Secure zero-touch association for hundreds of micro-robots using Lightweight Authorization over EDHOC

LAKE-WG + robotic swarms = fun!

geovane.fedrecheski@inria.fr

OpenSwarm

IETF 123 2025 | Madrid, Spain | July, 19, 2025

Problem #1: about security

Manual enrollment of devices in **massive IoT** deployments

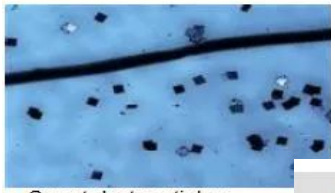
Industrial IoT

AI-generated

Large-scale robotic swarms

https://news.harvard.edu/gazette/story/2014/08/the-1000-robot-swarm/

Smart Dust



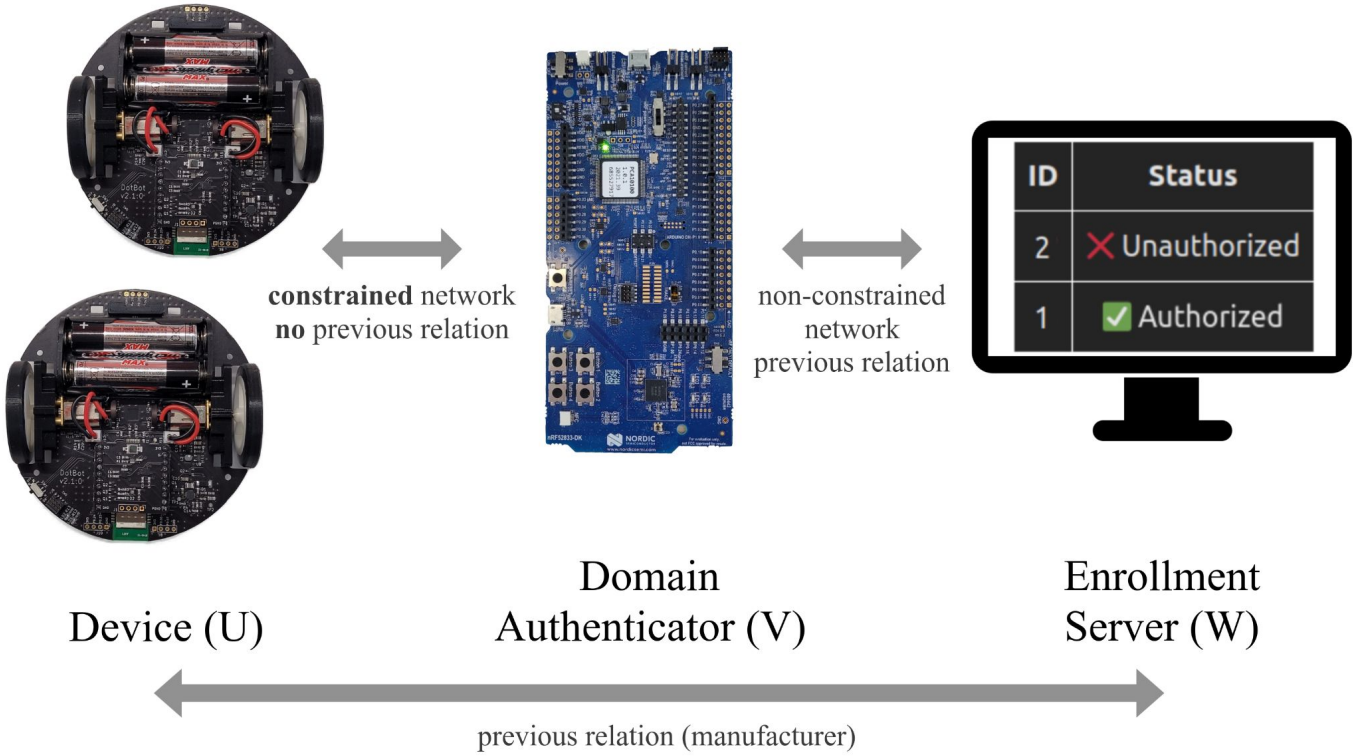
Smart dust particles

smartdust on a finger

https://news.berkeley.edu/2016/08/03/sprinkling-of-neural-dust-opens-door-to-electroceuticals/

