draft-duquennoy-6tisch-asf

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Overview

- ASF: Autonomous Scheduling Function
- 1) Autonomous slotframes
  - Slots based on a hash of neighbor’s MAC address
  - Slots added/removed locally, no extra signaling
- 2) Slotframe per traffic plane
  - E.g. one for TSCH sync, one for RPL control, one for application
  - The length of each slotframe dictates per-plane capacity
New in version 01

• Based on
  • Feedback from IETF 99
  • ML discussions

• Added
  • Configuration parameters and procedure
    • Packet format to disseminate configurations (6P signal)
    • Traffic filters
    • Makes Hash function configurable (SAX remains default)
  • Burst mode (conditional cells based on ‘frame pending’ bit)
**Configuration parameters**

<table>
<thead>
<tr>
<th>Slotf. handle</th>
<th>Slotframe size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. channel offset</td>
<td>Max. channel offset</td>
<td></td>
</tr>
<tr>
<td>Tx Cell Opt</td>
<td>Rx Cell Opt</td>
<td>Nbr Set</td>
</tr>
<tr>
<td># Filters</td>
<td>Traffic filter list ...</td>
<td></td>
</tr>
</tbody>
</table>

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Figure 2: Format of the ASF SIGNAL slotframe descriptor.

- **Rendez-vous; sender-based; or receiver-based**
- **Channel offsets assigned to the slotframe**
- **SAX or something else**
- **Empty; TSCH time sources; RPL parents; RPL preferred parent; or all IPv6 neighbors**
- **Discussed next**
Traffic filters

- Role: assign traffic to different slotframes

- IEEE frame type
- Unicast/broadcast
- IP protocol (0x3a: ICMPv6, etc.)
- If ICMPv6: type+code
- If UDP or TCP: port

Figure 6: Format of the ASF SIGNAL traffic filters.
Config dissemination

• Configurations are embedded in a 6P SIGNAL IE
• The IE is included in EBs. Two cases
  • A subset of (secured) EBs include the config
    • First join, second wait for secured EB with config
  • All EBs (unsecured) include the config
    • Not sure if this opens new attack
    • Bootstrap with 6tisch minimal schedule is already unsecured
Burst mode

- Problem: in a given slotframe, ASF has only one cell per neighbor
- Solution: allocate consecutive slots on-demand

- How: IEEE 802.15.4 ‘frame pending’ bit
  - Set when more than one packet ready to Tx
  - If ACKed, then send next packet in next timeslot, same ch offset
  - Stop condition
    - Sender: when buffer empty or no-ACK
    - Receiver: when ‘frame pending’ unset or no RX
Discussion

• Technical
  • Initial dissemination in EBs: security
  • Burst mode: implementation issues?

• Integration in WG. *From interim meeting minutes:*
  • Identify components, discuss how to best integrate
  • Cutting multiple ideas into smaller docs?
  • Integration with MSF?
Backup slides

• (copied from IETF 99, just in case)
1/3: Rendez-vous slotframe

- Equivalent to 6tisch-minimal RFC 8180
- Used for rendez-vous
- E.g. RPL control, 6LoWPAN-ND, etc.

```
  Ch. offset

  RxTxSh

  Timeslot
```
2/3 Receiver-based slotframe

- Nodes have one fixed Rx cell
- Nodes have one Tx (Shared) cell for each neighbor (IPv6 nbr cache)
- E.g. use for unicast to any neighbor
3/3 Sender-based slotframe

- Nodes have one fixed Tx (Shared) cell
- Nodes have one Rx cell for each neighbor (IPv6 nbr cache)
- E.g. use for received from a privileged neighbor, e.g. TSCH time source