

# Use cases for DIS Modifications

draft-papadopoulos-roll-dis-mods-use-cases-00

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# Objective of the Draft

*Identify Use Cases that prompt DIS modification*

There are several drafts that request modifying the DIS:

- draft-ietf-roll-rpl-observations-03
- draft-thubert-roll-eliding-dio-information-04
- draft-ietf-roll-dis-modifications-01

# Use Case: Node Joining DODAG

*A smart meter being replaced in the field, while a RPL network is operating and stable.*

- The meter will wait for the DIO which might take a long time if the Trickle timers have relaxed due to the steady state.
- If the meter sends a DIS, it will send in multicast, because it has no knowledge of its surroundings (inconsistency).
  - The receivers will reset their Trickle timer to the shortest period.
  - The DIOs will be sent in multicast, which will trigger energy expenditure at nearby nodes.

# Potential Solution

- The DIS message may include:
  - The "**No Inconsistency**" flag set to prevent resetting of Trickle timer in responding routers.
  - The "**DIO Type**" flag set to make responding routers send unicast DIOs back.
  - A **Response Spreading option** based on the density of nearby routers.
  - A **Metric Container** listing the routing constraints that the responding routers must satisfy in order to be allowed to respond.

# Use Case: Identifying Defunct DODAG

- A RPL node may remove a neighbor from its parent set for a DODAG for a number of reasons:
  - The neighbor is no longer reachable
  - The neighbor advertises an infinite rank in the DODAG
- However, a RPL node may fail to remove a neighbor:
  - The node may fail to receive the neighbor's DIOs advertising an increased rank or the neighbor's membership in a different DODAG

# Use Case: Identifying Defunct DODAG

- Thus, a node would continue to consider itself attached to a DODAG even if all its parents in the DODAG are unreachable or have moved to different DODAGs.
- Such a DODAG can be characterized as being defunct from the node's perspective.
- If the node maintains state about a large number of defunct DODAGs, it may consume a considerable portion of the total memory in the node.

# Potential Solution

- The DIS message has the "No Inconsistency" flag set to prevent resetting of Trickle timer in responding routers.
- A Solicited Information option to identify the DODAG in question.
  - I and D flags set
  - RPLInstanceID/DODAGID fields must be set to values identifying the DODAG.
- A Response Spreading option specifying a suitable time interval over which the DIO responses may arrive.

# Use case: Adjacencies probing

*To reduce the control traffic overhead, RPL uses the Trickle timer to update configuration parameters.*

- However, in the absence of **regular traffic** or **L2 feedback**, the adjacencies cannot be tested and repaired if broken.
- RPL provides a mechanism in the form of unicast DIS to query a node for its DIO. A node receiving a unicast DIS must respond with a unicast DIO with Configuration Option.
- *This mechanism could as well be made use of for probing adjacencies.*

