Power consumption due to IPv6 multicast on WiFi devices

draft-desmouceaux-ipv6-mcast-wifi-power-usage

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Context

IPv6 uses multicast a lot
WiFi doesn't like multicast

IETF 89: ietf-v6ONLY SSID drained a lot of battery on WiFi devices
→ coincidence? probably not...

In this draft:

- providing some data about this issue: experimental approach + model

- discussing possible solutions

IPv6 multicast

Configuration:

ND

DHCPv6

Discovery services:

mDNS (Bonjour)

LLMNR (Windows)

...

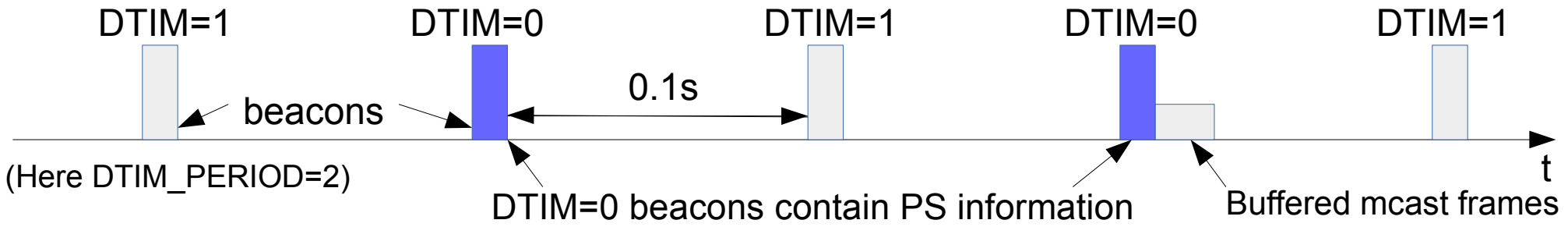
+ multicast management: MLD

Experimental measurements:

- when joining a v6 WiFi network, at least 4 mcast packets issued (RS + 3 DAD), possibly more than 20 (mDNS, MLD)

- once connected, ~0.025 pkts/device/s

Multicast and WiFi Power-Save



When receiving a beacon containing DTIM information:

DTIM mcast bit == 1 ? → device wakes up and retrieves buffered mcast frames

Multicast and WiFi Power-Save

Power measurements:

idle = 10mA; retrieving the beacon = 10mA

retrieving frames (NIC) = 40mA; retrieving frames (CPU) = 150mA

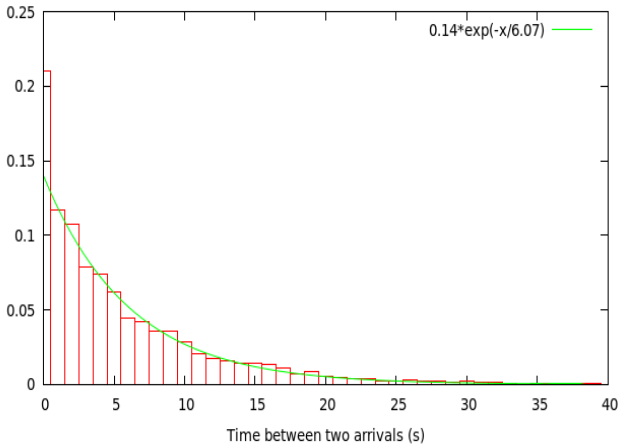
(Simple) model leads to:

K more times energy used when RATE mcast packets/s received

$K(RATE) = 1 + 1.4\ RATE$ (and $K \leq 15$)

Large-scale networks

Experimental measurements: arrivals = exponential(λ)



1/λ is small: 600 hosts → 1/λ = 6 secs

We have seen that RATE(N,λ) = 0.025N + 4λ (λ: arrival rate)

Hence multicast power multiplier K is:
K(N,λ) = 1 + 1.4RATE = 1 + 0.035N + 5.6λ

30 nodes, arrival rate 10 min → K = 2 (!)

Solutions?

L2 or L3?

L3 sends to much multicast: okay...

But L3 should work the same way whatever L2 is!

Some solutions:

L2

NIC mcast filter

Optimizing retransmissions

L3

Reducing mcast
(unicast RA, decrease timers)

Proxies (ND, mDNS)

L2/L3: MLD snooping

Questions?