23 October 2015 Webex

IPv6 over the TSCH mode of IEEE 802.15.4e

Chairs:
 Pascal Thubert
 Thomas Watteyne

Etherpad for minutes:
 http://etherpad.tools.ietf.org:9000/p/6tisch?useMonospaceFont=true

Note Well

This summary is only meant to point you in the right direction, and doesn't have all the nuances. The IETF's IPR Policy is set forth in BCP 79; please read it carefully.

The brief summary:

- By participating with the IETF, you agree to follow IETF processes.
- If you are aware that a contribution of yours (something you write, say, or discuss in any IETF context) is covered by patents or patent applications, you need to disclose that fact.
- You understand that meetings might be recorded, broadcast, and publicly archived.

For further information, talk to a chair, ask an Area Director, or review the following:

- BCP 9 (on the Internet Standards Process)
- BCP 25 (on the Working Group processes)
- BCP 78 (on the IETF Trust)
- BCP 79 (on Intellectual Property Rights in the IETF)

Reminder:

Minutes are taken *
This meeting is recorded **
Presence is logged ***

* Scribe; please contribute online to the minutes at
http://etherpad.tools.ietf.org:9000/p/6tisch?useMonospaceFont=true
** Recordings and Minutes are public and may be subject to discovery in the
event of litigation.
*** From the Webex login

Agenda

- Administrivia   [3min]
  - Agenda bashing
  - Approval minutes from last meeting
- Rechartering   [10min]
  - charter text
  - work items and milestones
- new activity in the join process   [5min]
- draft-wang-6tisch-6top-sublayer   [10min]
- draft-dujovne-6tisch-6top-sf0   [10min]
- draft-thubert-6tisch-tracks   [5min]
- Preparing for IETF94 Yokohama   [10min]
  - draft agenda
  - recommended formats and slides
- AOB   [2min]

Administrivia

Admin is trivia

- Approval Agenda
- Approval minutes

Rechartering

Charter

- Latest text at https://bitbucket.org/6tisch/meetings/wiki/charter2

- Text communicated to Brian Haberman (AD)

The group will…

1. Produce "6TiSCH architecture" to describe the design of 6TiSCH networks. This document will highlight the different architectural blocks and signaling flows, including the operation of the network in the presence of multiple LBRs. The existing document will be augmented to cover dynamic scheduling and application of the DetNet work.

2. Describe the mechanisms offered by the 6top sublayer. This includes a protocol for neighbor nodes to negotiate adding/removing cells. The work on the protocol and associate packet formats could be continued at the IEEE.

3. Produce a specification for a default 6top Scheduling Function including the policy to enable distributed dynamic scheduling of time slots for IP traffic. This may include the capability for IoT routers to appropriate chunks of the matrix without starving, or interfering with other 6TiSCH nodes. This particular work will focus on IP traffic since the work on tracks is not yet advanced enough to specify their requirements for OTF operations.

4. Produce a specification for a secure 6TiSCH network bootstrap, adapted to the constraints of 6TiSCH nodes and leveraging existing art when possible.

5. Produce requirements to the detnet WG, detailing 6TiSCH chunks and tracks, and the data models to manipulate them from an external controller such as a PCE.

New activity in the join process

6tisch secure join process: the show so far

- When 6tisch started in 2013, the RPL and general 6lowpan security fields were too large to solve.

- But, as 6tisch partially grew out of the industrial requirements for RPL, there was a belief that in the far more **restrictive** industrial environment a solution could be found.

6tisch security scope

- The network has **professional management.**
- The scale of the network is large, from a diversity of vendors, with a diversity of installers
  - While installers are not outright hostile, they are not skilled in the arts of network configuration.
  - Rekeying the network after installation is important.

Simplying assumption 1: 6tisch like has a PCE

- Once one assumes external help, make the most of it.

- The PCE<->node protocol (now called 6top) will be present anyway: leverage that!

Simplying assumption 2: leverage 802.1AR work

- The "MIC" – Manufacturer Installed Certificate! – provides a way to authenticate the nodes

  - The network just needs to get the right list of valid nodes.

Challenge 1: how does the network authenticate?

- In a zero-touch system, the node needs a way to know if it has found the correct network!

- Systems are resold: not just controllers, but sometimes entire plants.

  – Situation described in which one tower in a large refinery might be sold to a competitor! Network adjancies with old network would still be possible!

