

WE PREDICT A RIOT
lessons learned on developing software for riot

Background



- PhD student at RheinMain University of Applied Sciences
- Member of Distributed Systems Group (DOPSY) at RheinMain
- Lecturer on Embedded Systems and Real Time Operating Systems
- Middleware Enthusiast, Model-Driven Software Development

- Current RIOT Project: sDDS for RIOT



- Lead Embedded Software Engineer at SWIE
- Former Technical Lead at mesh:ine
- Alumni of Distributed Systems Group (DOPSY) at RheinMain
- PhD student at Humboldt-Universität zu Berlin

- Current RIOT Projects: Thesis, MQTT-SN, and CC2650 support

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Agenda

- Motivation
- Community/Platforms/Documentation
- API
- Future Work and Outlook

Motivation

How to start a RIOT project?

1. Let's do a project in RIOT
2. Talk to the community and see if somebody is already doing it
3. What's the reference platform?
“nah, just kidding. what do we have in our lab and is on the supported platforms list?”
4. Let's do this!



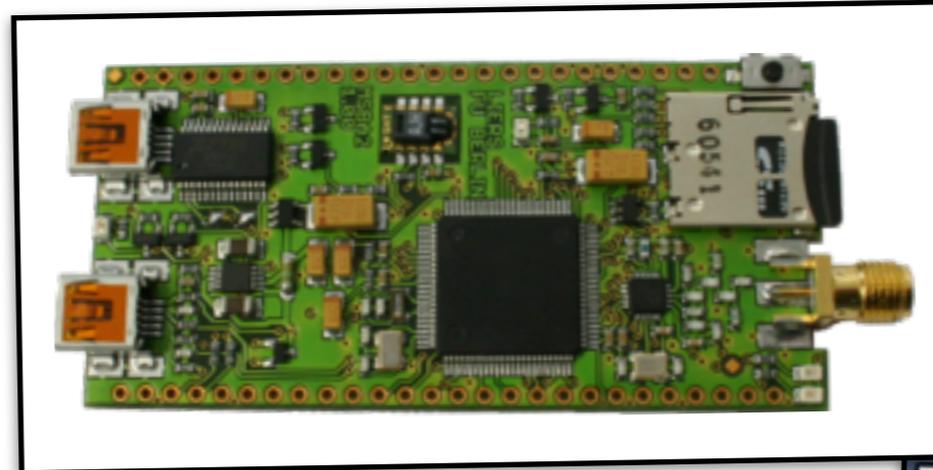
Community/Platform/Documentation

Community

- RIOT has probably one of the best OSS communities
 - if you don't believe us, take a look on LKML or systemd
- people on {devel,user} mailing list are super helpful
- big shout-out to Oleg Hahm for his continuing support and taking our questions patiently
- so know your maintainer, or even better - **become one**