# Discussion: Adjacencies probing

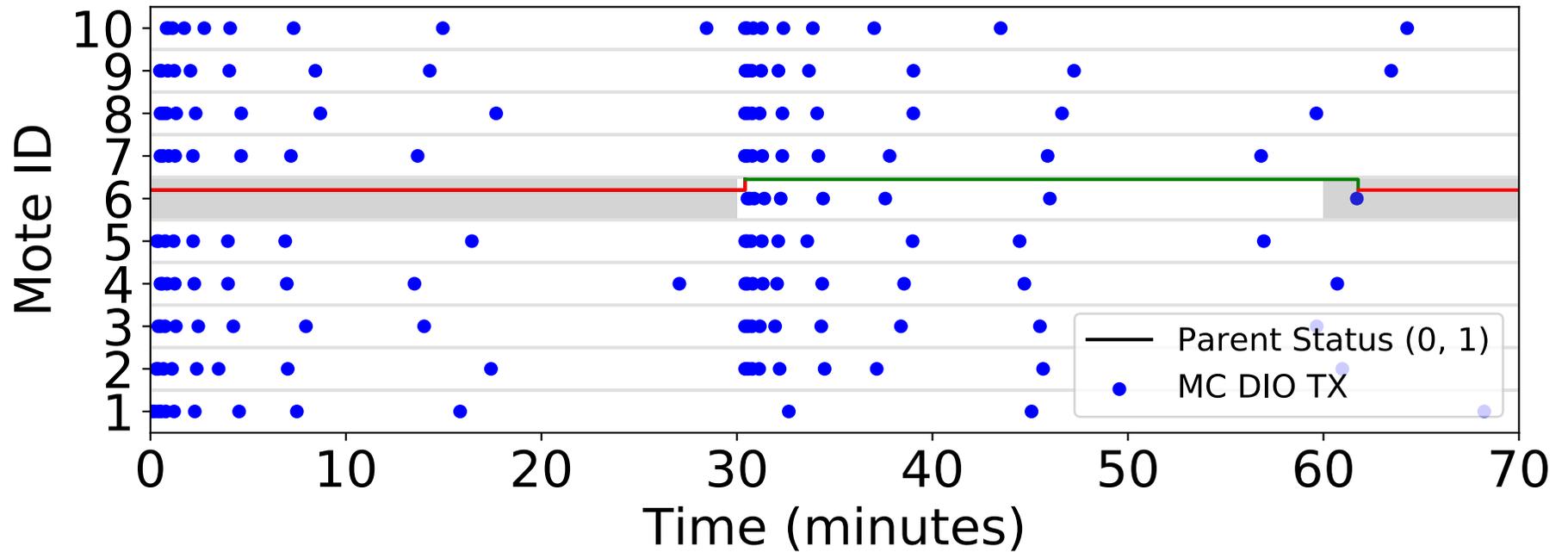
- Should the probing scheme be standardized (recommendations)?
  - frequency of probing depending on traffic conditions.
  - in some cases, it may be advantageous to send multicast DIO as probing response from the parent if it has several child nodes without resetting their trickle timers.
  - probing can happen in both directions, i.e., parent to child and child to parent.

# Preliminary results on : draft-ietf-roll-dis-modifications-01

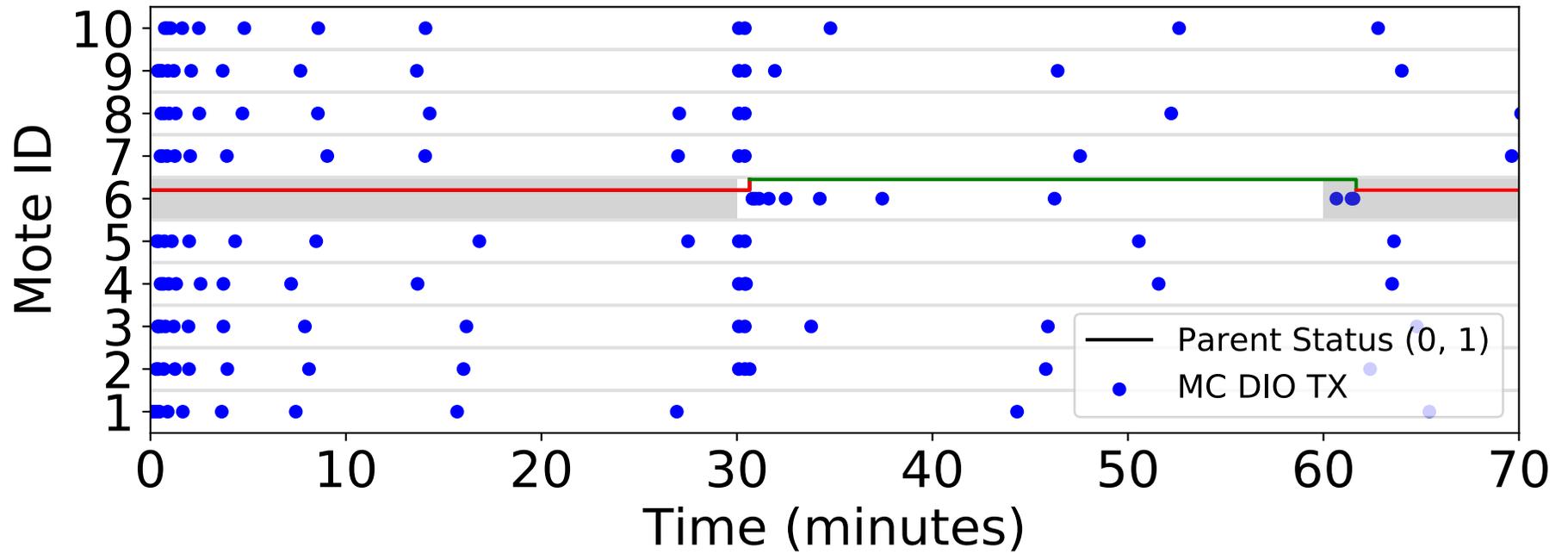
## Configuration setup :