Requirements: automated, secure, lightweight

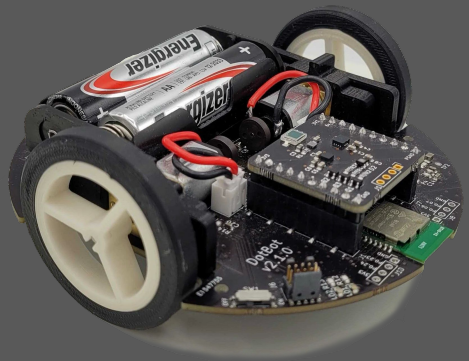
Solution #1: Lightweight Authorization over EDHOC (**ELA**) (draft-ietf-lake-authz)



https://datatracker.ietf.org/doc/draft-ietf-lake-authz/

Problem #2: connecting a swarm of micro-robots

OpenSwarm Testbed



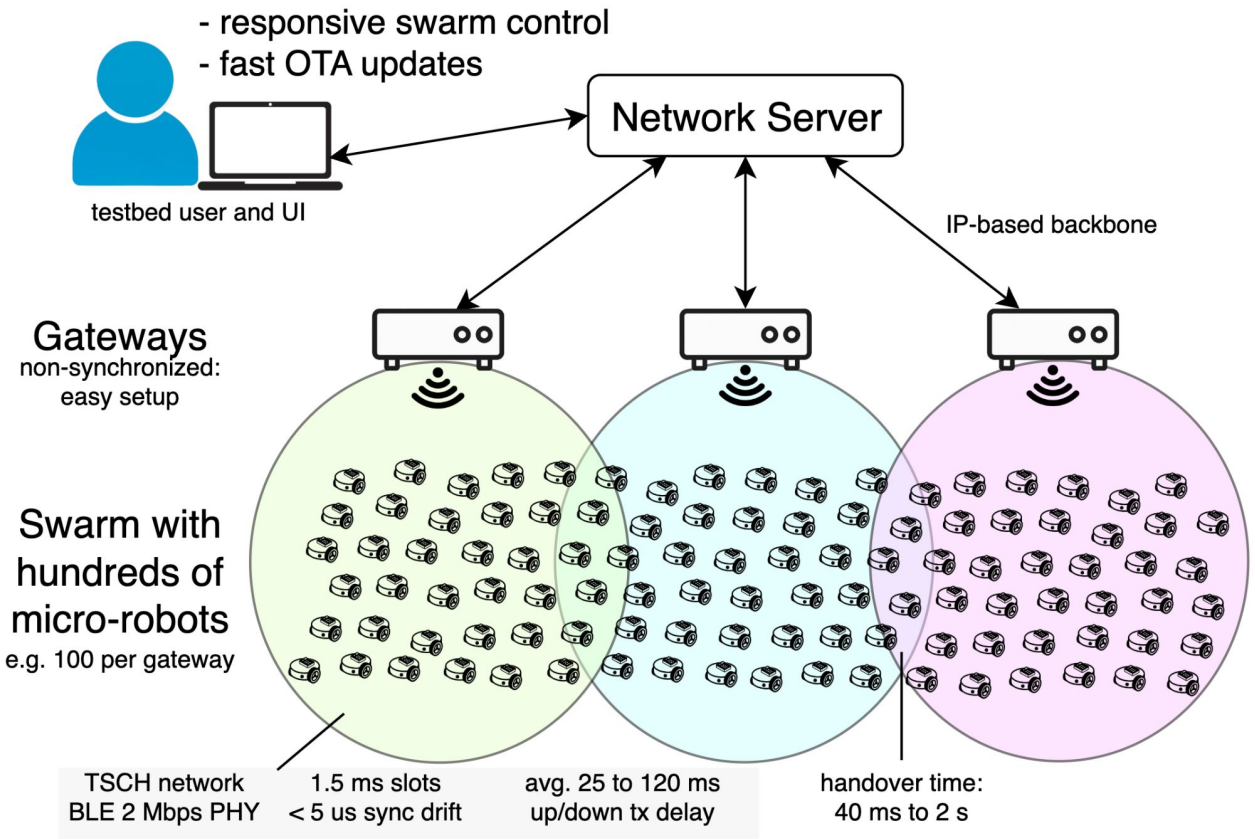
Gateway (nRF52840)

DotBot
(nRF5340)

Solution #2: Micro-robot Access Radio Infrastructure (**Mari**)