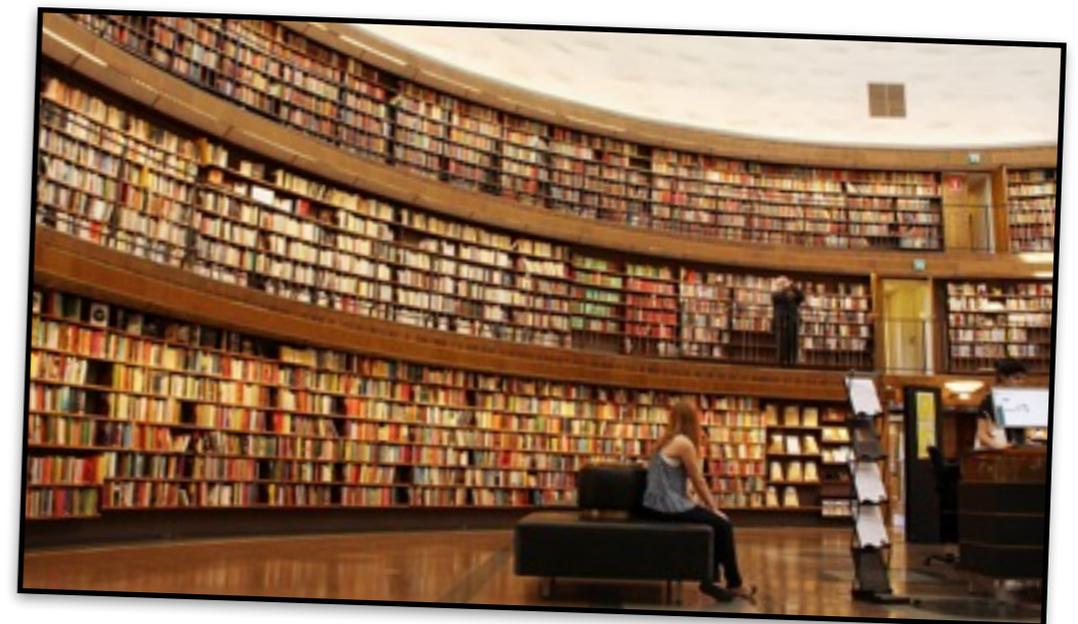
Supported Platforms

- extensive list of supported devices
- what “supported” means subject to interpretation
- spark core ist “supported”, but wifi is not
- devices which used to be supported, might not be supported nowadays
- list with supported RF options, WIP, and ‘highly unlikely” would be great



Documentation

- documentation on an operating system level is quite good
- but mostly it is RTFC (read the fine code)
- overview of the API for app developers would be nice
- last resort: shell (application) code, unit tests



API

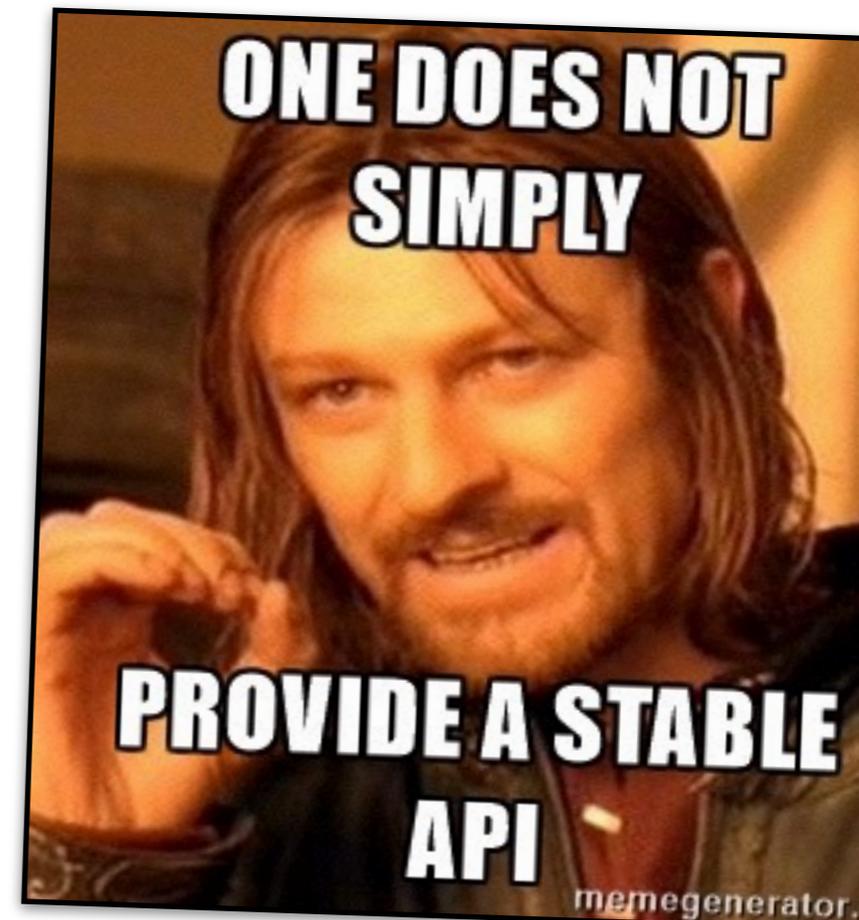
API

- started to work on routing algorithm (thesis related)
- just on a side note:
“working at a startup and trying to finish your PhD thesis is like riding a rollercoaster and eating soup at the same time”
- reading a lot of Lotte Steenbrinks AODV2 implementation
- find the concept of a forward information base (FIB) still a bit irritating
- introduction of GNRC (new network stack)



API (cont.)