- Cooja – Contiki NG
- Network of 10 nodes in grid topology
- RPL
- 6TiSCH Minimal

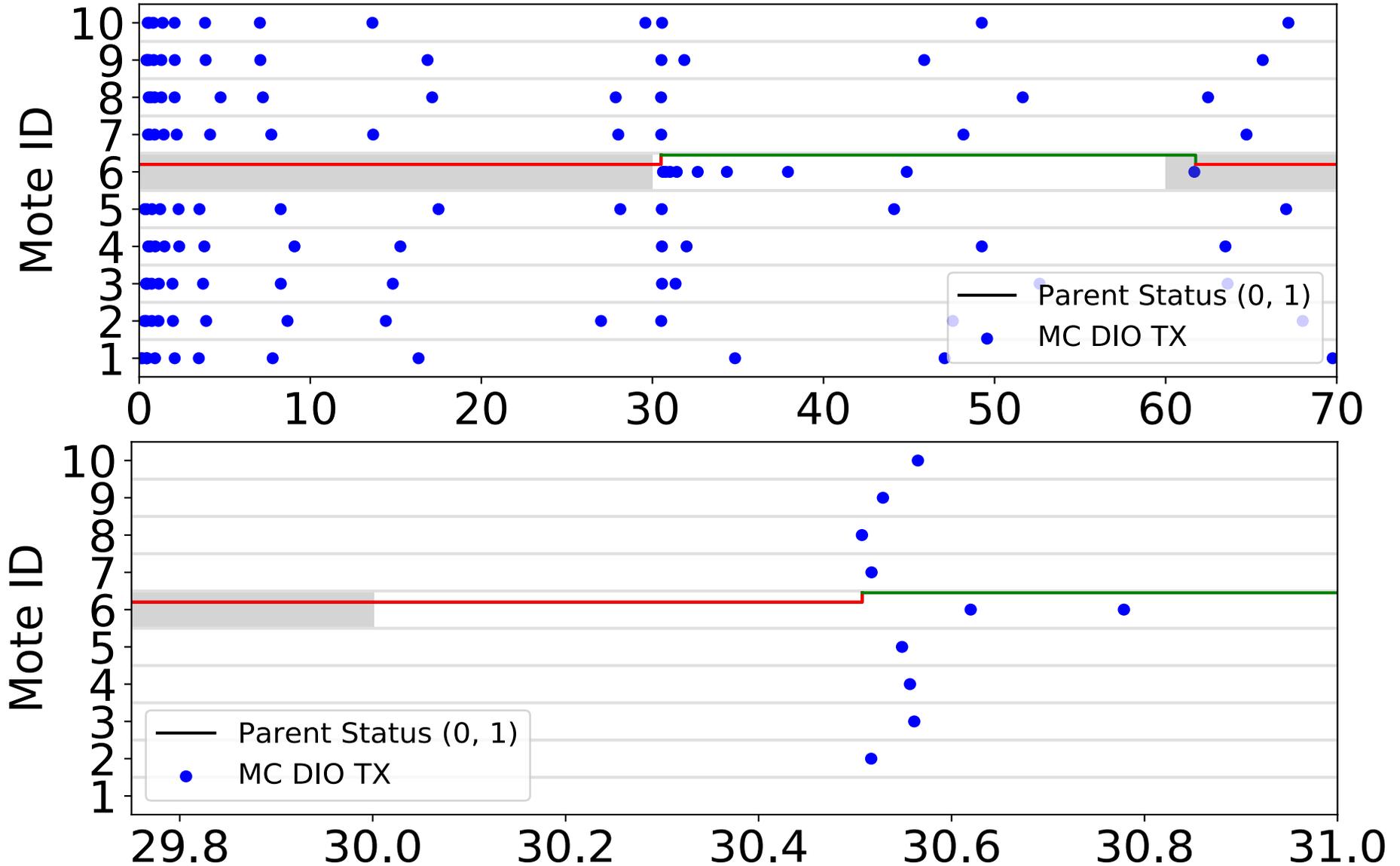
