

*Because every life has a purpose...*



# Cloudy with a Chance of RIOTs Towards an Open Industrial Internet

Michael Frey – 2<sup>nd</sup> RIOT Summit – 29<sup>th</sup> September 2017

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# Agenda

- Background
- Towards an Open Industrial Internet
- Summary

# Background

- Senior Software Developer at MSA
  - previously: contractor @ swie, technical lead @ mesh:ine, research assistant at HU berlin, ...
- Focus at MSA: Information-Centric Networks for the Industrial IoT
- MSA and RIOT have a history!



Dependable Systems  
Forschungsforum Öffentliche

FeuerWare

```
riot --bash -- 116x31
-MacBook-Pro:riot frey$ git grep "Heiko"
vsextrem/board_init.c: * Copyright (C) 2013 Heiko Will <hwill@inf.fu-berlin.de>
vsextrem/board_init.c: * @author Heiko Will
vsextrem/include/board.h: * @author Heiko Will
sba2-common/board_common_init.c: * @author Heiko Will
sba2-common/tools/CHANGES:(heavily hacked by Heiko Will & Kaspar Schleiser since then)
sba2/board_init.c: * @author Heiko Will
ude/lifo.h: * @author Heiko Will <hwill@inf.fu-berlin.de>
.c: * @author Heiko Will <hwill@inf.fu-berlin.de>
common/VIC.c:/* Copyright (C) 2005, 2006, 2007, 2008 by Thomas Hillebrandt and Heiko Will
common/arm_cpu.c: * Copyright (C) 2008, 2009 Heiko Will <hwill@inf.fu-berlin.de>
common/arm_cpu.c: * @author Heiko Will <heiko.will@fu-berlin.de>
common/bootloader.c: * @author Heiko Will <hwill@inf.fu-berlin.de>
common/include/VIC.h:/* Copyright (C) 2005, 2006, 2007, 2008 by Thomas Hillebrandt and Heiko Will
87/periph/uart.c: * @author Heiko Will <hwill@inf.fu-berlin.de>
c110x/cc110x-defaultsettings.c: * @author Heiko Will <hwill@inf.fu-berlin.de>
```

FeuerWare was developed by the Computer Systems & Telematics Group at the Freie Universität Berlin. Several modifications were made for an improvement of stability and functionality. The kernel has been replaced with new preemptive micro kernel. Furthermore driver functionalities have been separated from the kernel due to the replacement of the kernel and for hardware exchangeabilities. Functionalities that are not used by embedded devices have been removed resulting in an improved system.

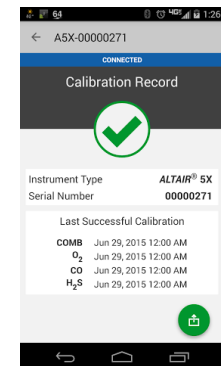
[MSB-A2 MSB-430H](#)

AUGLETICS, FU-Berlin, pres series of an in 21.03.2017

Co-organizing SIGCOMM'17 Matthias Wähl appointed Pos SIGCOMM 20 SIGCOMM is 15.03.2017

# MSA Safety - Mission and Products

- Improve **worker's** and **facilities** safety
- Main customer segments
  - Oil, gas, chemical industries
  - Fire fighters and first responders
- Core product groups
  - **Gas detection**
  - PPE and SCBAs
  - Fall protection



# Towards an Open Industrial Internet

- (Industrial) Devices become more and more connected
  - Networking is mostly (for now) a “nice-to-have” feature, particularly safety-wise
  - Industry is cautious about new technology (with side-effects)
  - “If it is not usably secure, it’s not the internet-of-things”
    - insecure devices/technology hurt adaption
    - releasing inherently broken devices is a “death sentence”



# Related Work (aka “The glorious past”)

- Field Buses, i.e.
  - HART (1989) and WirelessHART (2007)
    - Wireless Industrial Technology Konsortium (WiTECK) provides WirelessHART stack
      - ◆ no license fee for hardware products
      - ◆ license fees for “object code” products
  
- “New” technologies
  - OPC UA, DDS, ...

VITECK offers two levels of membership, Promoter and Adopter, please see below details on benefits and pricing of each.

	Promoter Member	Adopter Member
Initiation Fee	\$200,000 USD  Comparable to contributions from founding members to capitalize the organization, and, though the cost is not insignificant, it compares favorably to either the cost of in-house development or the time and effort needed to outsource or license a stack.	None
	\$40,000 USD	\$8,000 USD

At A Glance

	Promoter *\$55,000 USD/year	Participant \$9,900 USD/year	Adopter \$4,000 USD/year
Member Benefits	✓		
on the Board of Directors	✓		
and specifications	✓		