- TSCH network
- multiple gateways
- nodes move and perform **fast** handover

- per node **uplink**
  - ~10 Kbps*
- aggregate **downlink**
  - ~200 Kbps*

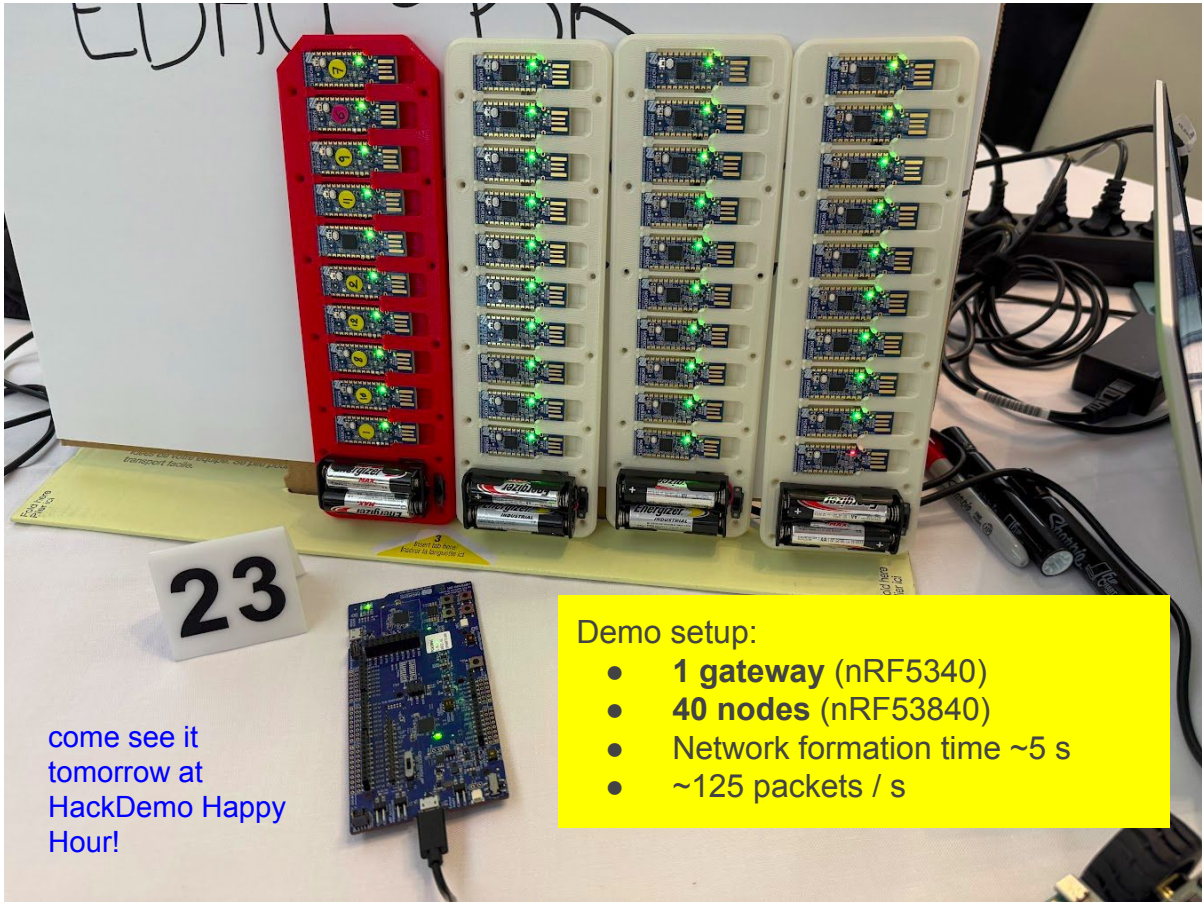


Mari network implementation

Bare-metal custom link layer on top of BLE radio

- throw away the whole BLE Host+Controller stack!

