

DONE

(github.com/fsantanna/tinyos-exps)

Evaluation

- Trickle
- Drip
- CTP Routing
- CC2420 Receive

Tokens / ROM / RAM

LINES	nesC - impl		Céu		Céu/nesC	
	lines	tokens	lines	tokens	lines	tokens
Trickle	140	477	58	155	0.41	0.32
Drip	90	303	92	248	1.02	0.82
Ctp RT	133	383	115	310	0.86	0.81
CC recv	192	590	146	456	0.76	0.77
MEM	nesC		Céu		Céu/nesC	
	ROM	RAM	ROM	RAM	ROM	RAM
Trickle 4	3894	114	5128	236	1.32	2.07
Drip 2	13296	415	14360	525	1.08	1.27
Ctp RT	27712	3281	29726	3329	1.07	1.01
CC recv	12062	379	12426	387	1.03	1.02

Performance

- CC2420 driver uses interrupts (async events)
 - (with fine grained atomic sections)
- Async execution breaks Céu assumptions
- But...
 - "premature optimization is the root of all evil"
 - "scheduling is easy when the resource is almost always idle" (vs RTOS)

Performance

```
async event void InterruptFIFOP.fired () {  
    atomic {  
        ceu_go_event(IN_CC_RECV_FIFOP, NULL);  
    }  
}
```

```
async event void RXFIFO.readDone (...) {  
    atomic {  
        cc_recv_readdone_t t = { rx_buf, rx_len, error };  
        ceu_go_event(IN_CC_RECV_READDONE, &t);  
    }  
}
```

Performance

- A mote receives 800 x 20-bytes messages
- While performing two periodic activities
- nesC
 - receives and activities preempt each other
 - maximum concurrency
- Céu
 - receives and activities run to completion

Performance

- Parameters:
 - receive rate: 100ms
 - act-1 rate: 75ms for 1ms (1k instr ?)
 - act-2 rate: 180ms for 3ms (3k instr ?)
- nesC
 - messages = 800
 - act-1 + act-2 = 1140
- Céu
 - the same

Performance

- Parameters:
 - receive rate: 100ms
 - act-1 rate: 45ms for 1ms
 - act-2 rate: 90ms for 3ms
- nesC
 - messages = 800
 - act-1 + act-2 = 1297
- Céu
 - messages = 800
 - act-1 + act-2 = 1294 (-0.3%)

Performance

- Parameters:
 - receive rate: 50ms
 - act-1 rate: 45ms for 1ms
 - act-2 rate: 90ms for 3ms
- nesC
 - messages = 766
 - act-1 + act-2 = 2244
- Céu
 - messages = 751 (-2.0%)
 - act-1 + act-2 = 2239 (-0.3%)

References

- Safety
 - Efficient Memory Safety for TinyOS
- Languages
 - **Protothreads: Simplifying Event-Driven ...**
 - Virgil: Objects on the Head of a Pin
 - Threads2Events: An Automatic Code ...
- General
 - Experiences from a Decade of TinyOS Dev.

TODO

- Enumerate Céu features used on each example
- Rewrite (simpler) static analysis
 - safety
 - improve ROM
- More porting
 - rewrite SRP (exploring OO)
- More references
- Paper outline

Schedule

- 40 days left for SENSYS deadline
 - 6th April
- Next 7 days
 - rewrite the static analysis
 - rewrite SRP
 - enumerate Céu features
- 13-15th March SAAB-Brazil (Stockolm)
 - need to write a poster