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IGMP/MLD-Based Explicit Membership Tracking Function for Multicast Routers

draft-asaeda-mboned-explicit-tracking-02

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Objectives

- Problem in bursty IGMP/MLD message transmission
 - Requirement to save network resources
 - Especially in the recent IGMPv3/MLDv2/LW-IGMPv3/LW-MLDv2 due to elimination of the report suppression mechanism
- Requirement of fast leave or shortening leave latency

Functions

- The explicit tracking function on routers works for:
 - Per-host accounting
 - Reducing the number of transmitted Query and Report messages
 - Shortening leave latencies
 - Maintaining multicast channel characteristics (or statistics)

Objective 1: the Number of Messages Transmission

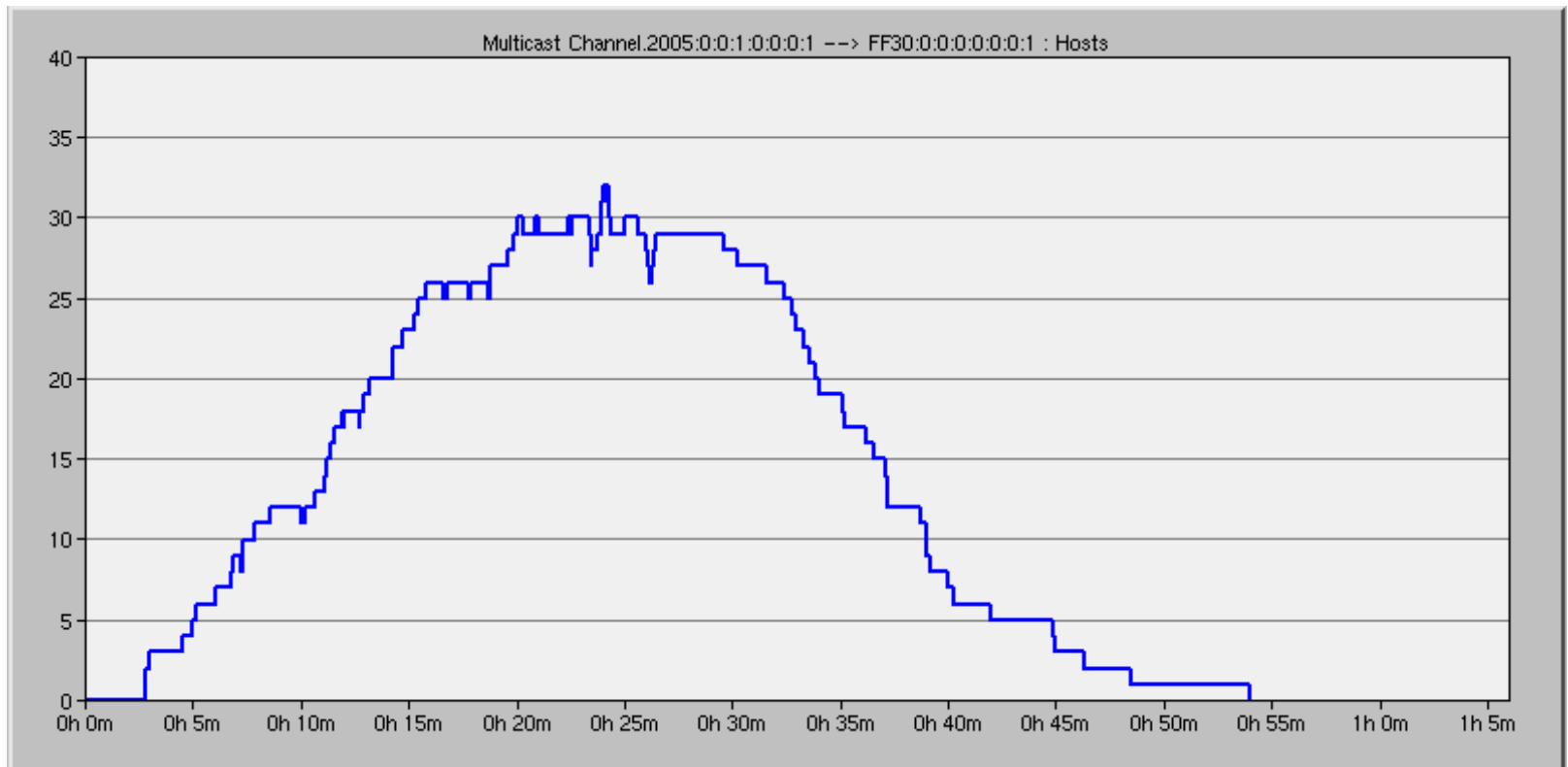
- Whenever a router receives the State-Change Report, it sends the corresponding Group-Specific or Group-and-Source Specific Query messages to confirm whether the Report sender is the last member host or not.