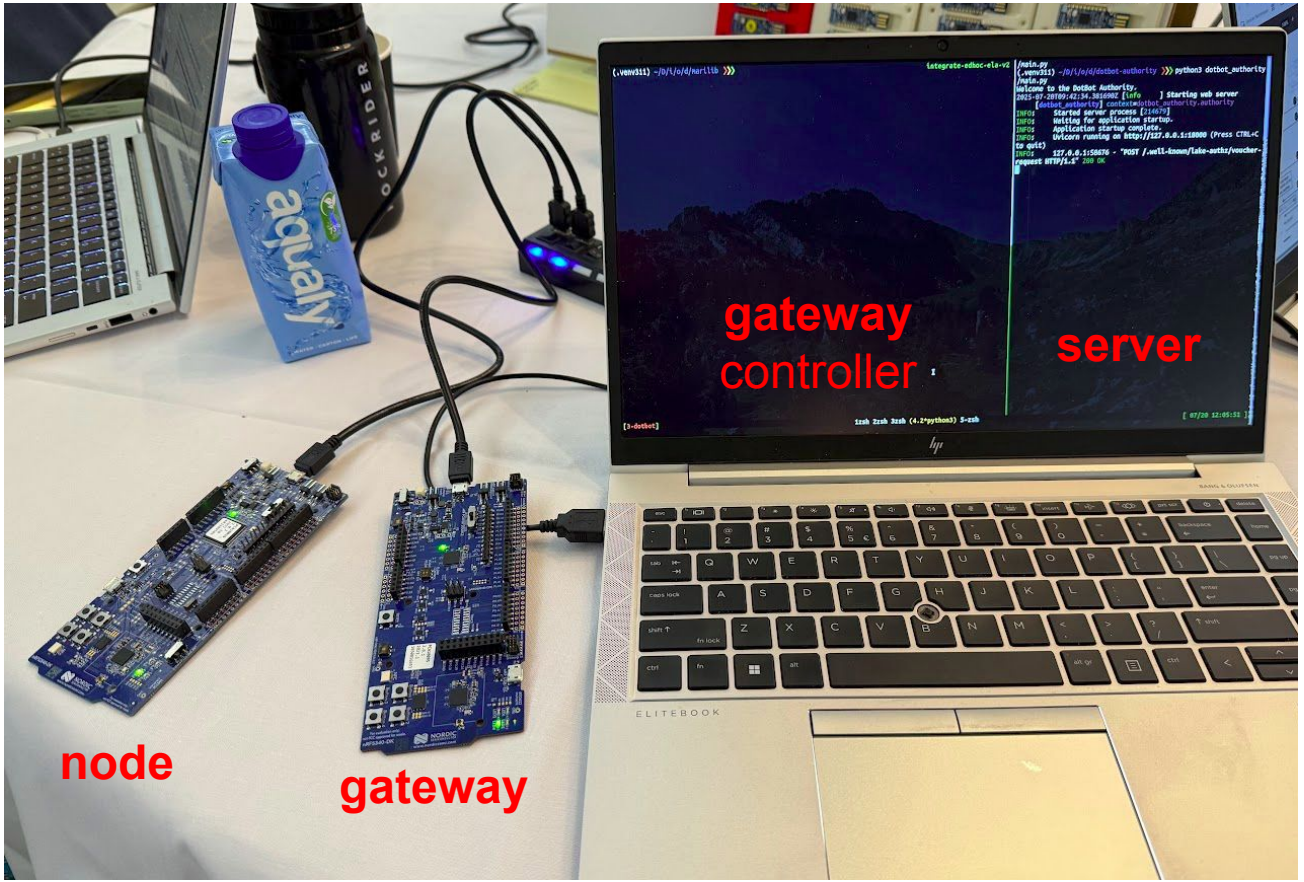
Missing secure association



The Plan

Secure association of Mari Nodes via ELA*

* Lightweight Authorization over EDHOC (draft-ietf-lake-authz)