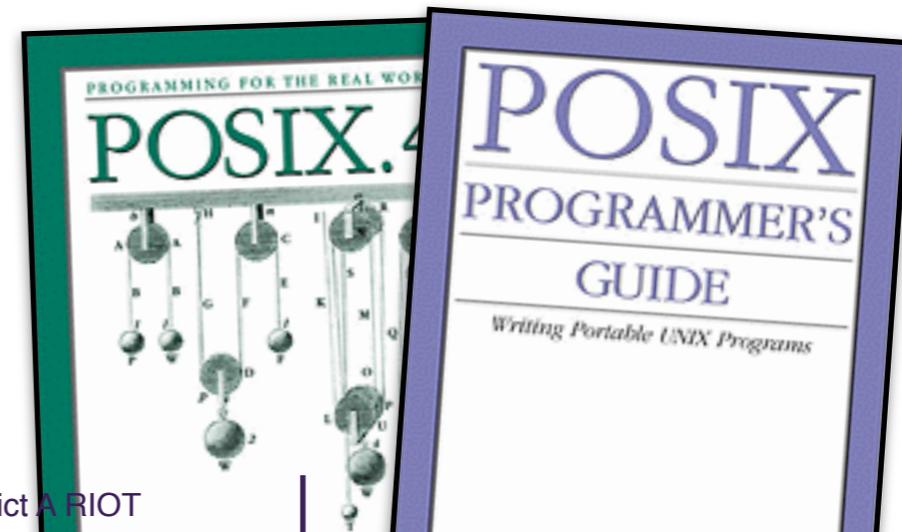
- started to work on mqtt-sn client
- straight forward to implement from specification
- again work hits pretty hard on it
- somebody decides to introduce a new timer API
- lesson learned: be fast and/or patient, expect the unexpected



API (cont.)

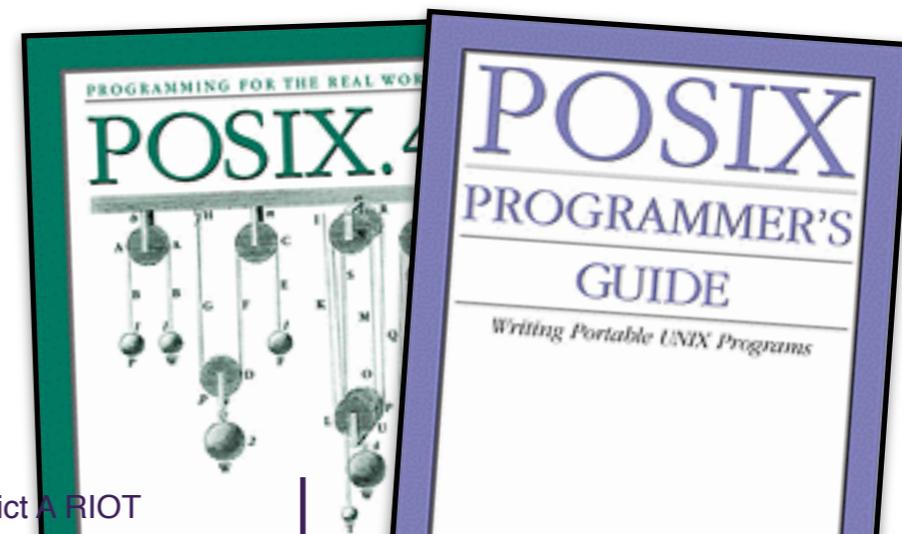
“Partial POSIX compliance. Towards full POSIX compliance”

- C99 should be a somehow a common standard, but it isn't
- no “containers” in RIOT, so everybody does it on his own or uses `ut{hash,list}`
- “static” vs. “dynamic” initialization



API - Example `utlist`

- `LL_SEARCH(head, elt, like, cmp);`
- “... in other words, the same convention that is used by `strcmp` ..”
- end up storing IPv6 addresses quite often, but:
 - `bool ipv6_addr_equal(const ipv6_addr_t *a, const ipv6_addr_t *b);`
 - `int strcmp(const char *s1, const char *s2);`



Future Work/Summary

Sorry to interrupt, but this is important. Windows 10 free upgrade offer ends July 29.

