

# draft-ietf-6tisch-msf-02

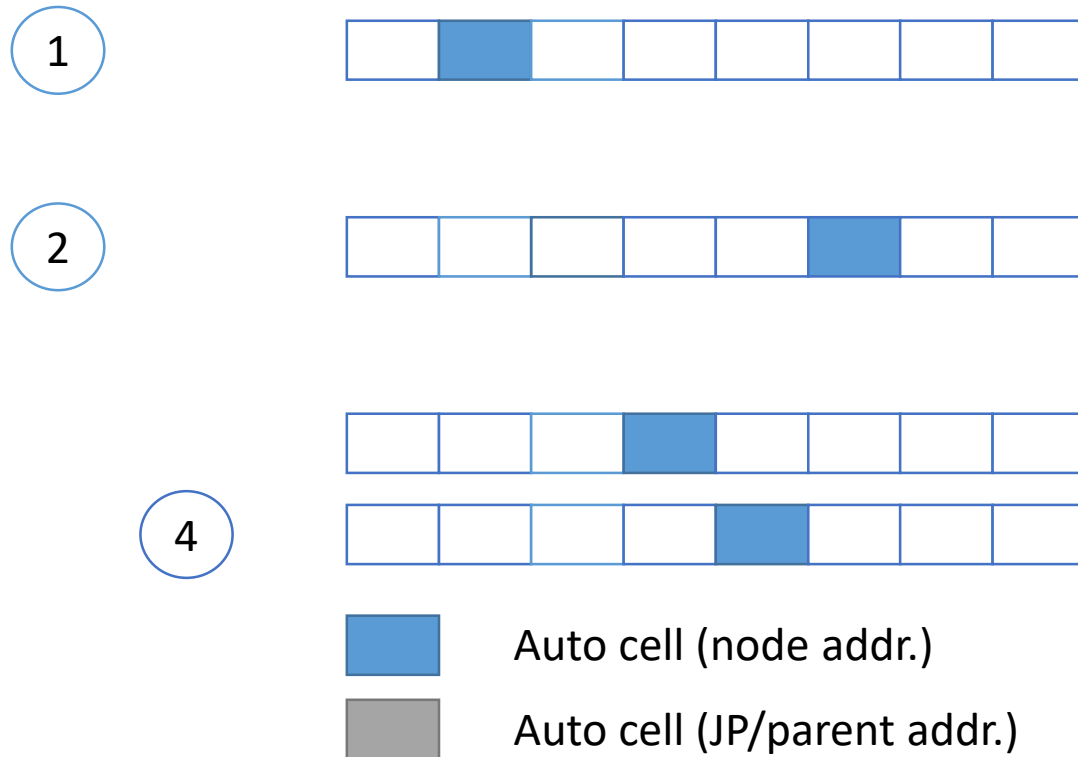
Malisa Vucinic,  
Xavier Vilajosana,  
Simon Duquennoy,  
Diego Dujovne,  
Tengfei Chang

# Agenda

- Update msf-02
  - Using SHARED and non-SHARED autonomous cells
  - Resolve the pending issues in msf-01 version
  - Revised the specification overall
- Evaluation
  - OpenTestBed
  - Experimentation

