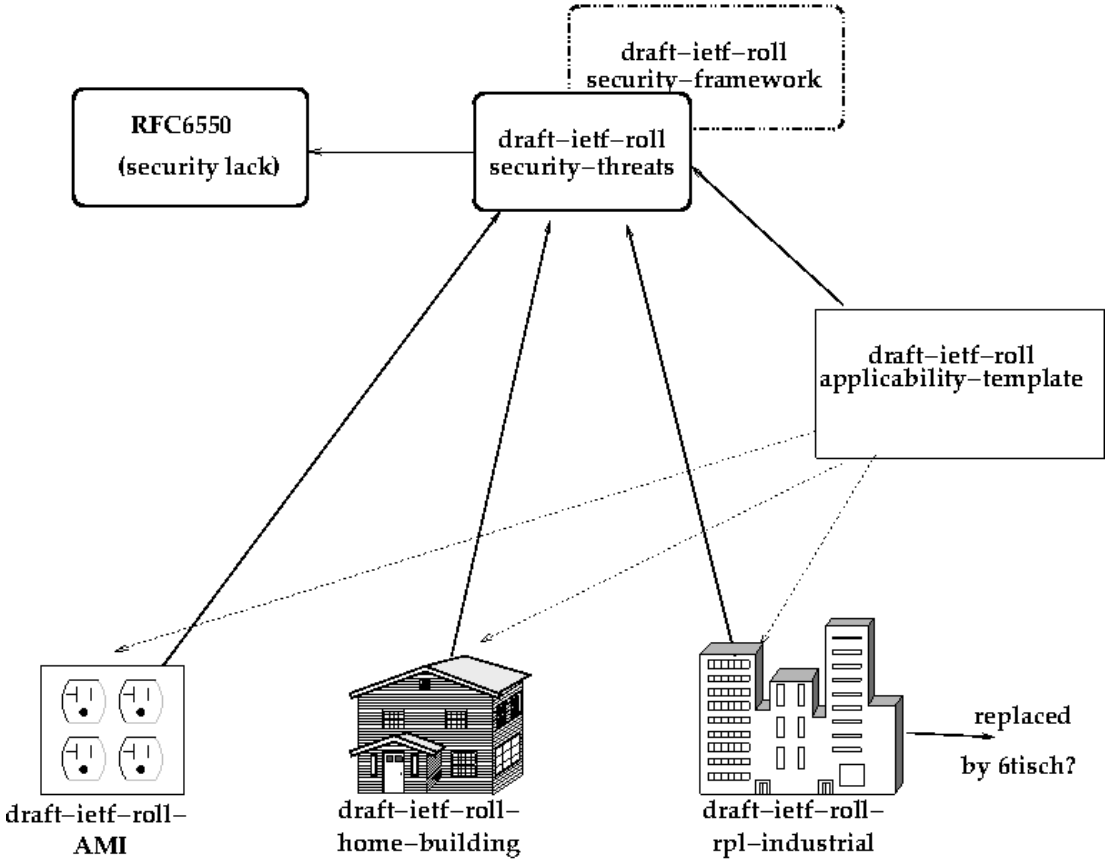
Michael Richardson

03-06-2014

draft-ietf-roll-applicability-template-04

- received secdir review
  - had two calls to coordinating secdir review of template with reviewers of other applicability documents
- added explanation for a number of sections
- added section on MPL
  - diff: http://goo.gl/RhfKdX
- recall: this document a work in progress, never intended for publication!
- need clarification text on relationship of documents in the applicability statements.