Lower Specific Query Transmission

- A router enabling the explicit tracking function does not need to always ask Current-State Report message transmission to the member hosts whenever it receives the State-Change Report
 - Because the explicit tracking function works with the expectation whether the State-Change Report sender is the last remaining member of the channel or not

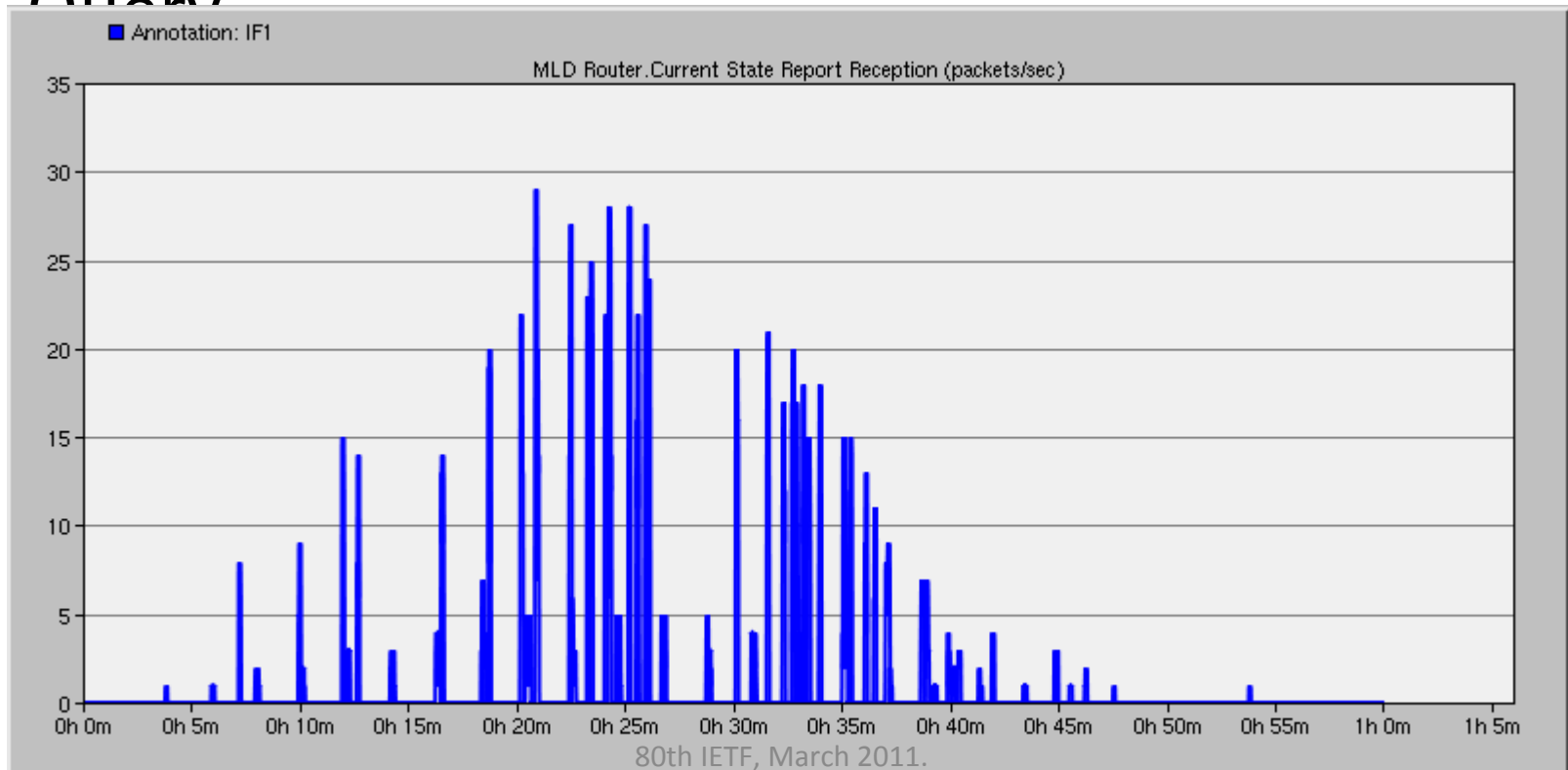
Simulation

- Transit Number of Members
 - 40 hosts individually join/leave a same channel



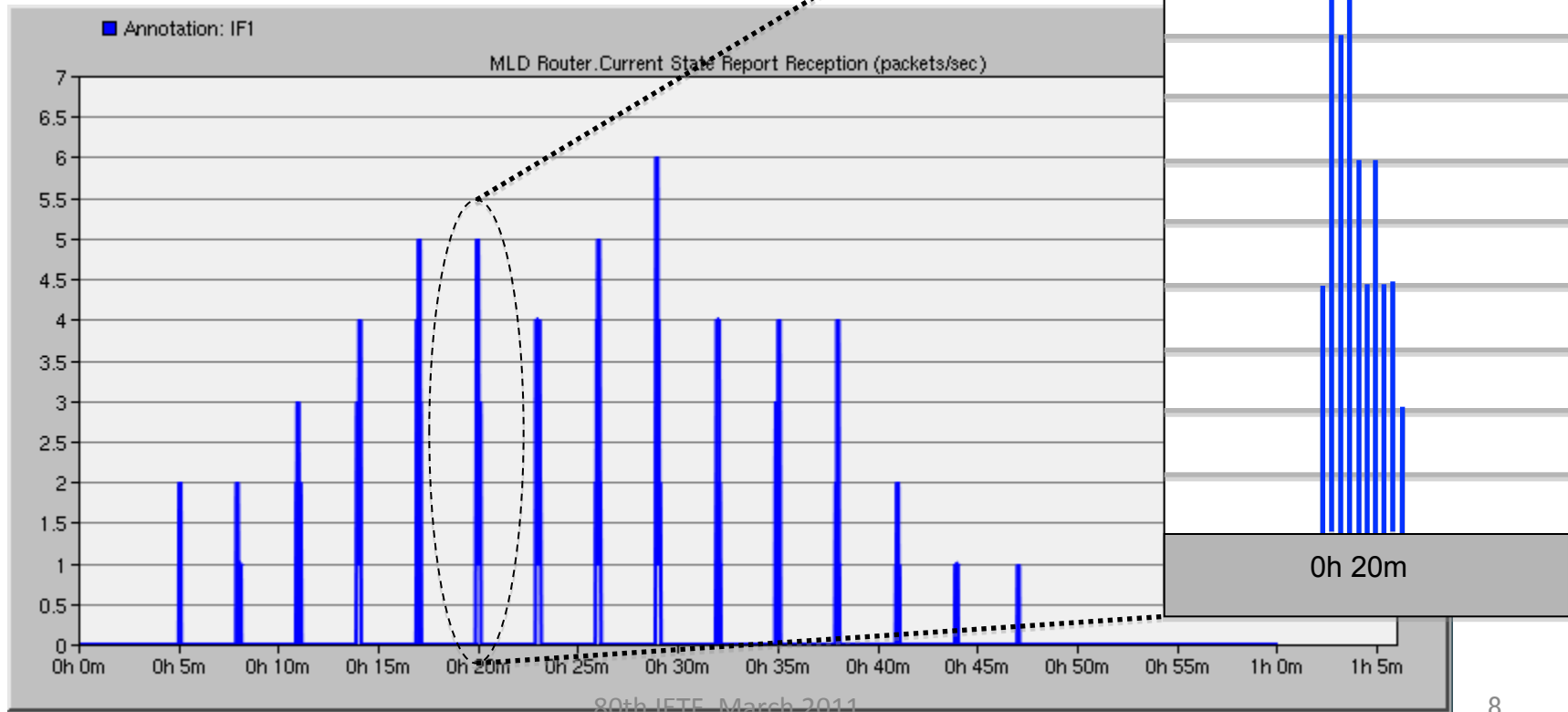
Current-State Report – Regular Case

- Responses for General Query
- Responses for Group- (and-Source) Specific Query



Current-State Report – With Explicit Tracking Function

- Responses for General Query
- No responses for Group- (and-Source) Specific Query (except for the LMQ)



Outdated State Information

- When a router expects that the State-Change Report sender was the sole member, but not the one, or when the number of receivers in the state information becomes “0”, but not “0”;
 - Other members remaining in the same channel will reply with identical Report messages
- When a router expects that there are other members, but there isn’t, or when the number of receivers in the state information is not “0”, but it is “0”;
 - The router sends periodical General Query later but does not receive the corresponding Report; it then starts the leave operation
 - Will add some intelligence (e.g., send State-Change Report when the number of remaining members is less than “5”, etc.)?
 - Maybe in the future IGMP/MLD

Objective 2: Leave Latency

- [Last Member Query Interval] (LMQI) and [Last Listener Query Interval] (LLQI)