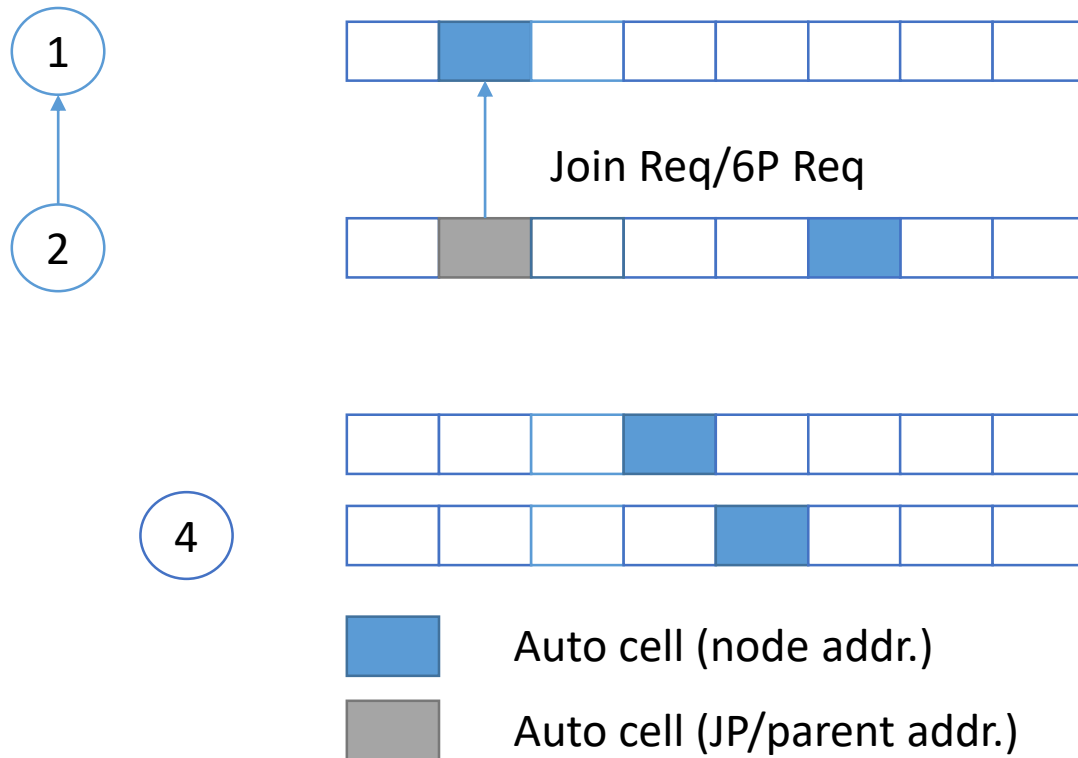
# Update msf-02

- Usage of Auto(nomous) Cells
  - Install Auto Cell (node addr.)



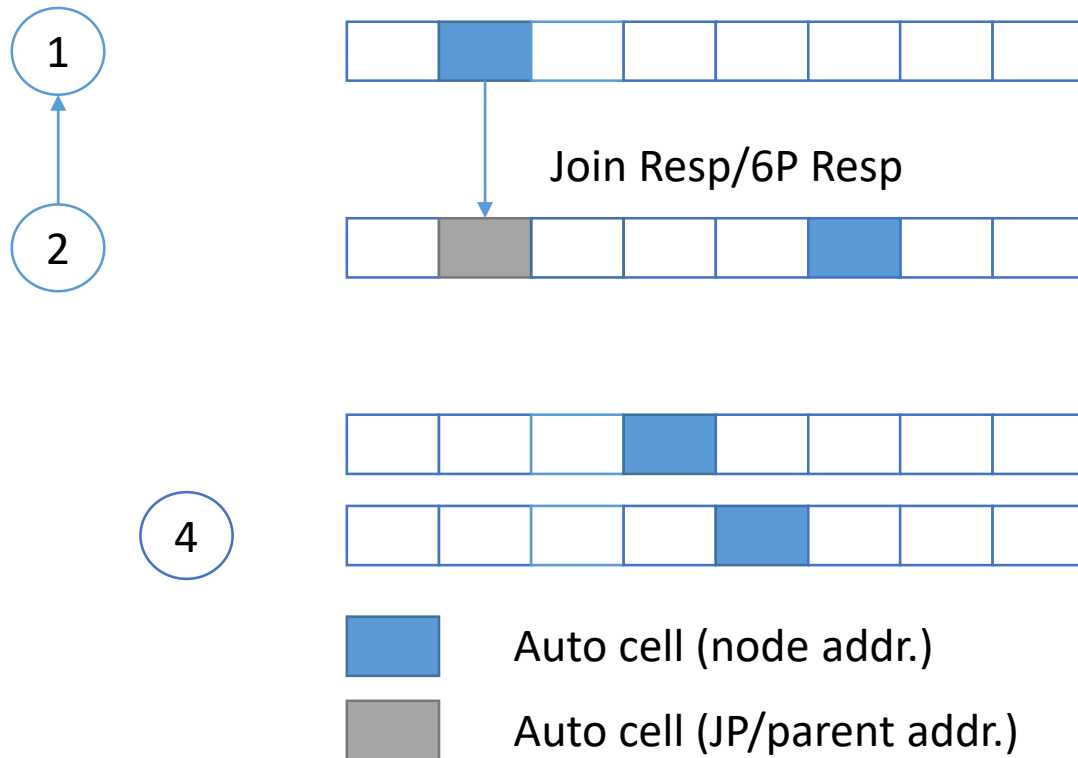
# Update msf-02

- Usage of Auto(nomous) Cells
  - Install Auto Cell (node addr.)
  - Install Auto Cell (JP/parent addr.)