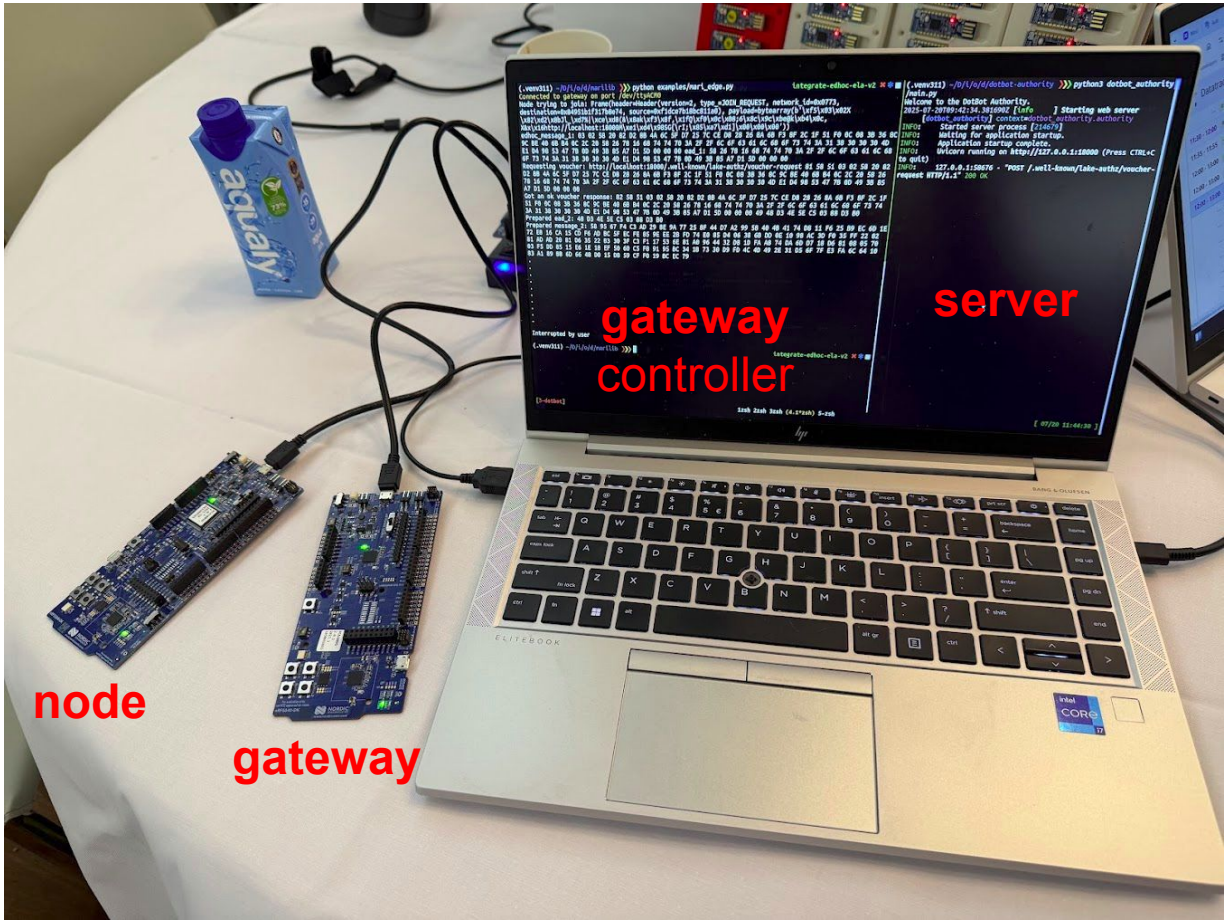


The Result

Secure association of Mari Nodes via ELA* ✅

- node sends m1 over JoinRequest
- Gateway requests Voucher to Server
- Gateway **receives the Voucher**, prepares m2
- TODO: send m2 to node, handle m3

* Lightweight Authorization over EDHOC (draft-ietf-lake-authz)



