



<https://goo.gl/LKBqPJ>

petulant-moo

Pre-determined TDMA scheduling.

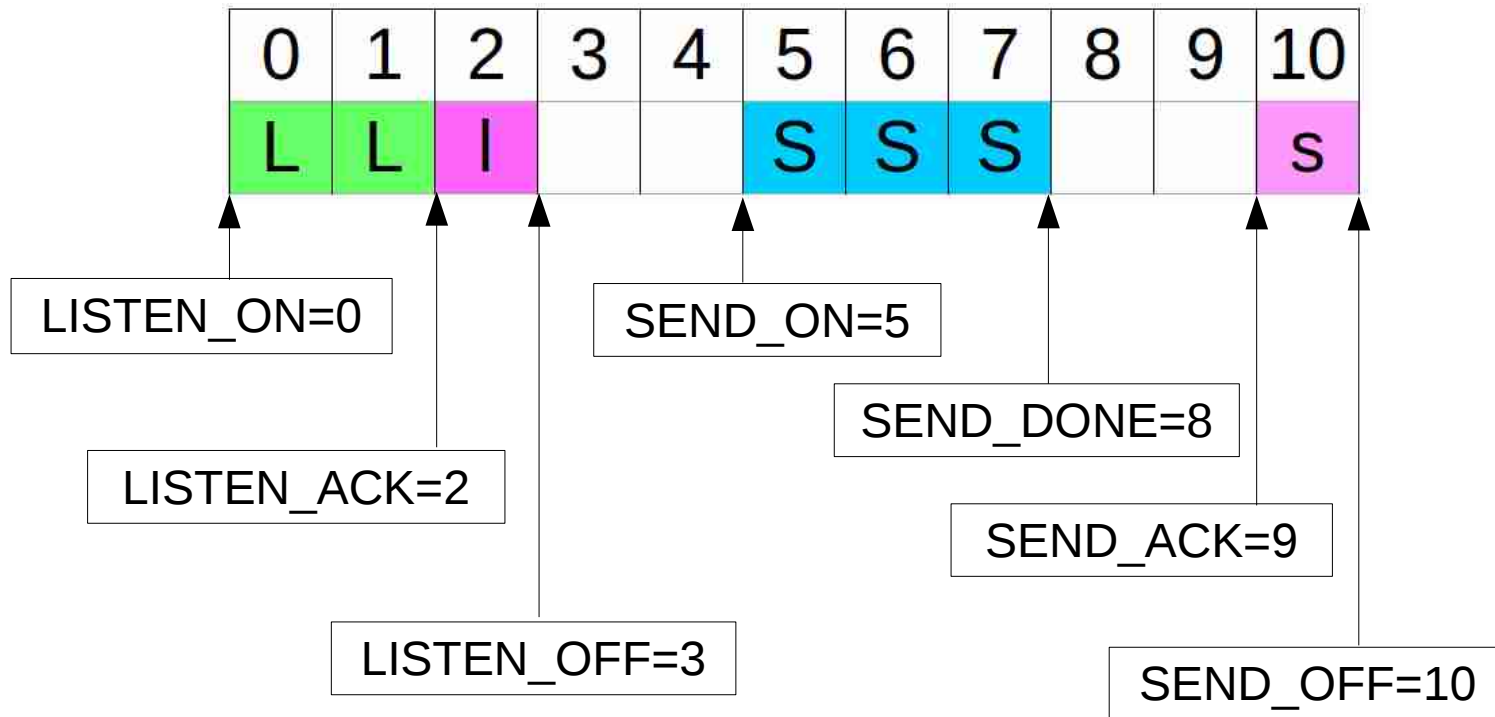
An efficient multihop routing algorithm for low power high data yield in static topologies.



<https://github.com/gubser/petulant-moo>

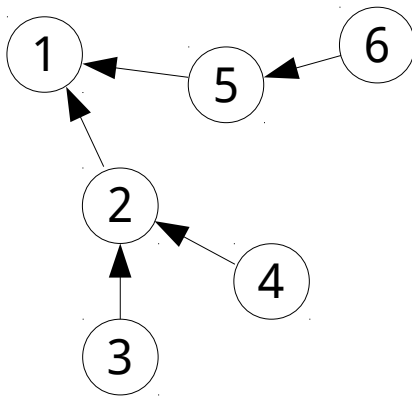
Scheduler

- Idea: Low duty cycle with pre-determined TDMA.
- State machine on every node executing its given schedule:



Scheduler

- Schedule for each node pre-computed based on selected topology:



Python script:

```

mote2 = M(2, [M(3), M(4)])
mote5 = M(5, [M(6)])
sink = M(1, [mote2, mote5])

```

```
sink.calculate()
```

→ C code output

	t	0	1	2	3	4	5	6	7	8	9	10
node 3		S		s								
node 4			S	s								
node 2		L	L	I			S	S	S			s
node 6					S	s						
node 5					L	I				S	S	s
node 1							L	L	L	L	L	I

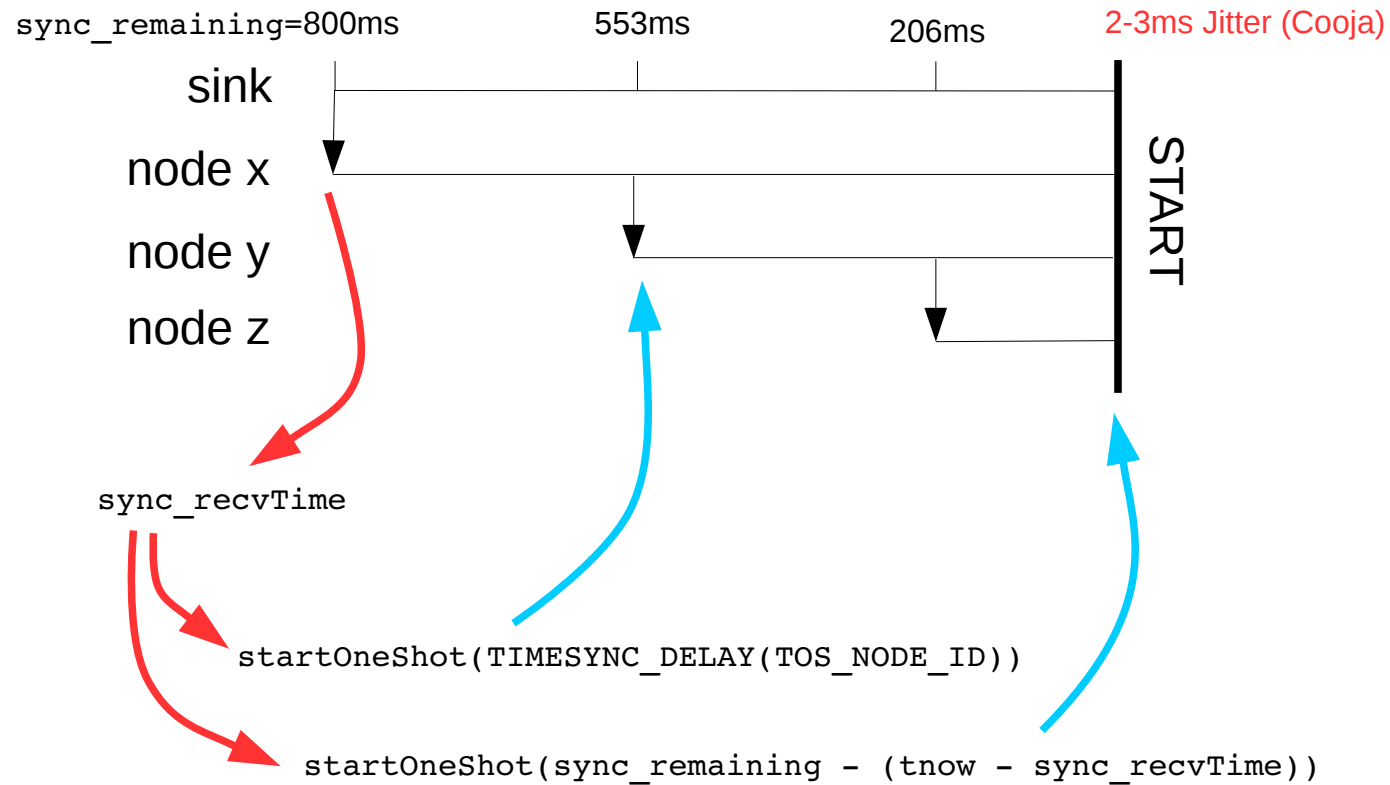


Legend

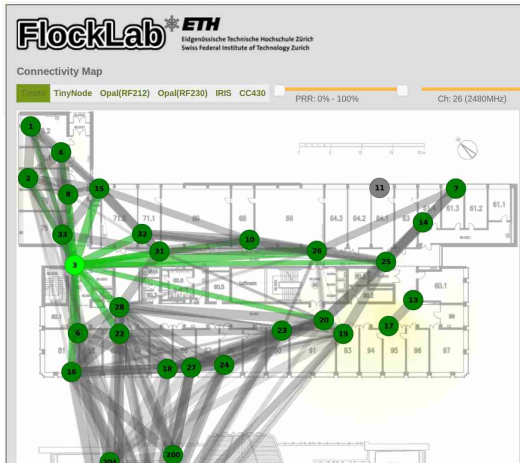
L	Listen	S	Send
I	Send ACK	s	Recv ACK

Connectivity

CC2420TimeSyncMessageC



Connectivity

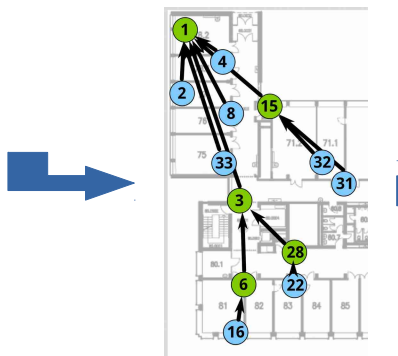