draft-ietf-roll-applicability-template-04



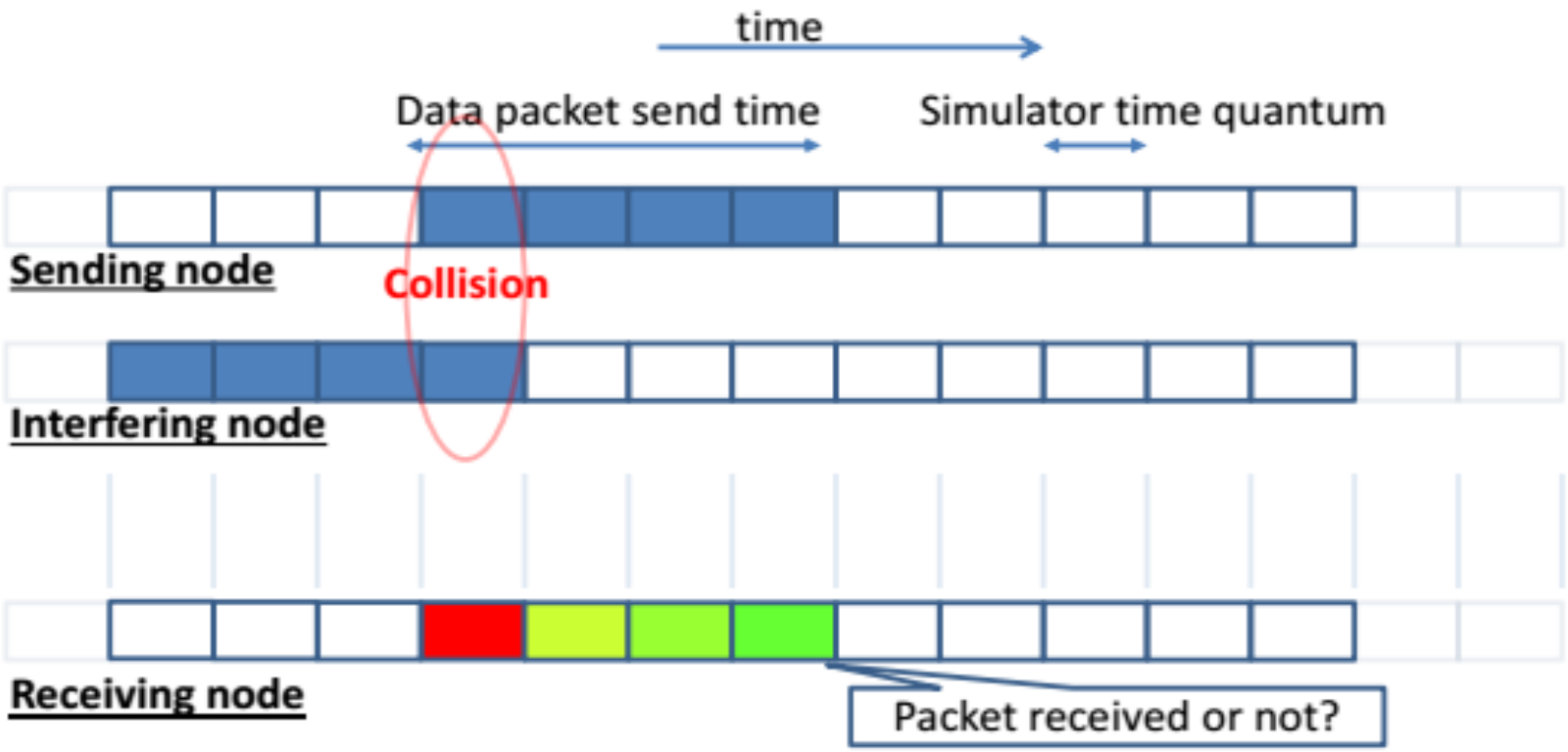
MPL performance evaluation

Evaluation methodology and first results

draft-roux-roll-mpl-eval-00.txt

Pierre Roux
Mounir Kellil
Alexandru Petrescu (Speaker)