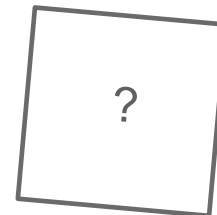
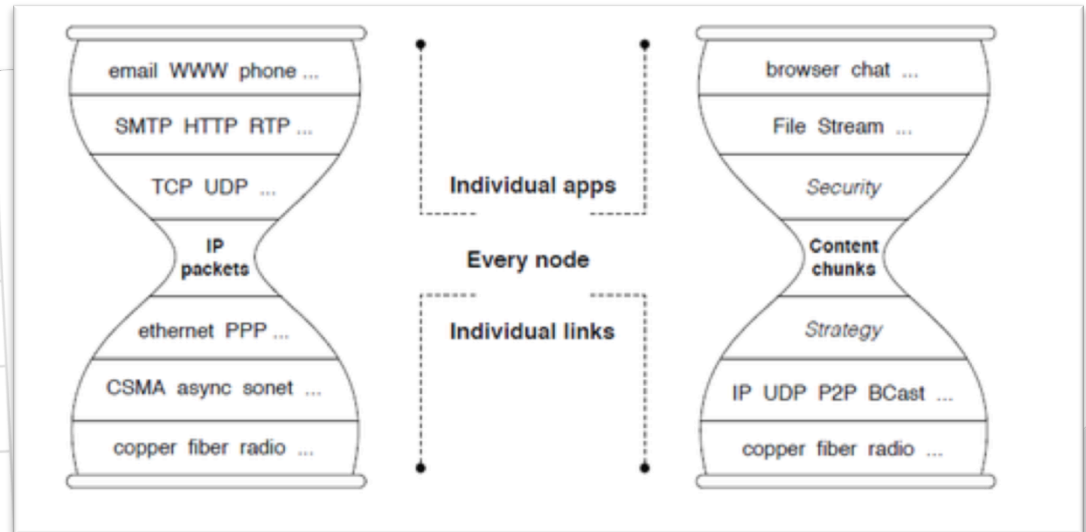


# What are the (preferable) requirements?

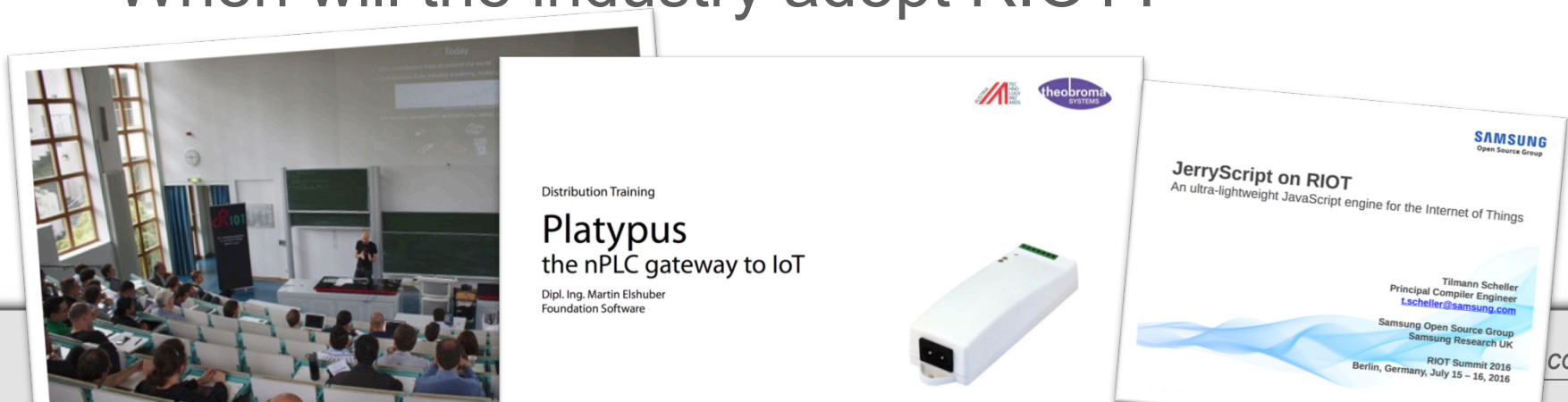
- “Technologies” should be
  - open in terms of
    - standardization
    - access to specifications
    - implementation(s)
  - secure
- Provide interoperability (no small island solutions)
- Close cooperation with research **and** industry

# Towards an Open Industrial Internet

application	CoAP, HTTP
transport	UDP, TCP
IP/routing	IETF RPL
adaptation	IETF 6LoWPAN
medium access	IEEE802.15.4e
phy	IEEE802.15.4-2006



- RIOTs close ties to research makes it an early adaptor to many (new) technologies
- “Pole position” for many, exciting, and new technologies
- API stability is a concern
- Rewrites of rewrites?
- When will the industry adopt RIOT?



- RIOT was internally evaluated by MSA in 2015
- Evaluation wasn't that bad, but competition is tough
- Many products at MSA require components which hold certain certifications
  - SIL, ATEX, and MISRA compliance
- “Raising eyebrows” about timers in RIOT
- No “commercial support”

# Summary

- RIOT is primarily used in research efforts at MSA
- Providing resources for RIOT certification(s) was a topic, but not in the near distant future
- ICN has the potential to become a core technology in future products
- Secure (and reliable) industrial devices are the key-factor for the success of an industrial IoT

**we are hiring**

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**Thank you! Any Questions?**