- Low current consumption thanks to scheduler.
- But not full data yield. How is the connectivity?

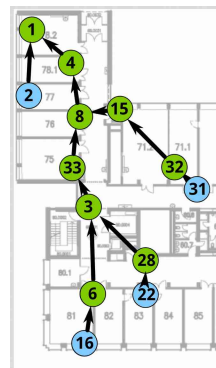
➡ Topology improvement by:

- connectivity map
- test runs

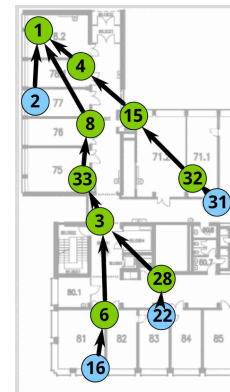
Example 10Pkt/s:



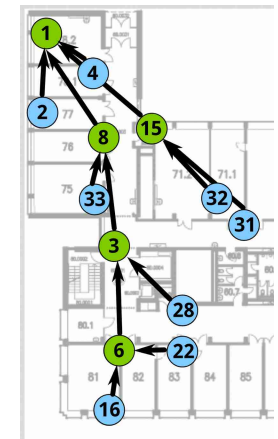
DY: 72.69%
I_avg: 0.55mA (0.98)
KPI: 85%



DY: 87.65%
I_avg: 0.87mA (0.97)
KPI: 92%



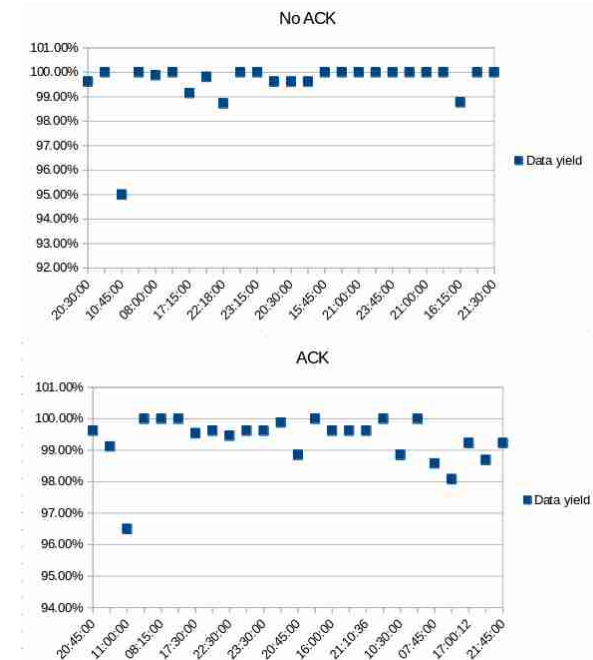
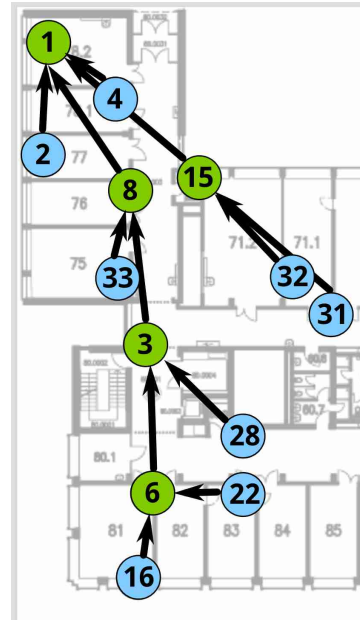
DY: 100.00%
I_avg: 0.76mA (0.97)
KPI: 98%