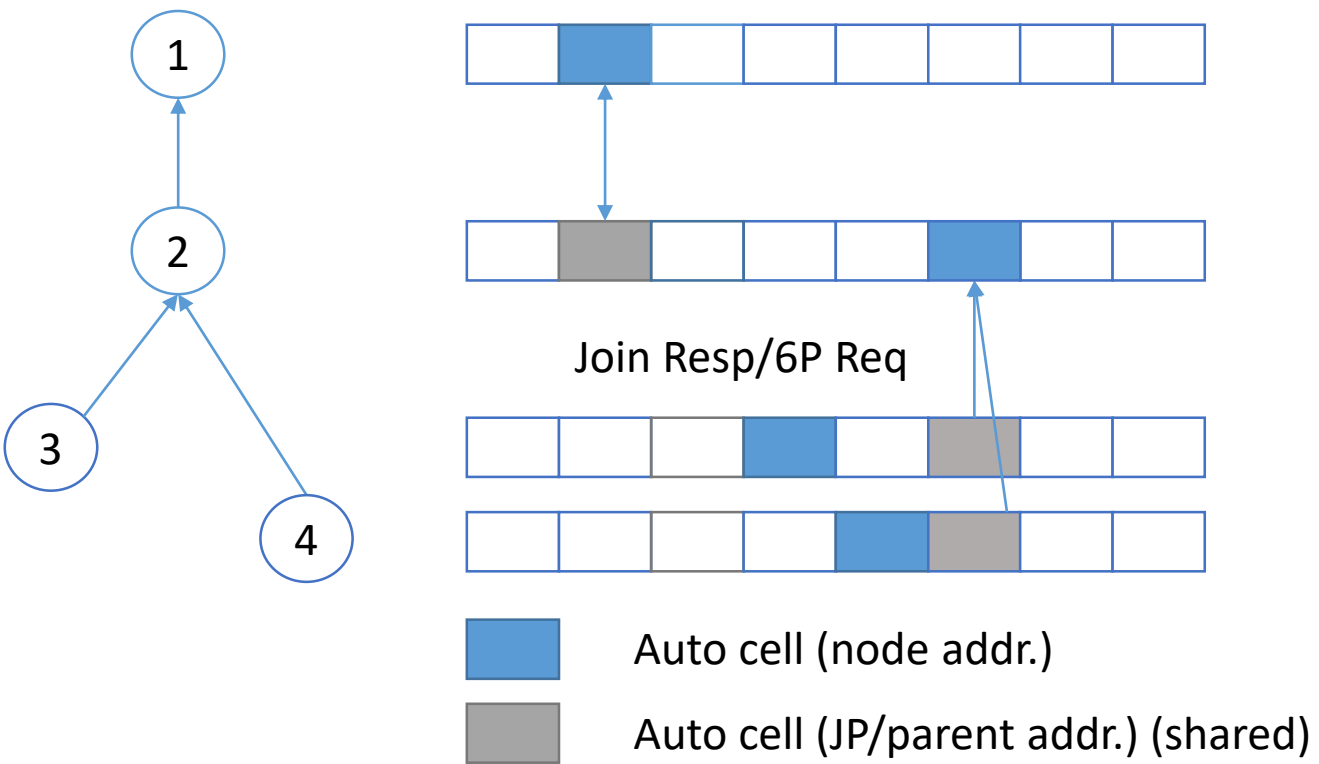
# Update msf-02

- Usage of Auto(nomous) Cells
  - Install Auto Cell (node addr.)
  - Install Auto Cell (JP/parent addr.)