# No flags



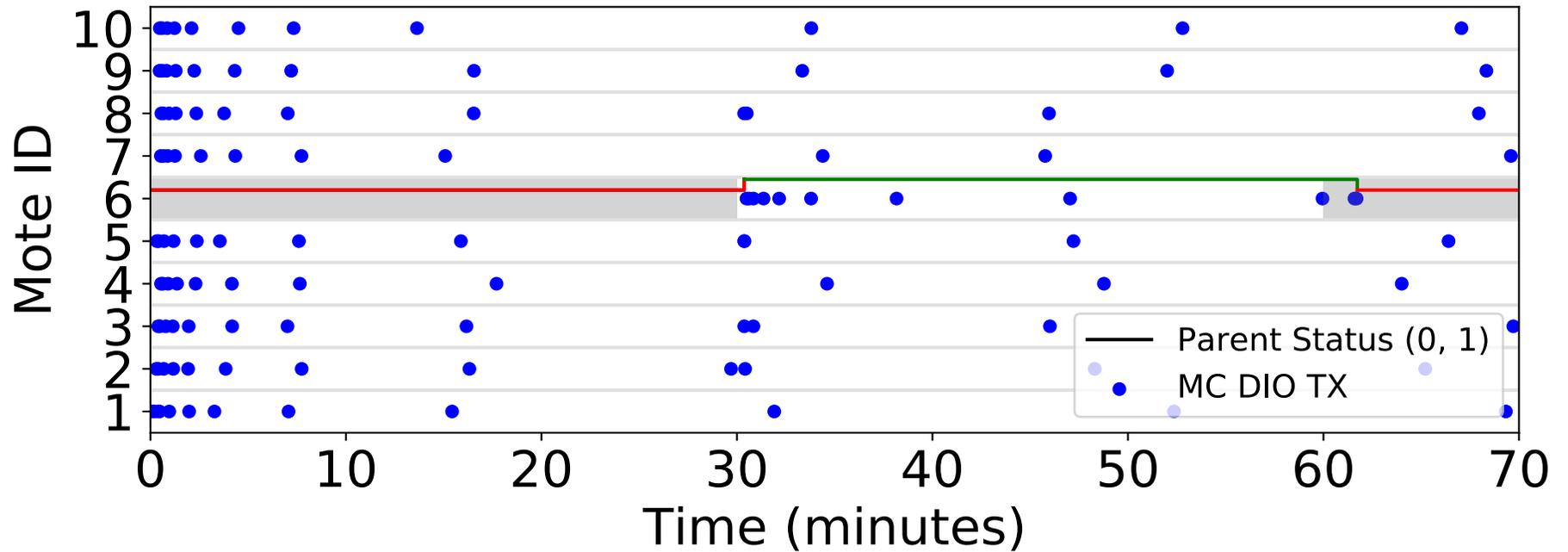
# N flag



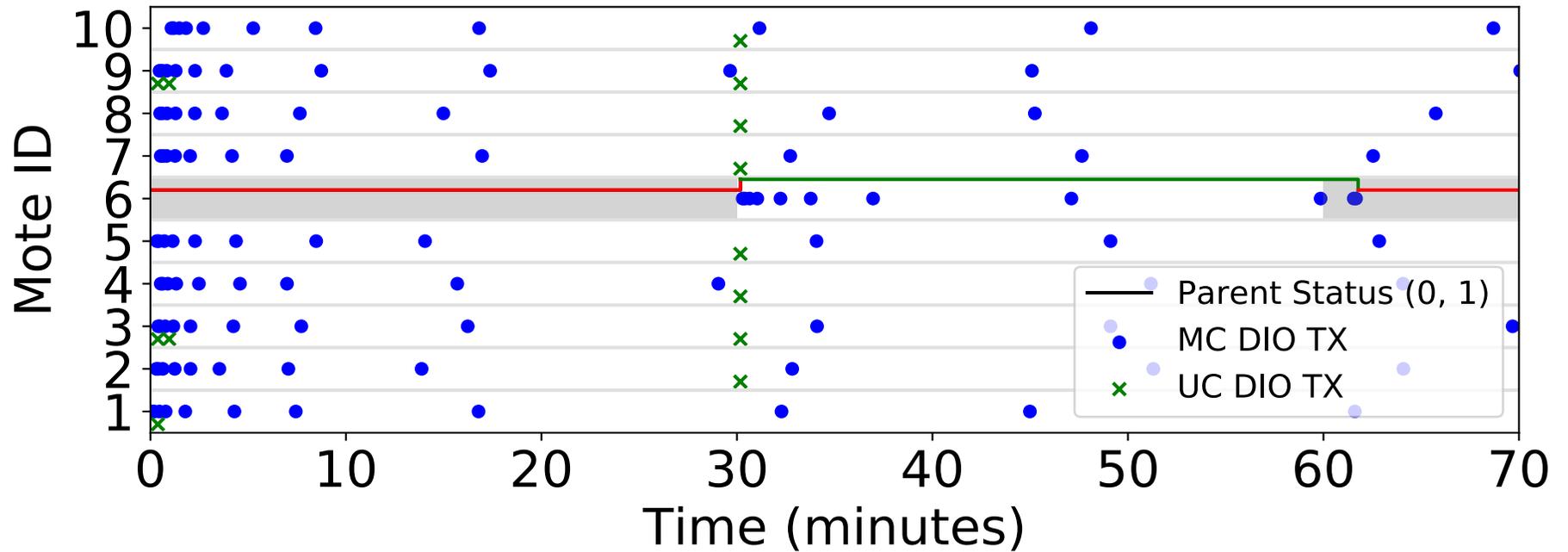
# N flag + RS (0 – 2 seconds)