Simulator principles

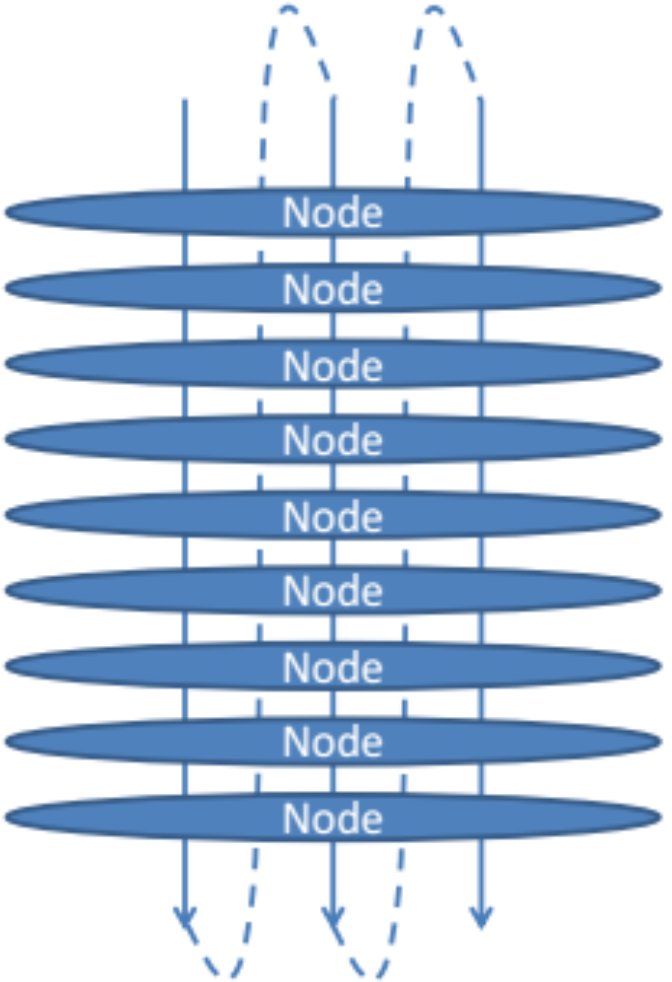


Signal over [noise + interference] averages over packet receiving time => Packet loss probability

Successful packet transmission or packet loss drawn randomly, according Packet loss probability

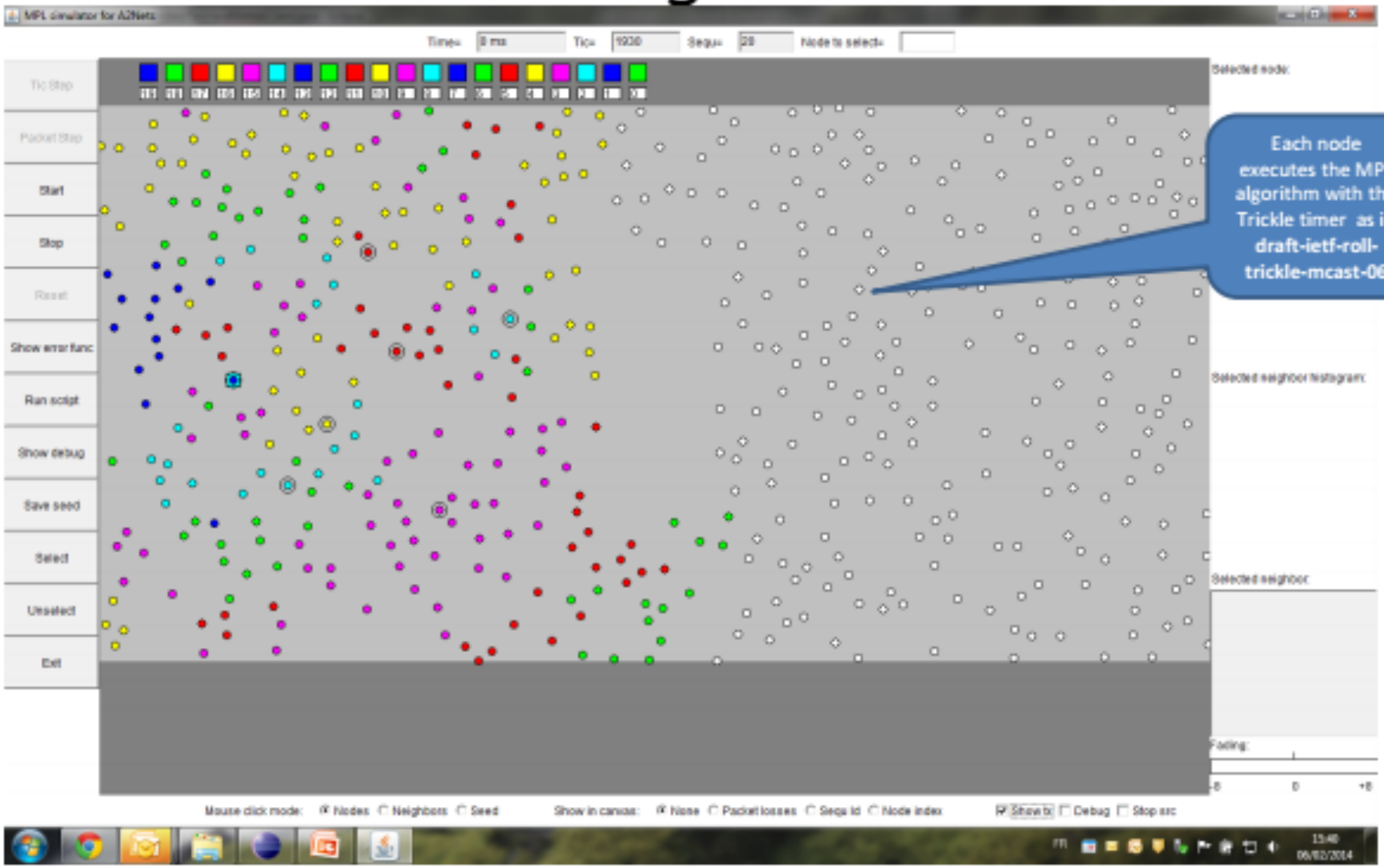
Main loop (each quantum time 10ms)