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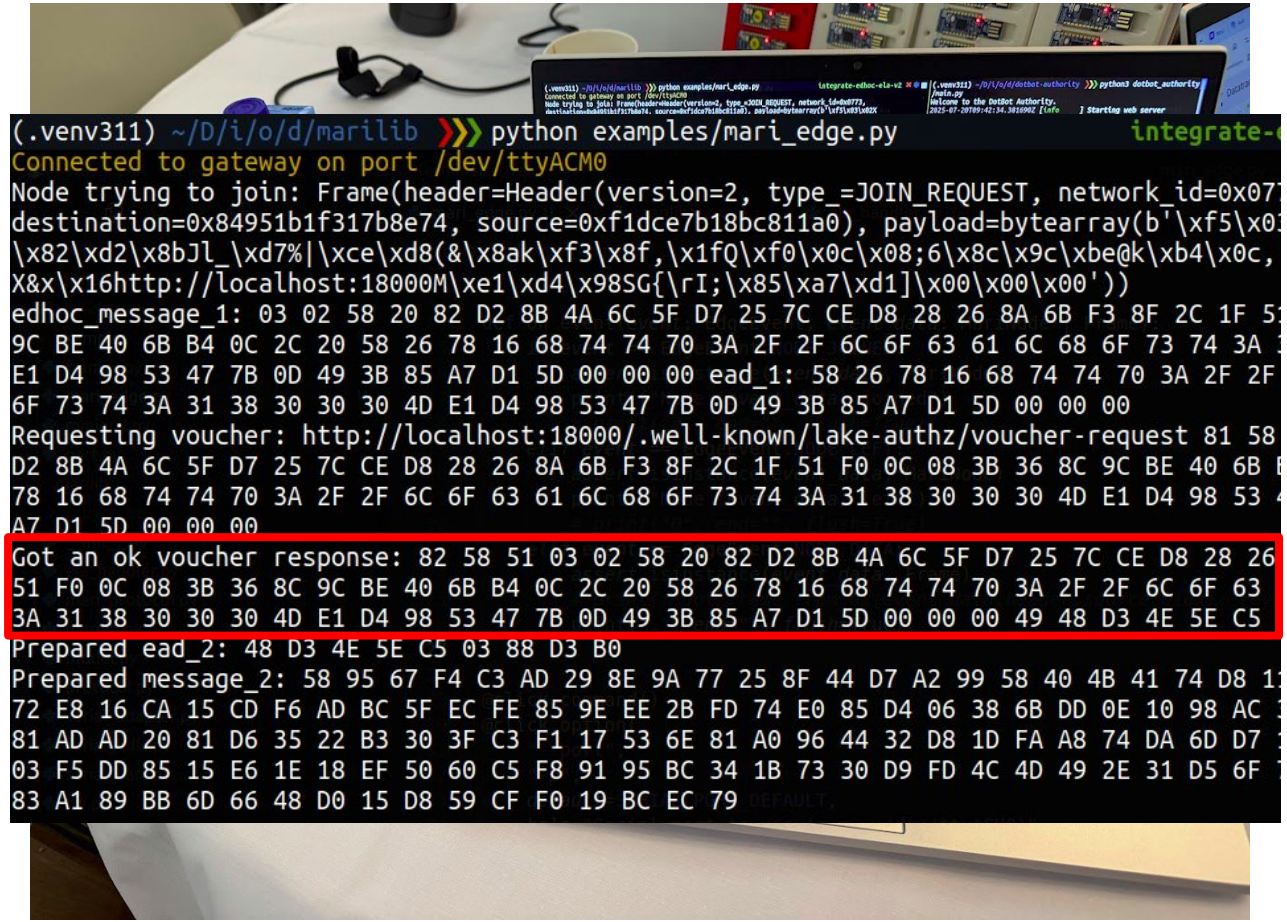
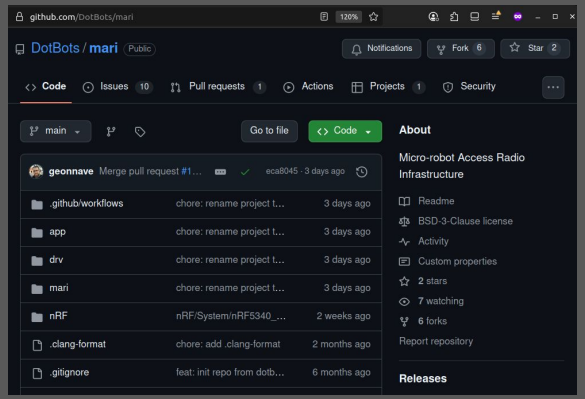


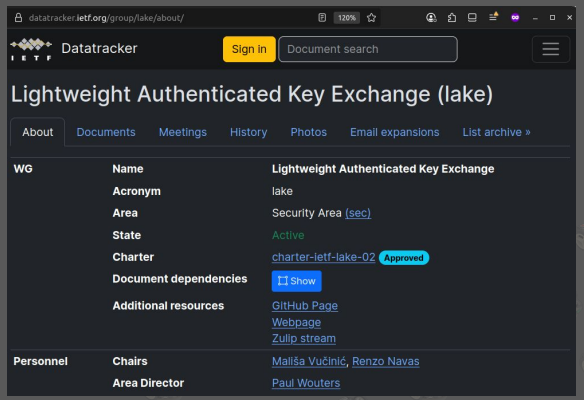
Thank you!

github.com/dotbots/mari



https://github.com/DotBots/mari/pull/125

LAKE-WG



https://datatracker.ietf.org/group/lake/about/

Contact

geovane.fedrecheski@inria.fr