 - The maximum time allowed before sending a responding Report
- [Last Member Query Count] (LMQC) and [Last Listener Query Count] (LLQC)
 - The number of Group-Specific Queries or Group-and-Source Specific Queries sent before the router assumes there are no local members
- [Last Member Query Time] (LMQT) and [Last Listener Query Time] (LLQT)
 - Total time the router should wait for a report, after the Querier has sent the first query

Shortening Leave Latencies

- [Last Member Query Timer (LMQT)] and [Last Listener Query Timer (LLQT)]
 - Default: $LMQI * LMQC$ (= 2 sec.)
 - Shorter value contributes to shortening leave latency
 - Example:
 - $LMQC = 1$, then $LMQT = 1$ sec.
 - Note, $LMQI$ can be shorter, e.g., 0.5 sec.
- Note
 - There is a risk that a router misses Report messages from remaining members if the router adopts small $LMQC/LLQC$
 - However the wrong expectation would be lower happened for the router enabling the explicit tracking function.

Membership State Information

- Membership state information
 - (S, G, Number of receivers, (Receiver records))
 - Receiver records
 - (IGMP/MLD Membership/Listener Report sender's addresses)
- ASM
 - “S” is with “Null”
- EXCLUDE mode (S,G) join
 - Not integrate into state information?
 - Just keep the current state without modification
 - Or integrate translated ASM join into state information?

Interoperability and Compatibility

- Not work for old IGMP/MLD
 - Because of the Report suppression mechanism
 - Tracking router keeps the current state as is
- Not work for IGMPv3/MLDv2 router changing its compatibility mode to the older version
 - The router keeps the current state as is

Next Step

- WG document?