Microsoft recommends upgrading to Windows 10—the most secure Windows ever built. The upgrade is free and you can easily roll-back to your current operating system within 31 days if you decide Windows 10 is not right for you. We'll check for compatibility before starting the upgrade. Over 300 million people have upgraded. Upgrade your PC before the offer ends!

[Notify me three more times](#)

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Over The Air Updates



Security

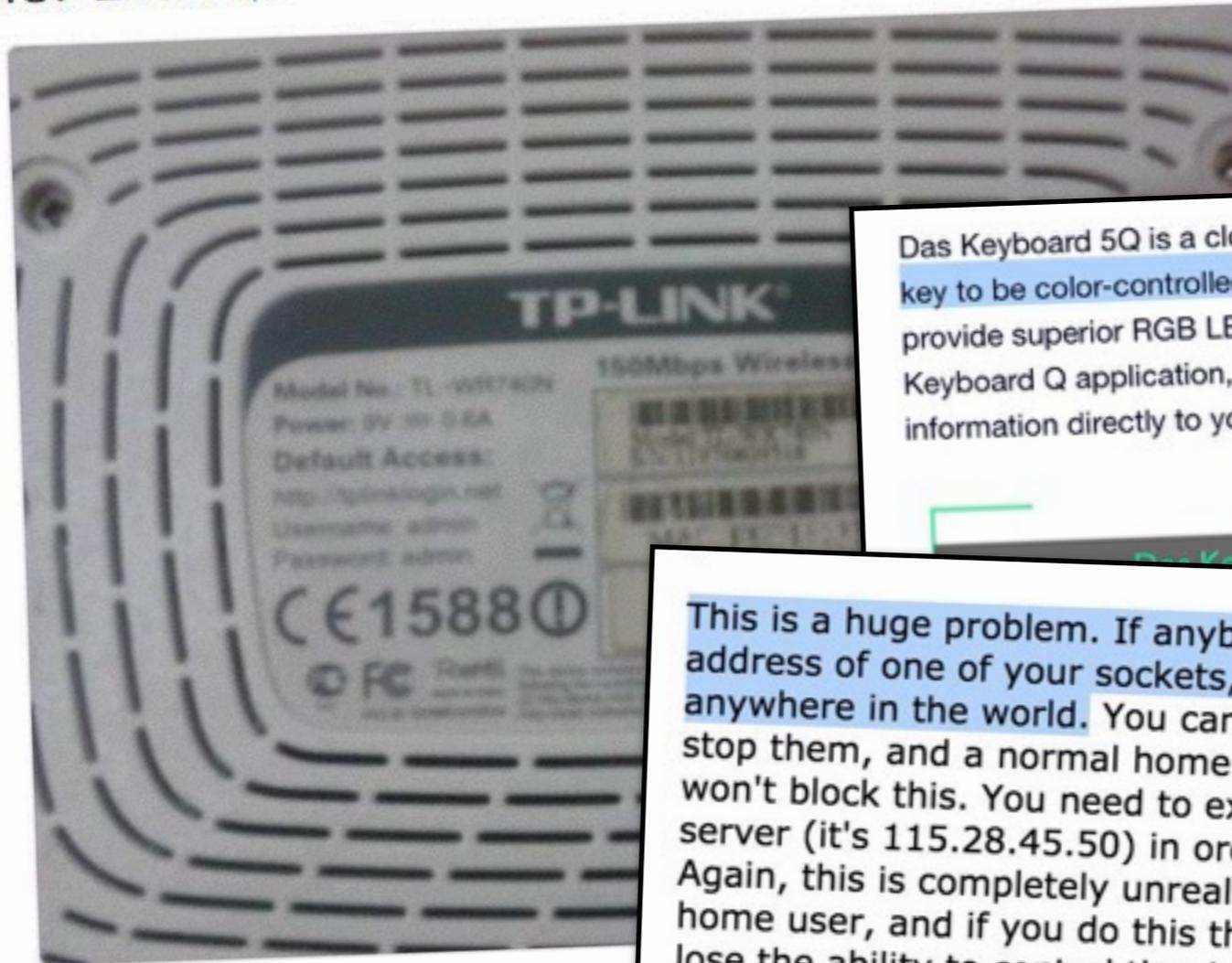


Amitay Dan @popshark1 · Jul 1

TP-Link forgot to buy the domain

tplinklogin.net

Exploit can be made, the domain is for sell for 2.5m\$