Work done to date

- 2014 January to August
  - Security design team worked through many assumptions and design options.
  - A number of drafts produced outlining options:
    - draft-richardson-6tisch-idevid-cert-01
    - draft-richardson-6tisch-security-6top-05
    - draft-richardson-6tisch-security-architecture-02
    - 6tisch-security-architecture-elements-01.txt

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    - 6tisch-security-architecture-elements-01.txt

Work done to date

- Drafts that were reviewed include:
  - draft-pritikin-bootstrapping-keyinfrastructures-00
  - draft-kelsey-intarea-mesh-link-establishment-05
  - draft-piro-6tisch-security-issues-02

Results so far

- Input to the terminology draft:
  - JCE, JA
- 6top objects to manage security
- There was a **lengthy** and *repetitive* discussion about K1, K2 in the minimal work.
  - Much dispute whether K1 is necessary, sufficient.
  - Concern that 802.15.4 (pre-2015) can not actually specify reception of encrypted and cleartext (joining packet) at the same time.

Future Work

From point of view of mcr:

- IETF ANIMA WG will take lead (MCR hasn't time/resources to work on both)

- Zigbee IP specification has EAP-TLS + PANA

    - Seems there is little enthusiam for this solution.

        - (why didn't Thread Group use it?)

- Thread Group specification uses DTLS with some extensions for proxying between JCE and JA.

    - This is very close to some proposed design
      team proposal

Suggestions

- Determine why/if Thread Group solution won't work.

  – Propose changes if necessary.

- Maybe it just works: adopt it.

draft-wang-6tisch-6top-sublayer-03

Qin Wang (Ed.)

Xavi Vilajosana

Status

- Version **- 03**

- Published on 21/10/2015

- Available at:
  https://datatracker.ietf.org/doc/draft-wang-6tisch-6top-sublayer

Goals

- Define the 6top cell negotiation protocol (6P)
- Introduce the use of an scheduling policy, referred as Scheduling Function (SF)
  - Which uses 6P to install/remove cells
  - The SF is out of the scope but indications and recommendations are given.
- Basic Cell usage monitoring
- Require the use of IEEE Information Element Space.
  - Request GroupID
  - Define sub-IEs for the different 6top

New in v.03

- Added COUNT, LIST, CLEAR operations
- Renamed from OF to SF
- Added abort transaction procedure.
- Added recommended structure for SF Spec.
- Added Appendix to define the IETF IE.
- Added IANA commands and ERR Codes.
- Minor editorial corrections and typos.
- Added terms for the terminology draft

The IETF IE

The IETF IE is a IEEE802.15.4 Payload Information Element with the **Group ID set to IANA_6TOP_IE_GROUP_ID**. The value of IANA_6TOP_IE_GROUP_ID is defined by the IEEE, communicated to the IETF, and noted by IANA. The format of the IETF IE is exactly the   **same** as the **format** of an **MLME Information Element,** as specified in [IEEE802154e], Section 5.2.4.5. **The difference** is that the space of **Sub-IDs is managed by the IETF/IANA**.

IEEE Liaison Considerations

If the specification described in this document is supported by the   6TiSCH WG, the authors of this document ask the 6TiSCH WG chairs to liaise with the IEEE to request a Payload Information Element Group   ID to be assigned to the IETF (Group ID IANA_6TOP_IE_GROUP_ID described in Appendix A).

draft-dujovne-6tisch-6top-sf0-00

Diego Dujovne, Luigi Alfredo Grieco,
Maria Rita Partattella, Nicola Accettura

Status

Goal:

Define the Scheduling Function for the 6top sublayer, called Scheduling Function Zero, SF0.

Background/History:

On the Fly Scheduling (draft-dujovne-6tisch-on-the-fly-06)

Next:

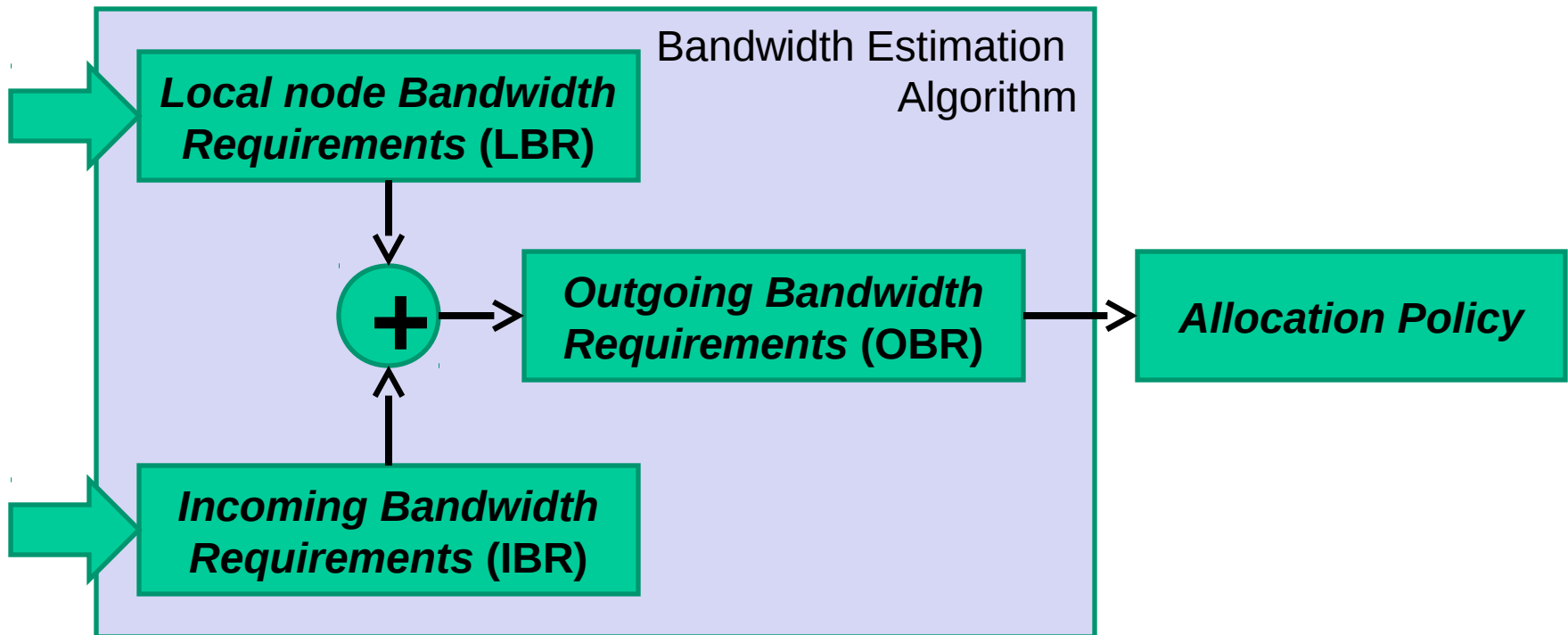TODO

Rules for Adding/Deleting Cells

3 steps procedure

Monitor traffic per node (locally generated, and/or incoming from neighbors)