1) Scan all nodes in the network for possible received packets. Treat received packet if any.
2) Scan all nodes in the network for checking and treating *trickle timer* status.
3) Scan all nodes in the network for treating ongoing or new packet transmissions.

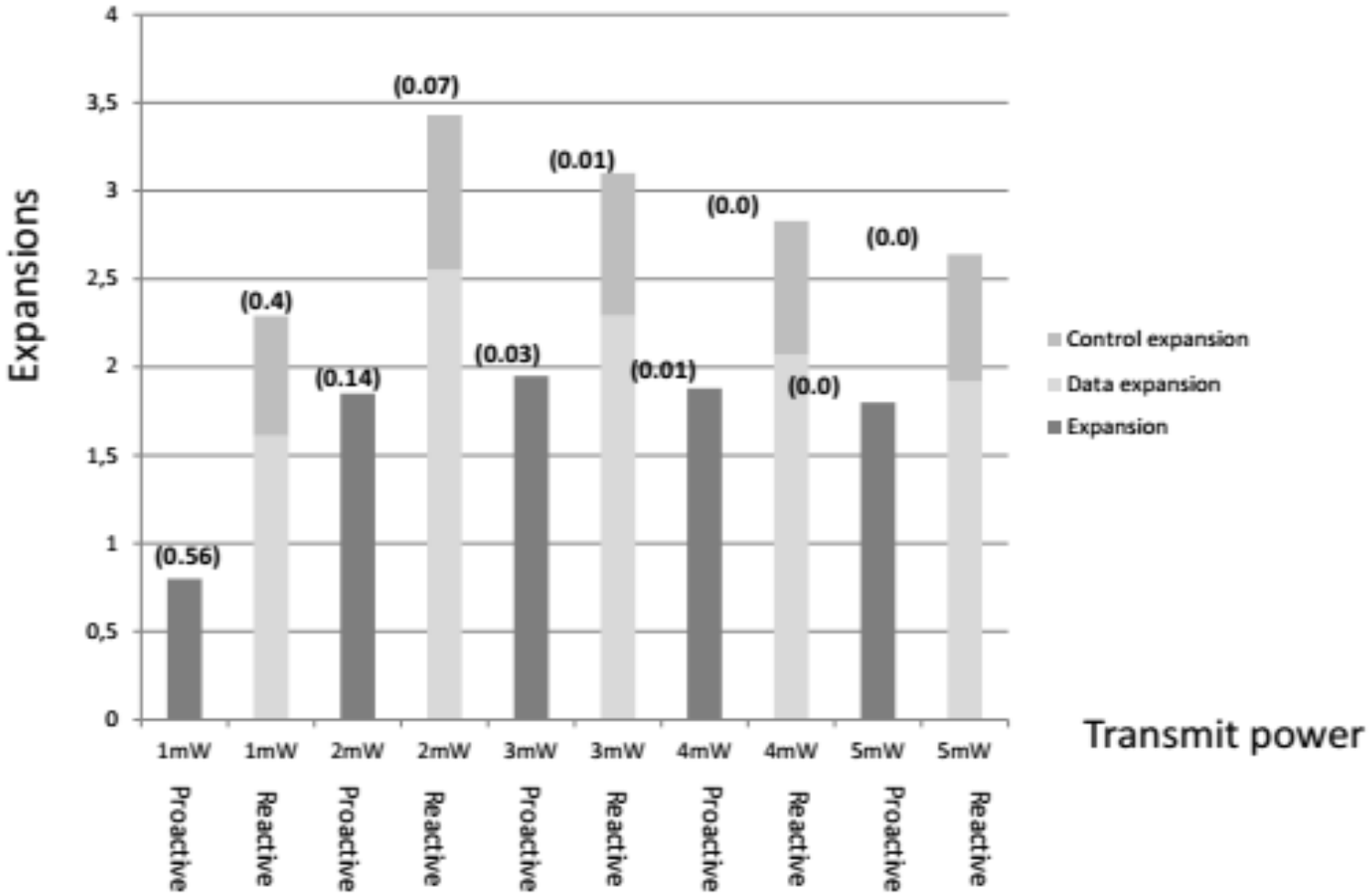


Simulator graphical insight

Live Run during Presentation



Example of evaluation result



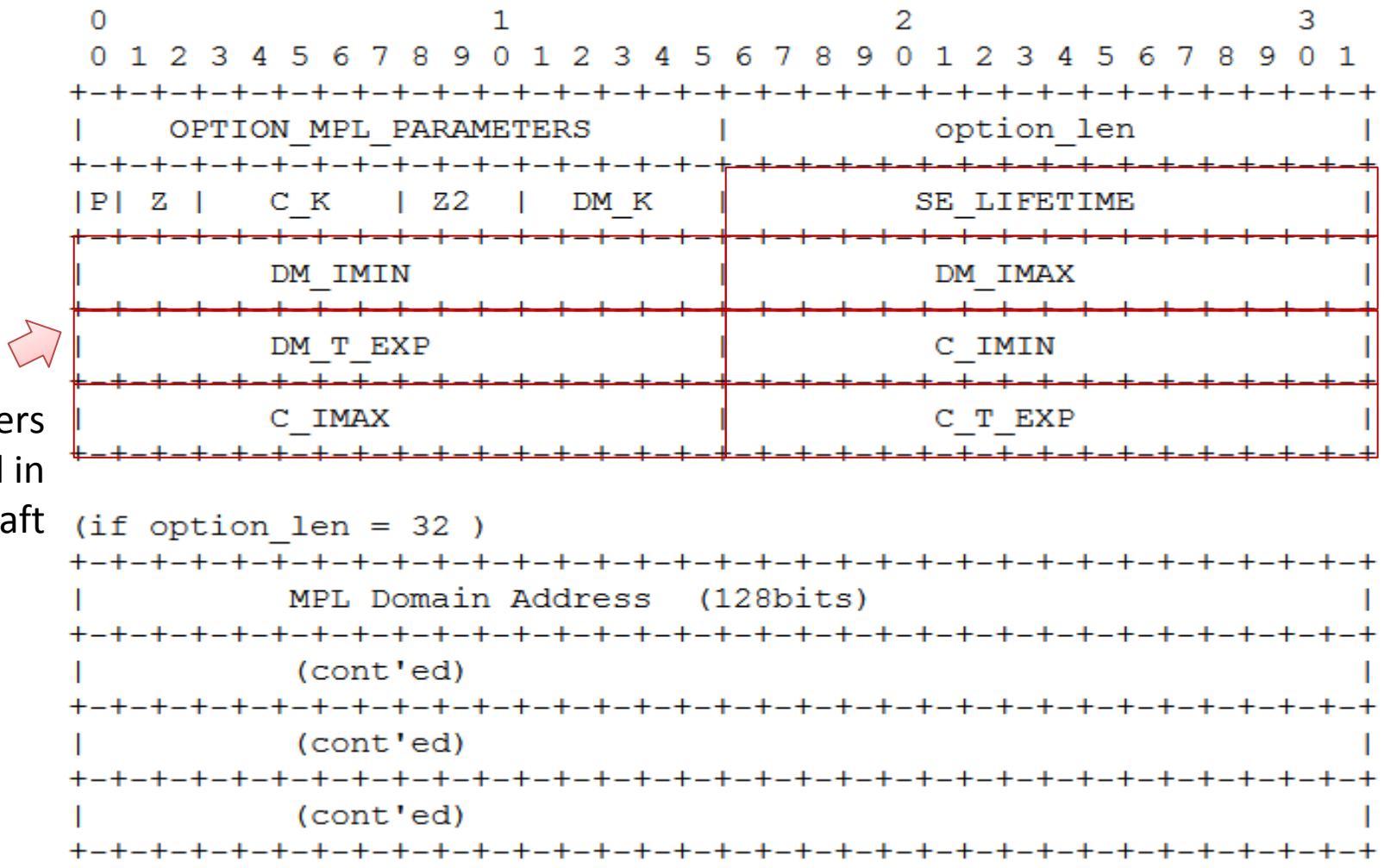
draft-doi-roll-mpl-parameter-configuration