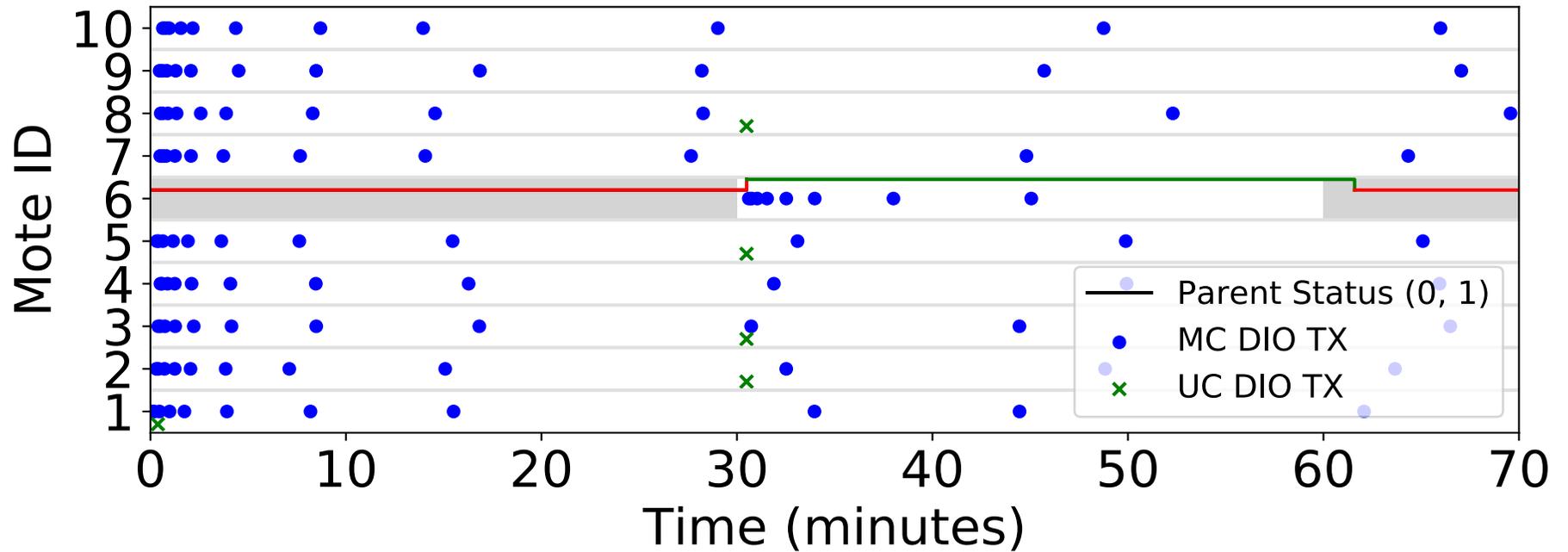
# N flag + RS + MC



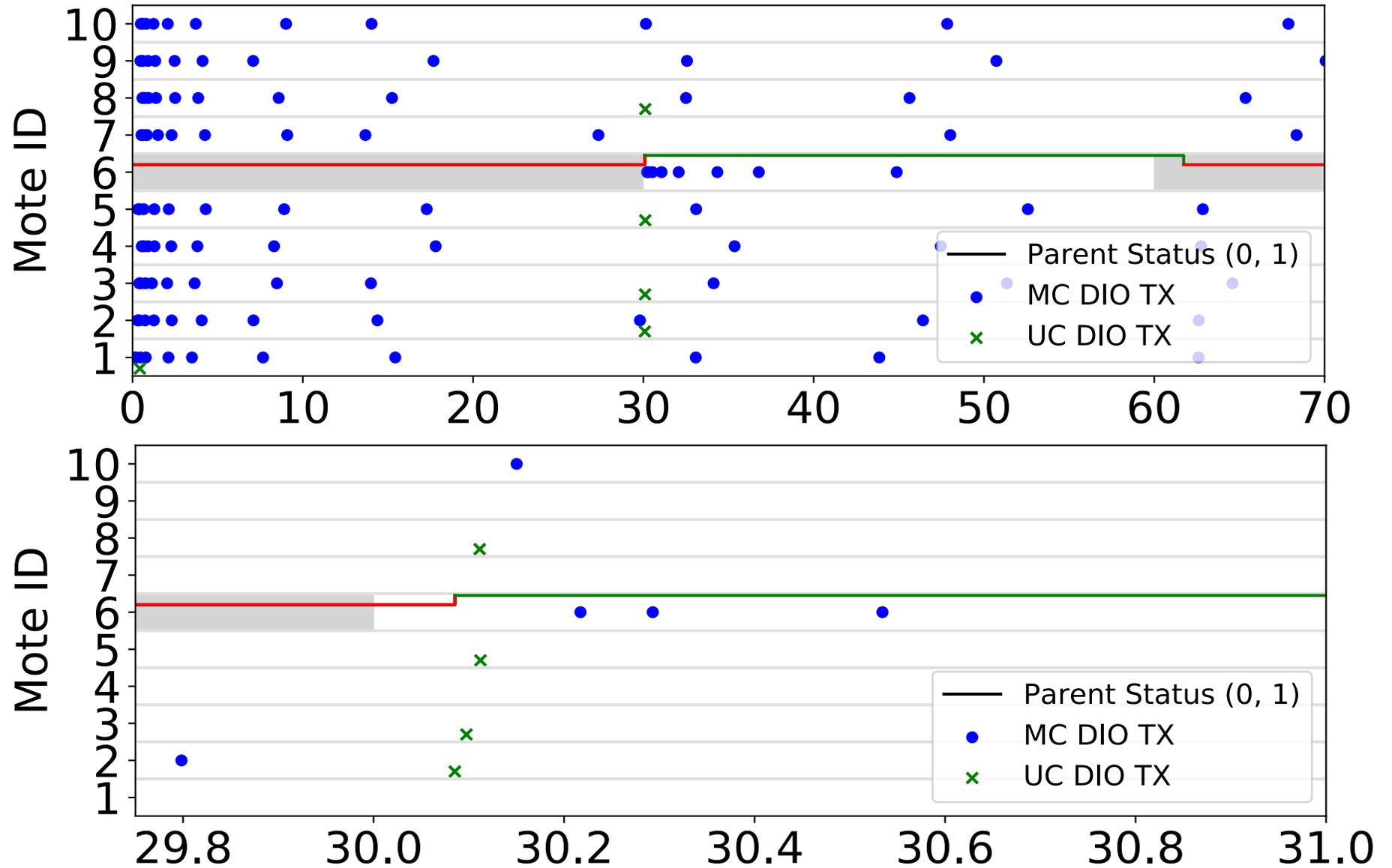
# N + T flags



# N + T flags + MC



# N + T flags + MC + RS



# Road Forward

- More Use Cases to be included in the draft?
- Opinions for the future of this use-cases draft?
  - to be included in the appendix of a solution draft?
- Regarding the solution draft, (single or multiple?) :
  - draft-thubert-roll-eliding-dio-information-04
  - draft-ietf-roll-dis-modifications-01

**Thanks!**