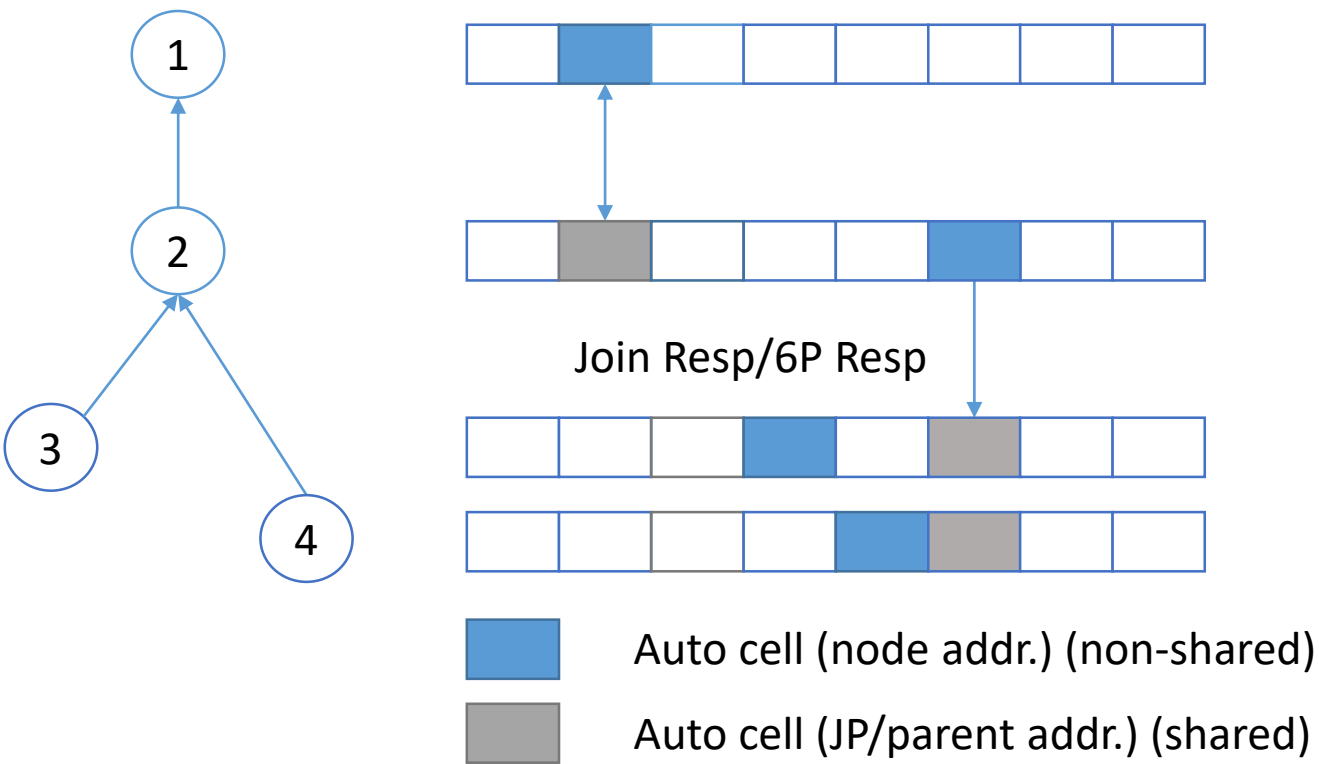
# Update msf-02

- Usage of Auto(nomous) Cells
  - Install Auto Cell (node addr.)
  - Install Auto Cell (JP/parent addr.)
    - Shared, contention with siblings



# Update msf-02

- Usage of Auto(nomous) Cells
  - Install Auto Cell (node addr.)
    - Non-Shared
  - Install Auto Cell (JP/parent addr.)
    - Shared, contention with siblings



# Update msf-02

- Pending Issues Resolved
  - Security issue on autonomous cell installation
  - NumCellsElapsed shouldn't update on shared dedicated cell
  - Parameters for SAX is missing
  - 6P Timeout calculation is wrong
  - Separate Cell Counters for TX and RX
  - non-trusted packet shouldn't be accounted for for adapting traffic
  - Two slotframes
  - Wrong end state statement
  - Dependency on RFC8180 shouldn't be a MUST
  - DIO can be unicast packet as indicated in RFC6550
  - Create a list of packets that be able to be sent on minimal cell
  - Wrong statement in Step 4
  - Rephrase NumCellsPassed to NumCellsElapsed
  - Clarify term 'dedicated cell'
  - text is missing
- To Be Discussed
  - Handling the case when bandwidth allocation exceeds available capacity
  - Adapting 6P Timeout
  - Rules for broadcast frames is out of scope of MSF

For more information about the issues on mailing list:  
[https://mailarchive.ietf.org/arch/msg/6tisch/w68mMZFumm\\_b9RRHrEKg2zB-2Cg](https://mailarchive.ietf.org/arch/msg/6tisch/w68mMZFumm_b9RRHrEKg2zB-2Cg)



# Comments on version 02

- Security issue on neighbor cache during joining process
- non-trusted packet shouldn't be accounted for adapting
- EB/DIO transmission rules is implementation-specific optimization
- unclear how to implement "Trickle timer with rate-limiting"
- SAX hash function parameter configuration
- Definition of two type of autonomous cells
- 6P TIMEOUT calculation
- The usage of frame pending bit

# Evaluation

- Experimentation
  - OpenWSN
    - Latest Release: REL-1.24.0
      - Implementation of MSF-02
      - Increase the robustness of code


<https://openwsn.atlassian.net/wiki/spaces/OW/pages/376799234/Implementation+of+MSF-02>

<https://github.com/openwsn-berkeley/openwsn-fw/releases/tag/REL-1.24.0>

OpenWSN / ... / JIRA reports   1 Jira link

   [Share](#) 

## Implementation of MSF-02

 Created by Tengfei Chang  
35 minutes ago

Date	Mar 15, 2019
Issues	32 issues

### Summary

The main changes are implementing the autonomous shared and non-shared cells which is defined in MSF-02. As well lots of bugs are fixed from the sprint.

### Highlights

The changes are deployed on 40 nodes on OpenTestbed and tested for 24 hours with >95% end-to-end reliability of DAO packets.