Yusuke DOI
TOSHIBA Corporation

I-D.roll-trickle-mcast-06 Section 5.4

- *Following [RFC6206], it is RECOMMENDED that all MPL Interfaces attached to the same link of a given MPL Domain use the same values for the Trickle Parameters above for a given MPL Domain. The mechanism for setting the Trickle Parameters is not specified within this document.*
- Candidates of '*the mechanism*':
  - Preconfigured, (Stateless)DHCPv6, SNMP, NetConf, etc.
  - Some LLN may use DHCPv6 anyway: Let's piggyback on it.

Option Format



Timers defined in MPL draft

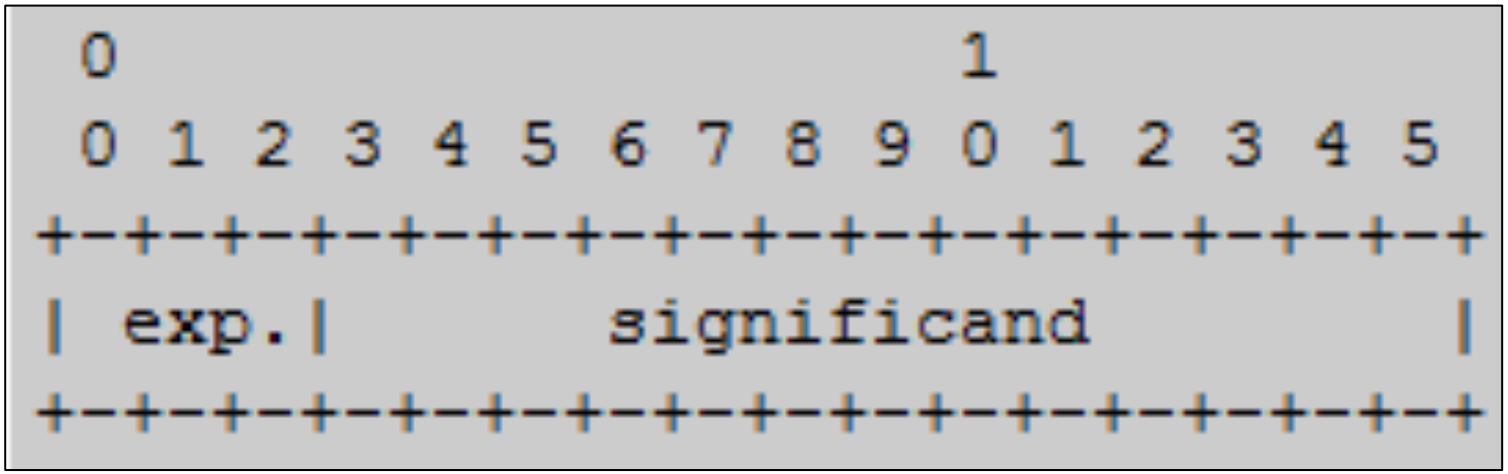
Optional MPL Domain Address

- optlen=16 → configuration for default MPL forwarders
- optlen=32 → configuration for the MPL Domain

A Challenge: How to Describe Timers within Small Number of Bits?