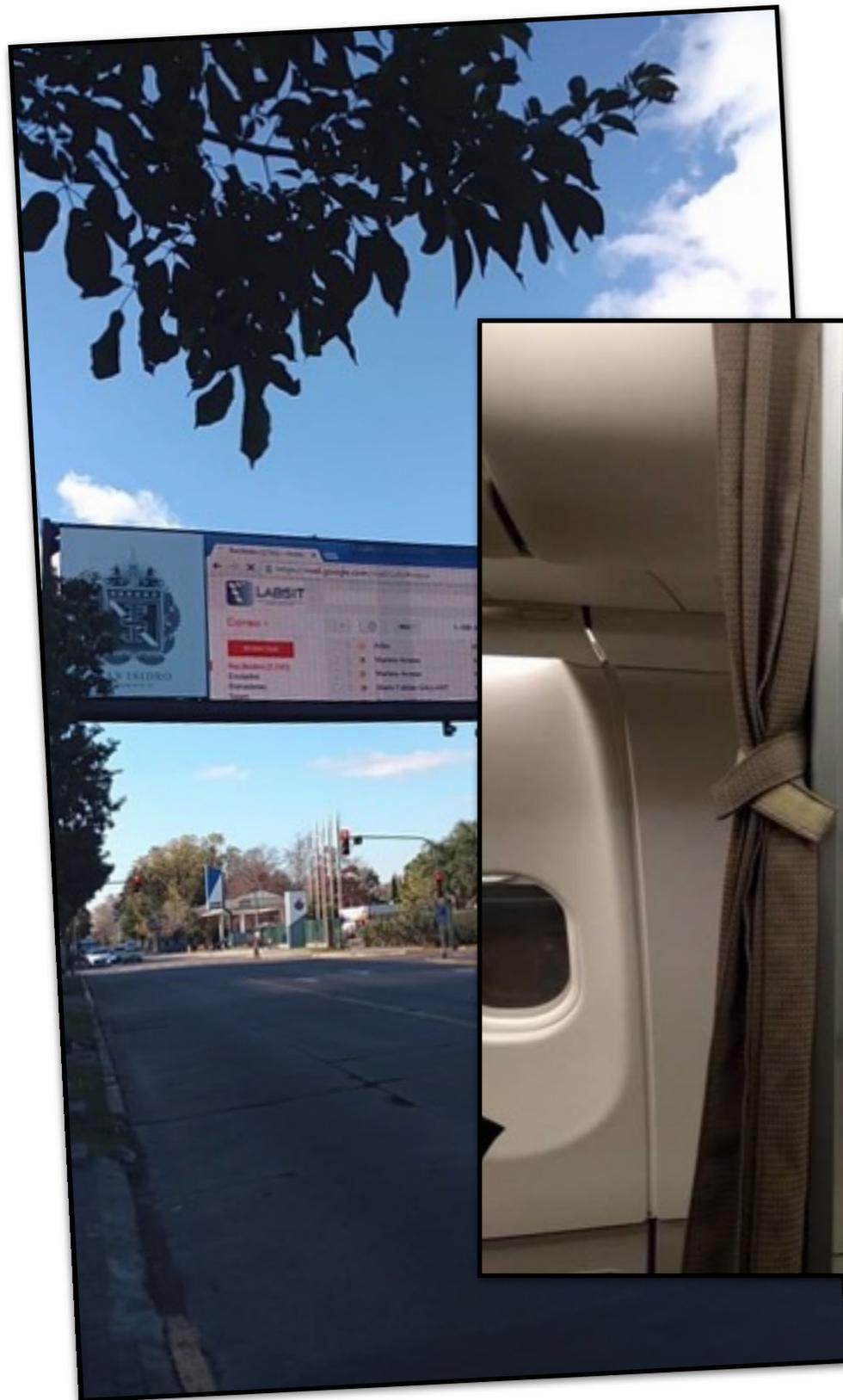


Das Keyboard 5Q is a cloud-connected, open API RGB mechanical keyboard that allows each key to be color-controlled over the Internet. It is built with ground-breaking electronics that provide superior RGB LED brightness and unsurpassed response time. Along with the Das Keyboard Q application, the Das Keyboard 5Q makes you more productive by streaming information directly to your keyboard.

This is a huge problem. If anybody knows the MAC address of one of your sockets, they can control it from anywhere in the world. You can't set a password to stop them, and a normal home router configuration