### All updates

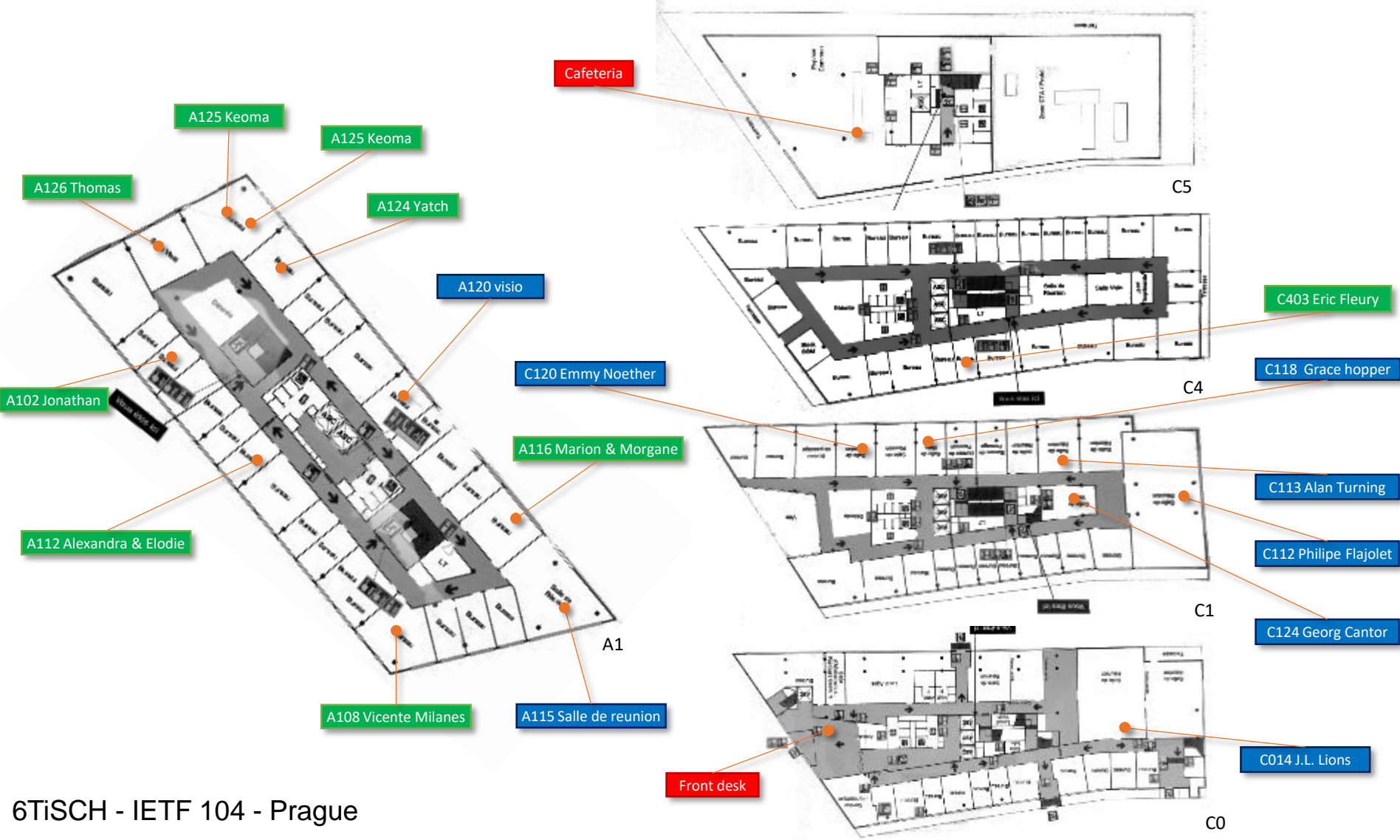
#### Improvement

- FW-814 CLOSED Add traffic control for applications.
- FW-800 CLOSED All the tasks pushed by OpenTimer are using the same priority which is not easy to see by which layer the task is created.
- FW-798 CLOSED Add configuration file support to scon options
- FW-797 CLOSED Update the hash collisions handling process according to MSF-02
- FW-796 CLOSED Update the keep-alive mechanism according to MSF-02 draft
- FW-795 CLOSED Update the installation of autonomous cell according to MSF-02
- FW-794 OPEN Update the 6P TIMEOUT calculation according to MSF draft v02
- FW-793 OPEN Update hash function of MSF according to version 02
- FW-789 CLOSED Enable OSCORE encryption during join