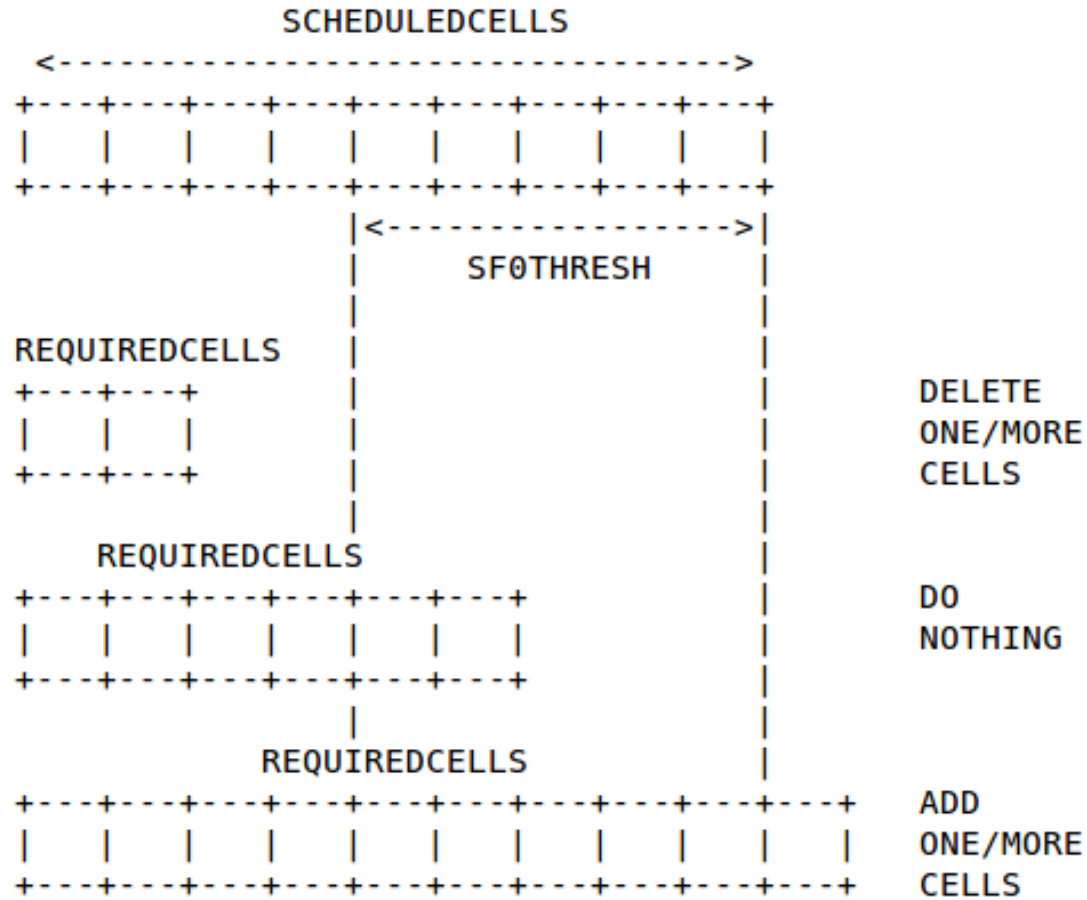**Estimate** the required bandwidth for that node, based on traffic/network condition

Determine the # of cells to add/delete based on the allocation policy

SF0 Bandwidth Estimation Algorithm

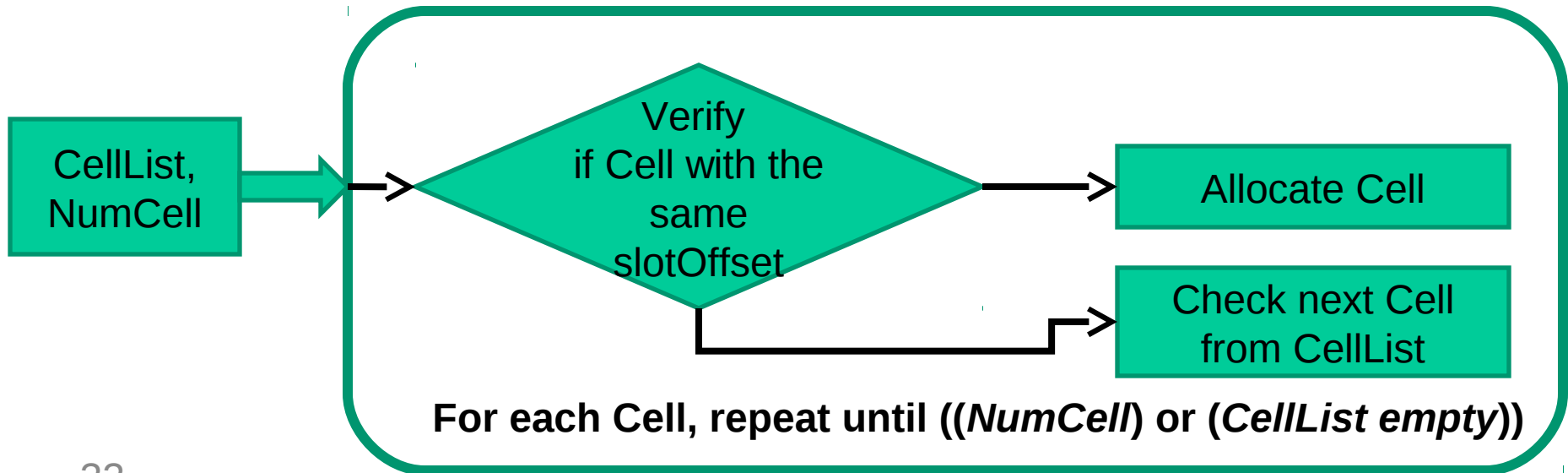Requirements-based algorithm:

SF0 Allocation Policy

CellList Rules

Transaction Source Node

| Select slotOffset Randomly | → | Verify slotOffset Free | → | Choose channelOffset Randomly |

For each Cell, repeat until *NumCell*

Transaction Destination Node

CellList, NumCell → Verify if Cell with the same slotOffset → Allocate Cell

→ Check next Cell from CellList

For each Cell, repeat until ((*NumCell*) or (*CellList empty*))

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Boot and Relocation

Node behavior at boot: At startup, issues a **CLEAR** command; the *Source Node* asks the *Destination Node* to **delete all** the **previously allocated cells** to that neighbour.