- Times should have wide range
  - Small timers may be in 10ms range
  - Large timers may become weeks
- Floating Point shall be good
- IEEE-754 defines half precision floating point, but:
  - Timers does not need negative numbers
  - Base-10 should be more convenient to make correspondence to values defined in configuration file (i.e. 36*10^5 ms instead of 28125*2^7, etc.)

Short Floating Point for Timers
(defined in this I-D)



Milliseconds to 13 weeks in 16-bit

- exp = 0: millisecond precision
- exp = 3: seconds precision
- exp = 6: 1000 seconds precision
- exp = 7: RESERVED

The author acknowledges Richard Kelsey for the initial idea.

Questions

- How do you configure MPL nodes?
- Is DHCPv6 a good candidate to configure MPL nodes?
  - If not, what else?
- Is our proposal in good shape?
- Open topics:
  - Is it safe to update parameters?
  - How to remove an MPL domain from a network?

Energy-awareness metrics global applicability guidelines draft-ajunior-roll-energy-awareness-01

Antonio Júnior and Rute Sofia
antoniojr@ufg.br, rute.sofia@ulusofona.pt

COPELABS, University Lusófona (Lisbon, Portugal)

Introduction

- LLNs aspects concerning routing metrics and also constrains in design are available in [RFC6551]. Path computation algorithms for single metrics have already been proposed and used in [RFC6552], and [RFC6719]

- Within the context of LLNs, we consider the specific case of User-centric Networks (UCNs) [ULOOP], i.e., networks partially or completely based on equipment that is owned and carried by regular Internet end-users

- The draft describes a new set of energy-awareness metrics which have been devised to be applicable to any multihop routing protocol having in mind LLNs, including the Routing for Low Power and Lossy Networks (RPL) protocol [RFC6550]

Alignment with the ROLL charter

- The intention of this draft is to contribute to the ROLL WG regarding energy-aware metrics applicable to RPL protocol performing a deep analysis
  - Routing metrics that can be applied to select paths based on energy-awareness of the nodes (instead of shortest-path or static policies)
  - Full backward compatible
- **We are working on implementation of the energy-aware metrics on RPL**
  - Analyzing the SimpleRPL, ContikiRPL and TinyRPL
- We want to specify a new metric container type according to RFC6551
  - Replacing the E_E field (8 bits) by the energy-aware cost

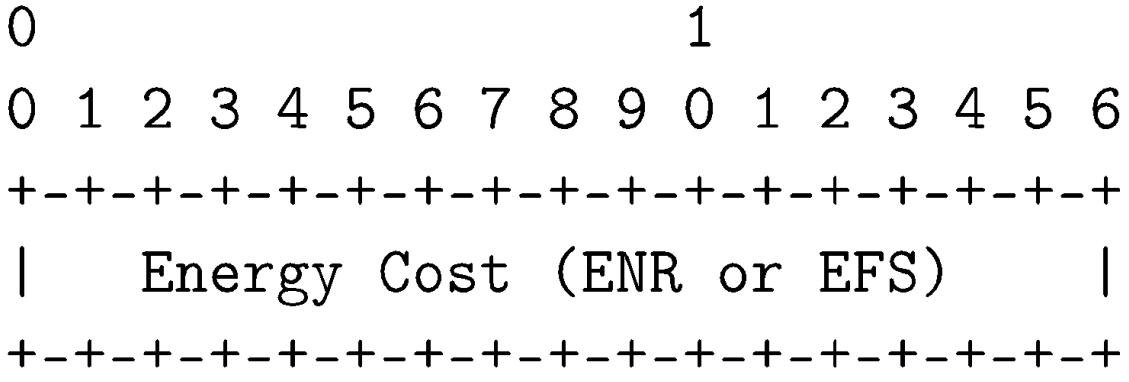
Our draft

Energy-awareness metrics global applicability guidelines

- Explains basic terminology related with energy-awareness approaches
- Describes metrics that have been validated [AJUNIOR1][AJUNIOR2] [AJUNIOR3] and which show performance improvement in the order of 30%
- Design aspects of proposed metrics
- Applicability guidelines of proposed metrics
  - RPL, AODV, OLSR