won't block this. You need to explicitly firewall off the server (it's 115.28.45.50) in order to protect yourself. Again, this is completely unrealistic to expect for a home user, and if you do this then you'll also entirely lose the ability to control the device from outside your home.

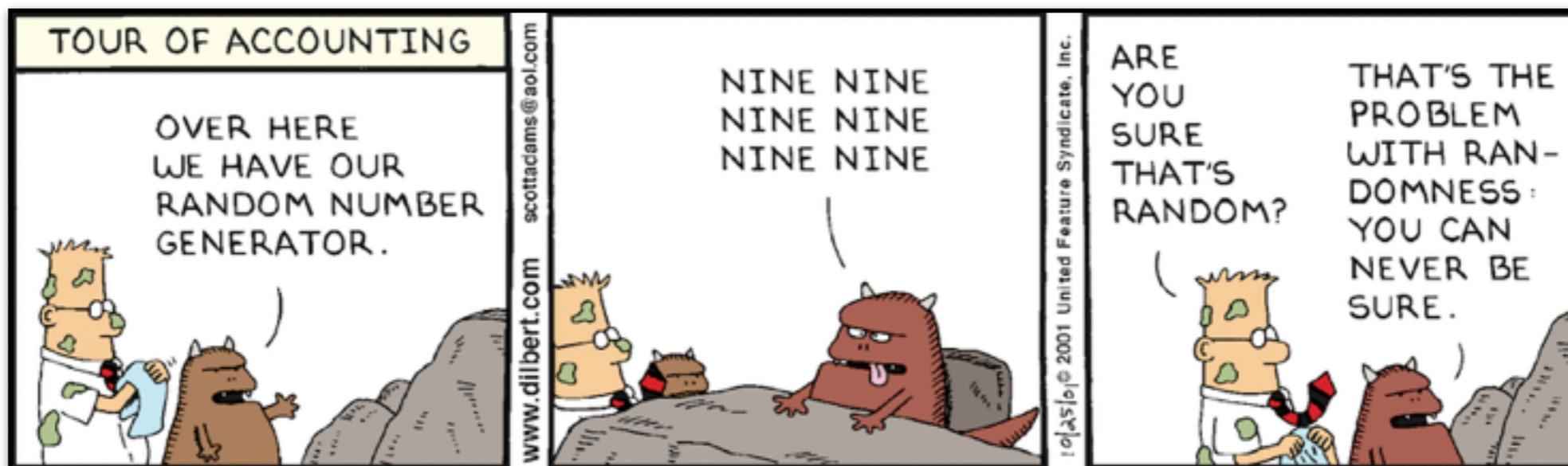


There Should Be More Systems Running RIOT



Wishlist

- most of these things are not capable to run on a MSP430-based architecture
- security on embedded devices is hard
 - certain ARM instruction sets support PXN and alike
- “smart” devices are not that smart
- cryptography apparently is not always the answer

