New leaf node joins established network

• Node needs to find a few good parents
  – Within short time
  – With little network energy expenditure
With current RPL spec

• Node either waits for incoming DIOs
  – Long time, any router, suppression
• Or multicasts DIS to prompt for DIOs
  – All routers nearby reset their Trickle timer
  – Lots of DIOs will be sent until timers relax to long period
  – Each DIO triggers energy consumption in vicinity (multicast)
Proposal

• One flag in DIS header (L bit)

• Allow DMC option in DIS messages
Proposal

• One flag in DIS header (L bit) to mean
  – "do not reset your Trickle timer"
    • Avoids streams of DIOs
  – "reply to me with unicast DIO"
    • DIO transmitted within short time
    • Saves energy at other nodes

• Allow DMC option in DIS messages
  – "reply only if constraints are matched"
    • Targets "good" candidates
Example of use

• Solicit info from routers Max hop 1 Max LQL 3
  – *No response*
• Solicit info from routers Max hop 1 Max LQL 6
  – *No response*
• Solicit info from routers Max hop 2 Max LQL 3
  – *Response heard*
  • Solicit info from routers Max hop 2 Max LQL 6
  • Solicit info from routers Max hop 3 Max LQL 3
(TBC) Collision mitigation

• **Optional**: spread out DIO responses

  ![Figure 2: The Response Spreading option](image)

  – Uniform random time within interval $[0 .. 2^{\text{SpreadingInterval}}]$

• Not needed if application known and decent MAC
Thank you!
Appendix: nuts and bolts
DIS base object format

Figure 13: The DIS Base Object

Flags: 8-bit unused field reserved for flags. The field MUST be initialized to zero by the sender and MUST be ignored by the receiver.
8.3. DIO Transmission

... The following packets and events MUST be considered inconsistencies with respect to the Trickle timer, and cause the Trickle timer to reset:
...

- When a node receives a multicast DIS message without a Solicited Information option, unless a DIS flag restricts this behavior.

- When a node receives a multicast DIS with a Solicited Information option and the node matches all of the predicates in the Solicited Information option, unless a DIS flag restricts this behavior.

A node that receives a DIS with the "Leaf Node" bit set MUST NOT reset its DIO Trickle timer, even if it matches the options carried by the DIS.
6.2.3. DIS Options

The DIS message MAY carry valid options.

This specification allows for the DIS message to carry the following options:

0x00 Pad1
0x01 PadN
0x07 Solicited Information

In addition to those already listed in [I-D.ietf-roll-rpl], the following option is declared valid for a DIS message:

0x02 Metric Container

A node that receives a DIS with a Metric Container option MUST ignore any Metric object in it, and MUST parse the Constraint objects in it, if any. The constraint values are compared to the values of the corresponding metrics known to the node.
(TBC) Collision mitigation option

- Who wants it? Who needs it?

Figure 2: The Response Spreading option