#### Bug

- FW-817 CLOSED no free queue buffer error occurs on a mote with 5 6P packet in queue.
- FW-816 RESOLVED Don't remove neighbor marked as parent when cleaning old neighbors
- FW-813 CLOSED Scheduler task overflow on dagroot when running a 40 nodes network
- FW-812 CLOSED RPL needs a thread to change the I2 destination address for IPv6 packet, in case of parent changes.
- FW-811 CLOSED Autonomous cell is not installed after parent is selected.
- FW-810 CLOSED Node keeps de-synchronized when using probability broadcast strategy.
- FW-809 CLOSED MSF-01 6PCLEAR vanishes also autonomous cells
- FW-805 CLOSED Critical error ERR\_FREEING\_ERROR happened, which caused reboot at opencoap
- FW-804 CLOSED error message "unknown error 73 " is printed out, which is known actually
- FW-803 CLOSED Cancel the join request retransmission timer only when the node joined.
- FW-802 CLOSED Default join priority should be 0xff to the neighbor whose EB haven't received
- FW-801 CLOSED If 6P CLEAR response failed to send out, clear its managed cells as well.
- FW-799 CLOSED Join Request re-transmission should check synchronization before sent.
- FW-775 CLOSED 6PCLEAR fails in case of schedule inconsistency due to parent switch

# Evaluation



# Experimental Result

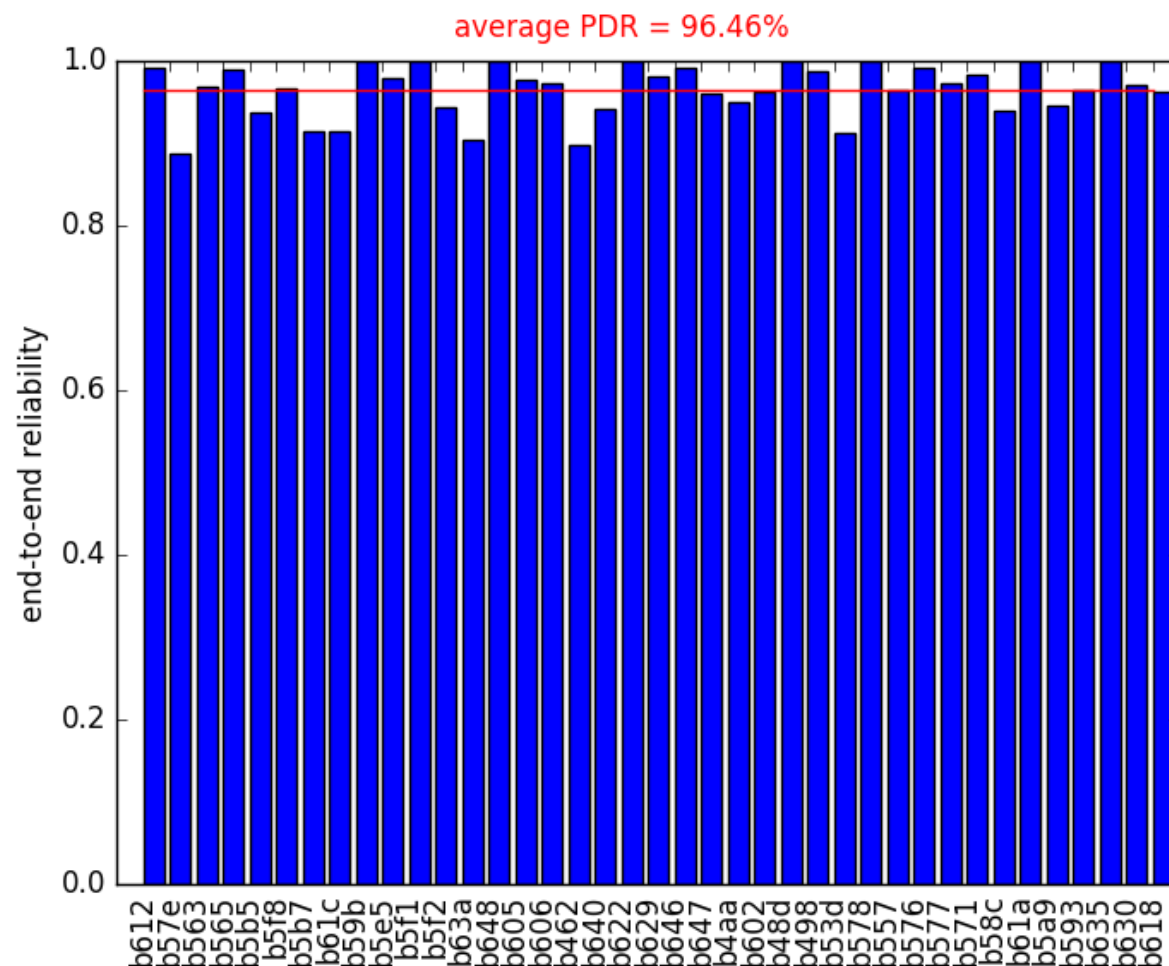
- End-to-End Reliability

- Configuration

- NUMTRIES: 3
    - 40 nodes
    - Traffic load on each node:
      - 1 packet/minute