Cell Relocation:

Uses PDR statistics, changes slotOffset and/or channelOffset.

Relocates when ***one or more cells*** have PDR ***lower than average***.

6P Error Handling

RC_SUCCESS:

(number of cells in CellList)=NumCells in 6P **ALL** request -> Operation **OK**.

(number of cells in CellList)<NumCells in 6P **ALL** request -> Not all cells allocated.

Node MAY retry immediately with a **different CellList** or build **new random CellList**.

6P Error Handling

RC_ERR_VER, RC_ERR_6OFID :

Node MUST NOT retry immediately

MAY add neighbour node on a blacklist

MAY retry to cantact neighbour later

RC_ERR_NORESOURCES:

Wait for Timeout and **restart scheduling process**

RC_ERR_BUSY:

Issue a Reset command.

IANA, Timeout

Ask IANA for SF Function Identifier:

  IANA_SFID_SF0

6P Timeout value:

  Maximum number of TSCH link-layer retries.

  Timeout=(2^(macMaxBE+1)-2^macMinBE) * SM

TODO

Meaning of the **container** field

Examples of **error handling**

Security considerations

Typos…

draft-thubert-6tisch-tracks

Recharter Item

5. "Produce requirements to the detnet WG, detailing 6TiSCH chunks and tracks, and the data models to manipulate them from an external controller such as a PCE."

⇒ draft-thubert-6tisch-4detnet

⇒ Now merged into draft-grossman-detnet-use-cases

Need for work on tracks

Refine and agree upon the 4detnet wok

Prepare for third Phase

   ? Including support of PCE-based tracks

   ? Including use of DetNet work

   ? Including soft tracks

Proposed work on Tracks

Initial try:

- Requirements (from ChongGang's draft)

- Architecture text (offloading Archie)

- Operations

  - Control and management (PCE, RSVP?)

  - Tagging and Forwarding

  - ARQ and Multipath Redundancy (PRP)

  - Hard vs. Soft tracks, dynamics

Unpublished work in BitBucket

https://bitbucket.org/pthubert/6tisch-tracks/src/master/draft-thubert-6tisch-tracks-00.txt

Preparing for IETF94 Yokohama

Agenda Yokohama

```
Meeting        :    IETF94 Thursday, November 5, 2015 (JST)
Time           :    15:20-17:20 JST Thursday Afternoon session II (2h)
Location       :    Room 303, Pacifico Yokohama, Yokohama, Japan
Chairs         :    Pascal Thubert <pthubert@cisco.com>
                    Thomas Watteyne <watteyne@eecs.berkeley.edu>
Responsible AD :    Brian Haberman
URLs           :    http://tools.ietf.org/wg/6tisch/
                    https://datatracker.ietf.org/wg/6tisch/
                    https://www.ietf.org/mailman/listinfo/6tisch
                    https://bitbucket.org/6tisch
```

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Intro and Status                              [5min]  (Chairs)

   Note-Well, Blue Sheets, Scribes, Agenda Bashing

New Charter                                   [25min] (Chairs)
   * Status Document
   * New Charter
   * Milestones
   * Action Plan

Dynamic Scheduling
   * <draft-wang-6tisch-6top-sublayer-03>        [20min] ()
   * <draft-dujovne-6tisch-6top-sf0-00>          [20min] ()

Tracks in 6TiSCH
   * <draft-thubert-6tisch-tracks-00>            [20min] ()

Any Other Business
   * Announcement second ETSI 6TiSCH Plugtests   [10min] (Miguel Angel Reina Ortega)
```

Slides for Yokohama

- Templates at https://bitbucket.org/6tisch/meetings/src/master/151105_ietf94_yokohama/
- Send slides to <u>both</u> Thomas & Pascal by **Tuesday 3 November midnight JST**

AOB ?

Thank you!