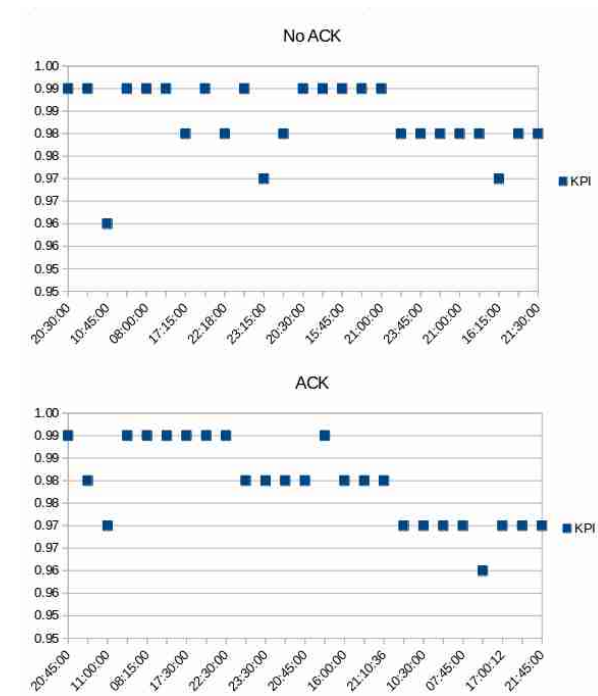
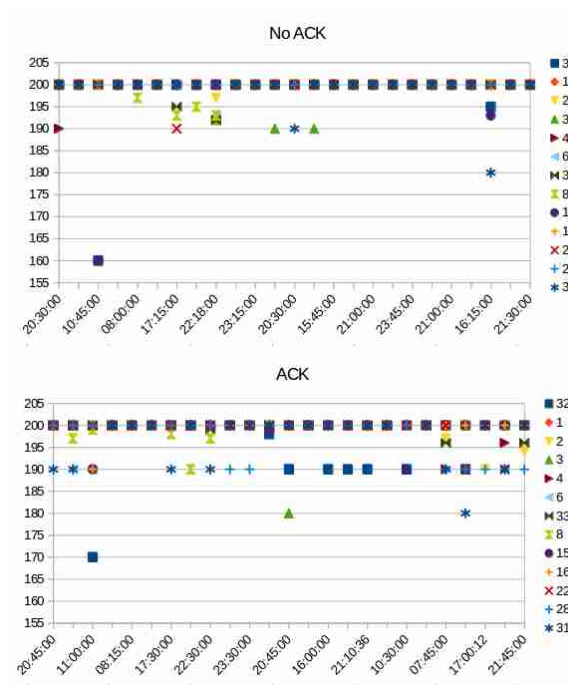
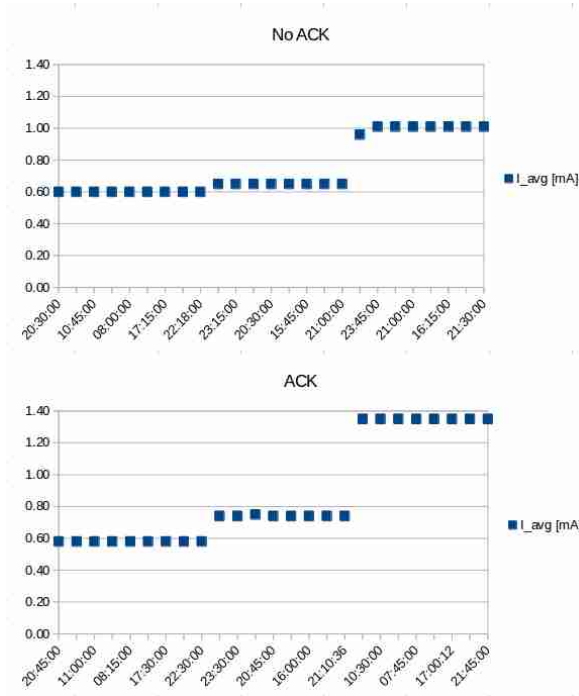
DY: 99.62%
I_avg: 0.61mA (0.98)
KPI: 99%

(Simple) ACK

- Can ACK improve the results?
Can better data yield compensate worse power performance?
- Idea: Is any data received?
 - Yes: Clear sent packets in buffer
 - No: Keep packets in buffer
- Problem:
 - Jitter: TDMA not working properly
 - More packets losses in good environment