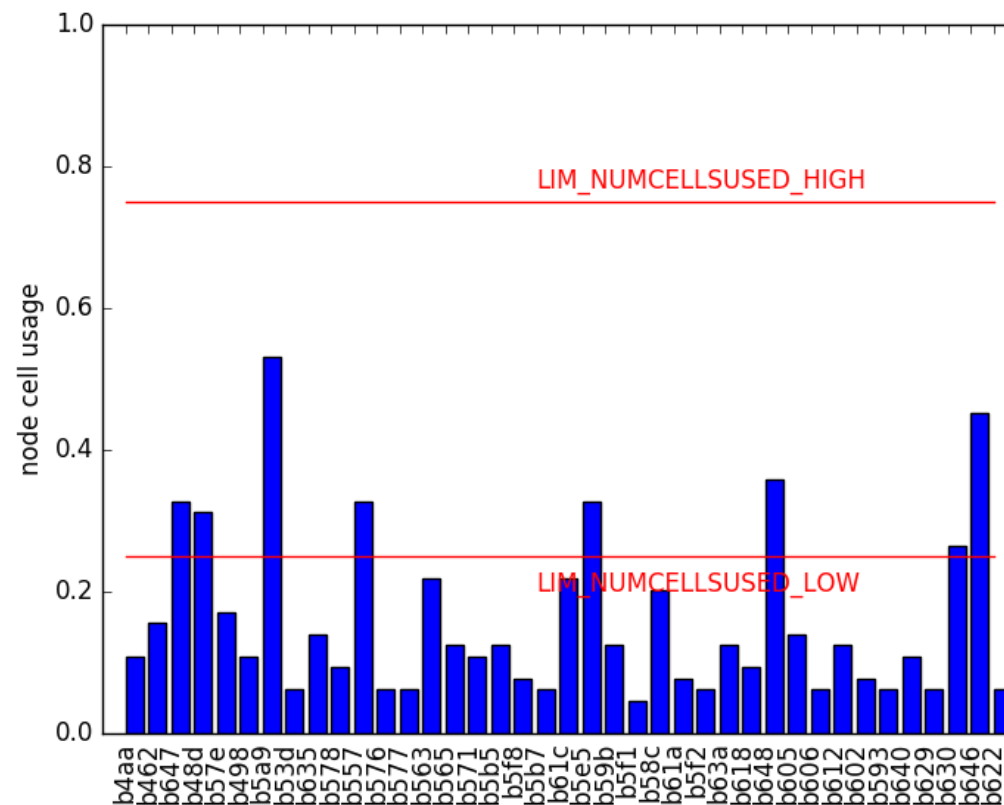
- Average: 96.46%

- Experiment in Office building during working hours
    - Total 4157 packets sent within 2 hours