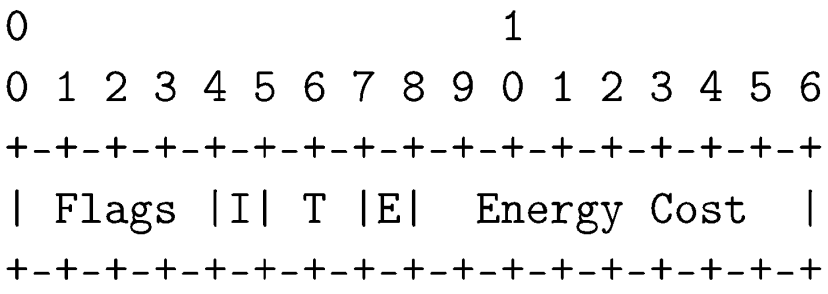
Main Design Aspects

- The energy-aware cost ranking (ENR or EFS metrics) are recorded in reserved field of control messages of any routing protocol occupying 8 bits or 16 bits



Using Energy Aware Metric with RPL

- RPL nodes are configured to support a set of metrics and constraints and select their parents in the DODAG according to the metrics and constraints advertised in the DIO messages
- Routing metric: Shortest path offering the shortest ranking of proposed metrics (ENR or EFS)
- The Node Energy object (NE) as defined in [RFC6551] can be used without any changes (using the E_E field)
  - flag 'E' (Estimation) should be set



Conclusions and Future Work

- The effectiveness and performance validation (under AODV and OLSR) of the metrics described in this draft can be found in detail in [AJUNIOR1], [AJUNIOR2] and [AJUNIOR3].
  - Without strong penalties in terms of operational changes and maintenance
  - Increasing network lifetime between 6.8% - 35.3%
  - Does not penalize the throughput, end-to-end delay and packet loss
- We are working on RPL implementation and we are considering a single document for RPL (as Michael suggested) including the results, then we can post a new draft version as soon as we have the results

References

- [RFC6551] JP. Vasseur, M. Kim, K. Pister, N. Dejean, D. Barthel, "Routing Metrics Used for Path Calculation in Low-Power and Lossy Networks", RFC 6551, March 2012.
- [RFC6552] P. Thubert, "Objective Function Zero for the Routing Protocol for Low-Power and Lossy Networks (RPL)", RFC 6552, March 2012.
- [RFC6719] O. Gnawali, P. Levis, "The Minimum Rank with Hysteresis Objective Function", RFC 6719, September 2012.
- [ULOOP] "ULOOP: User-centric Wireless Local-Loop," EU IST FP7 Project (Grant 257418).
- [RFC6550] T.Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik, J. Vasseur, and R. Alexander, "RPL: IPv6 Routing Protocol for Low-Power and Lossy Network" RFC6550, 2012.
- [AJUNIOR1] A. Junior, R. Sofia, and A. Costa, "Energy-awareness metrics for multihop wireless user-centric routing" in The 2012 International Conference on Wireless Networks (ICWN'12), July 2012.
- [AJUNIOR2] A. Junior, R. Sofia, and A. Costa, "Energy-efficient heuristics for multihop routing in user-centric environments" in 12th International Conference on Next Generation Wired/Wireless Networking (NEW2AN), August 2012.
- [AJUNIOR3] A. Junior, R. Sofia, and A. Costa, "Energy-awareness in Multihop Routing" in 2012 IFIP Wireless Days conference (WD'12), November 2012.

Detail the resolution: draft-ietf-roll-rpl-industrial-applicability

Propose to abandon this document

http://www.ietf.org/mail-archive/web/roll/current/msg08458.html

No responses: How to read silence on this matter?

Open Mic

-? Open consensus call on abandoning industrial

Thank you!!

Please sign blue sheets :-)