Results



- 50 test runs from 2nd December to 5th December

NO ACK:

Data yield: 99.59%

I_{avg} : 0.75mA

KPI: 98%

ACK:

Data yield: 99.33%

I_{avg} : 0.88mA

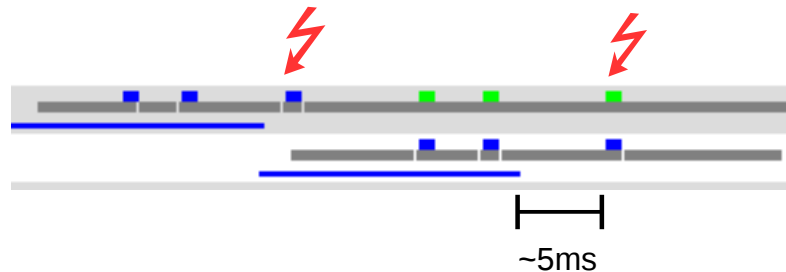
KPI: 98%

Challenges

- Reduce number of packets by bundling 10 data packets into one:

```
typedef nx_struct group_bulk_msg {  
    nx_am_addr_t source;  
    nx_uint8_t seq_no;  
    nx_uint16_t data[BULK_SIZE];  
} group_bulk_msg_t;
```

- CC2420 TinyOS implementation not suitable for TDMA. **Jitter** → **Packet Loss**
“Volunteers are needed to redo this architecture [...] to build other types of channel sharing mechanisms (i.e. TDMA).” [1]
- Due to very short channel occupancy, we are lucky most of the time.



[1] http://tinyos.stanford.edu/tinyos-wiki/index.php/CC2420_Layer_Descriptions

Challenges

- Intensively testing

FlockLab ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Create New Test

Please correct the following errors:

- Line 78: element data: Validation of image data failed. Check if elements on and platform are set correctly and if element contains correct data.
- Number of errors: 1. It is possible that there are more errors which could not be detected due to dependencies from above listed errors.

Upload XML test configuration:

XML File: No file selected.

Mini Calendar

December 2015

Mon Tue Wed Thu Fri Sat Sun

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Navigation

FlockLab ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Manage Tests for Felix Adamczyk

ID	Title	Description	Status	Start	End	Actions
24545	petulant-moo: Felix	mote6 = M(6, [M(...		2015-12-04 21:00:00 +01:00	2015-12-04 21:05:00 +01:00	
24544	petulant-moo: Felix	mote6 = M(6, [M(...		2015-12-04 20:45:00 +01:00	2015-12-04 20:50:00 +01:00	
24543	petulant-moo: Felix	mote6 = M(6, [M(...		2015-12-04 20:30:00 +01:00	2015-12-04 20:35:00 +01:00	
24518	petulant-moo: Felix	mote6 = M(6, [M(...				
24517	petulant-moo: Felix	mote6 = M(6, [M(...				
24516	petulant-moo: Felix	mote6 = M(6, [M(...		2015-12-04 10:45:00 +01:00		
24506	petulant-moo: Felix	mote6 = M(6, [M(...		2015-12-04 02:45:00 +01:00	2015-12-04 02:52:47 +01:00	

Mini Calendar

December 2015

Mon Tue Wed Thu Fri Sat Sun

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Navigation

Betreff: [FlockLab Dispatcher] Test 24488 aborted as requested
[FlockLab Dispatcher] Error notification
[FlockLab] Results for Test ID 24466
[FlockLab Dispatcher] Test 24487 aborted as requested
[FlockLab Dispatcher] Test 24466 stopped as planned
[FlockLab Dispatcher] Error notification

Von FlockLab <flocklab@tik.ee.ethz.ch>

Betreff: [FlockLab Dispatcher] Error notification

An Mich <felixad@ee.ethz.ch>

The test with ID 24488 could not be started as planned because of the following errors:

- * Could not set node ID 1 for target image 12420
- * Could not set node ID 2 for target image 12420
- * Could not set node ID 3 for target image 12420
- * Could not set node ID 4 for target image 12420
- * Could not set node ID 6 for target image 12420
- * Could not set node ID 8 for target image 12420
- * Could not set node ID 15 for target image 12420
- * Could not set node ID 16 for target image 12420
- * Could not set node ID 22 for target image 12420
- * Could not set node ID 28 for target image 12420
- * Could not set node ID 31 for target image 12420
- * Could not set node ID 32 for target image 12420
- * Could not set node ID 33 for target image 12420