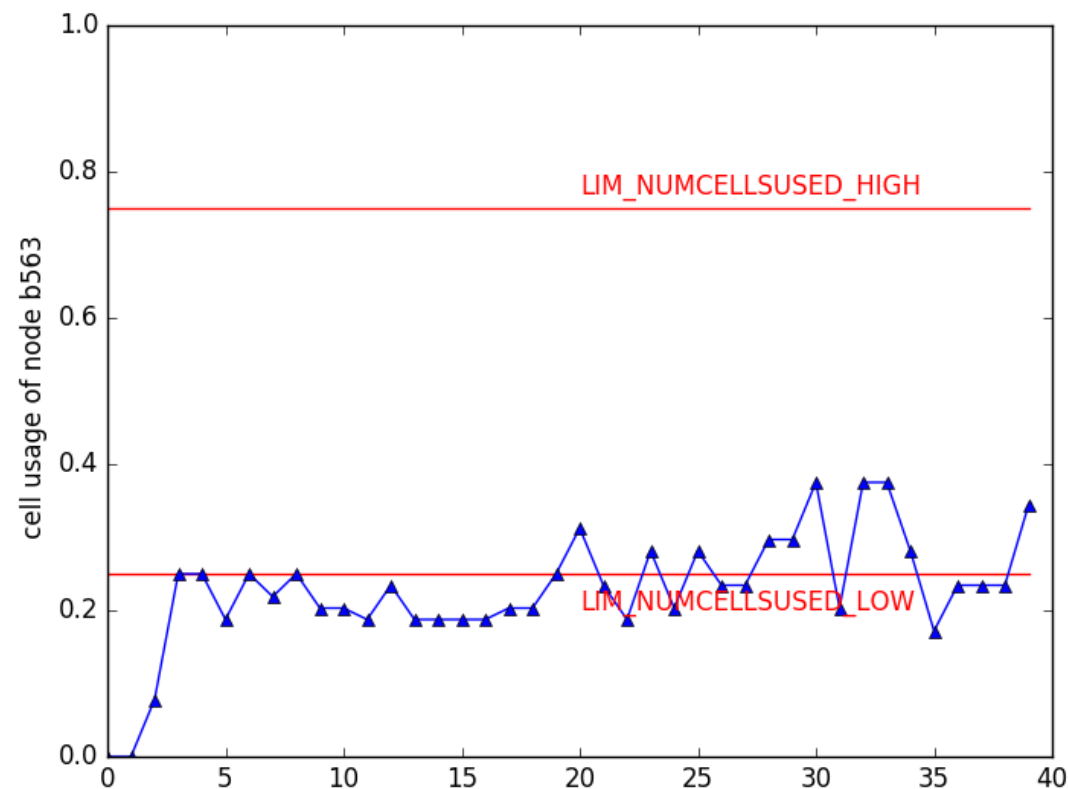
# Experimental Result

- Average Cell Usage
  - Computed every 64 Tx Cells
    - LIM\_NUMCELLSUSED\_HIGH 75%
    - LIM\_NUMCELLSUSED\_LOW 25%



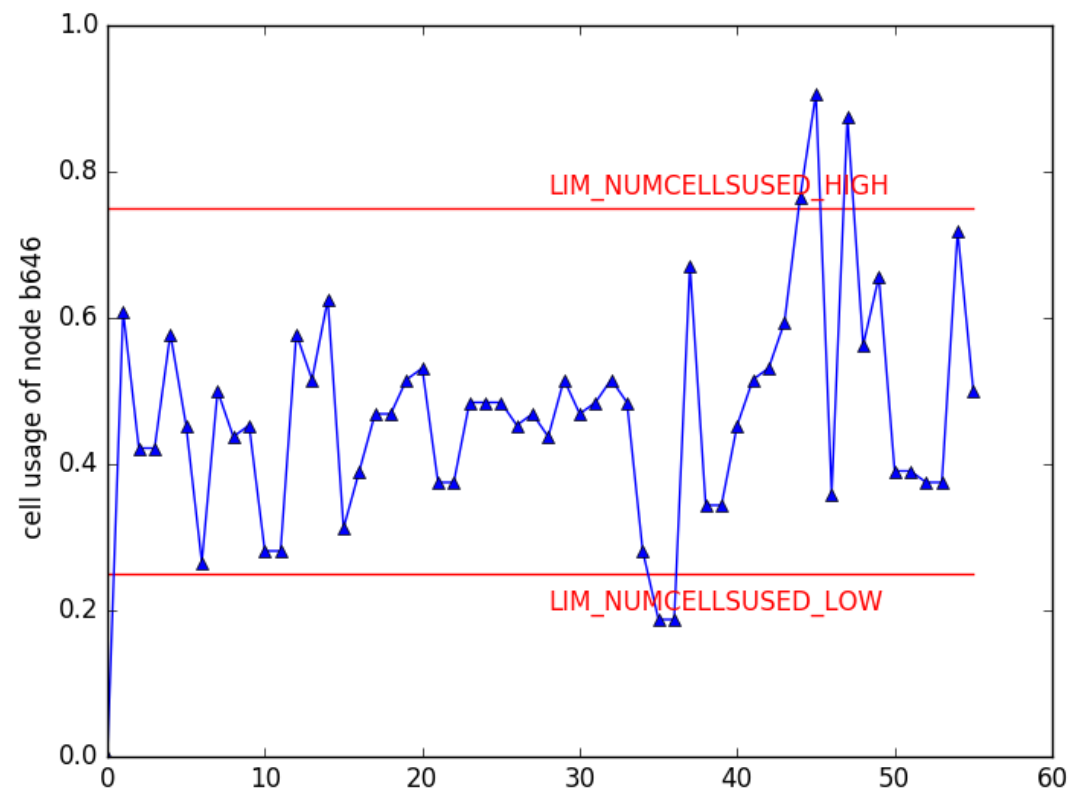
# Experimental Result

- Average Cell Usage
  - Computed every 64 Tx Cells
    - LIM\_NUMCELLSUSED\_HIGH 75%
    - LIM\_NUMCELLSUSED\_HIGH 25%
  - Node b563
    - Low cell Usage



# Experimental Result

- Average Cell Usage
  - Computed every 64 Tx Cells
    - LIM\_NUMCELLSUSED\_HIGH 75%
    - LIM\_NUMCELLSUSED\_HIGH 25%
  - Node b563
    - Low cell Usage
  - Node b646
    - High cell Usage



# Call for adoption

- The frame work of MSF draft is stable
- Evaluated in experimentation
- Next?