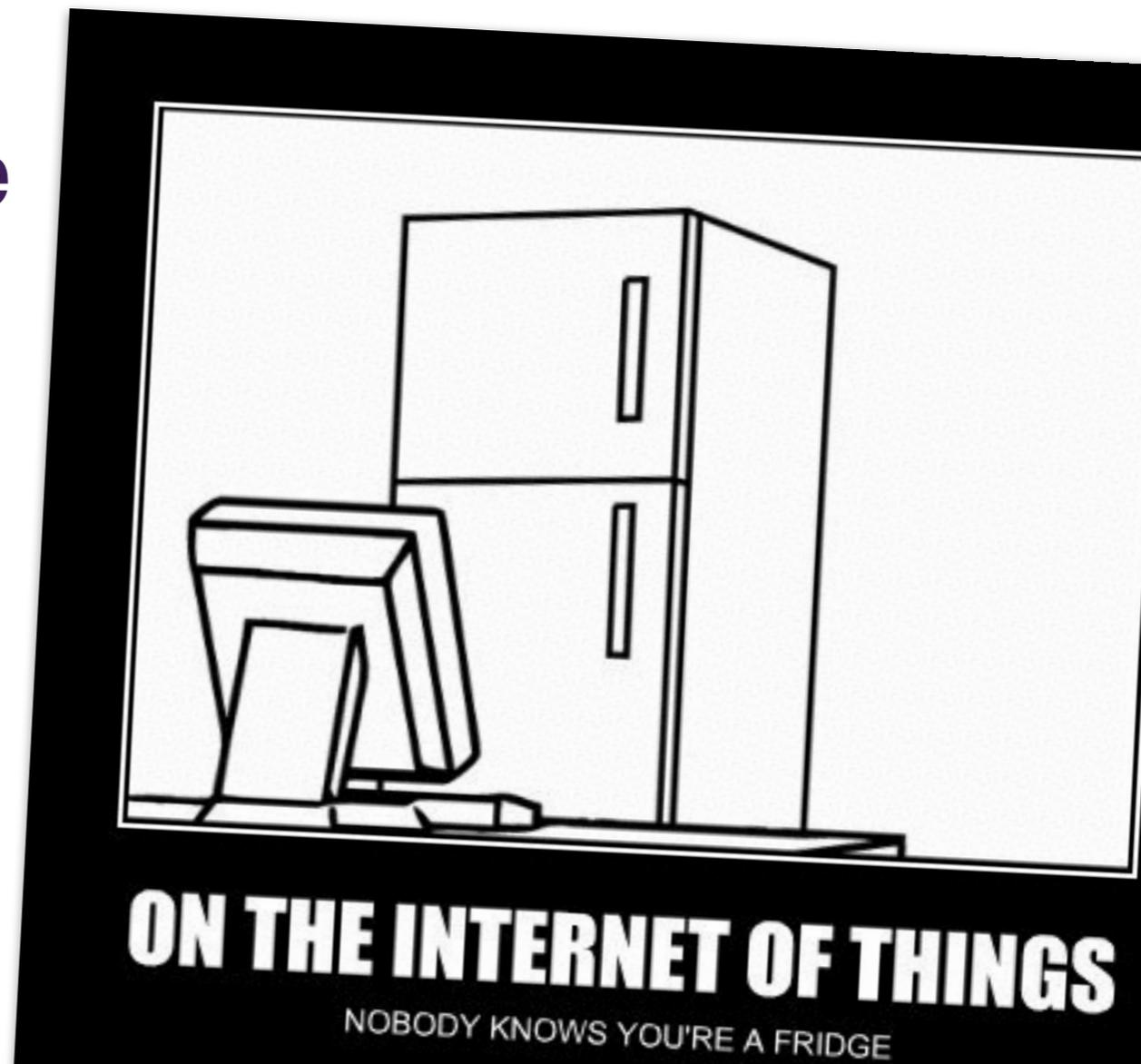


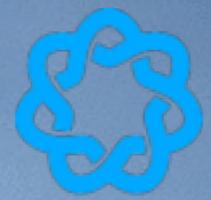
Wishlist (cont.)

- virtualization/containers/personalities
- support for network simulators (besides cooja)
- energy saving strategies
- over the air (OTA) updates
 - what happened to the task force?
 - would love to participate

tl;dr

- check the supported platform
- expect (frequent) API changes
- be prepared to read a lot of (good) code
- there a lot of things to do, which is pretty exciting
- become a part of the rich community





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