

Testbeds: Notes on Scaling and Sharing

Jörg Ott

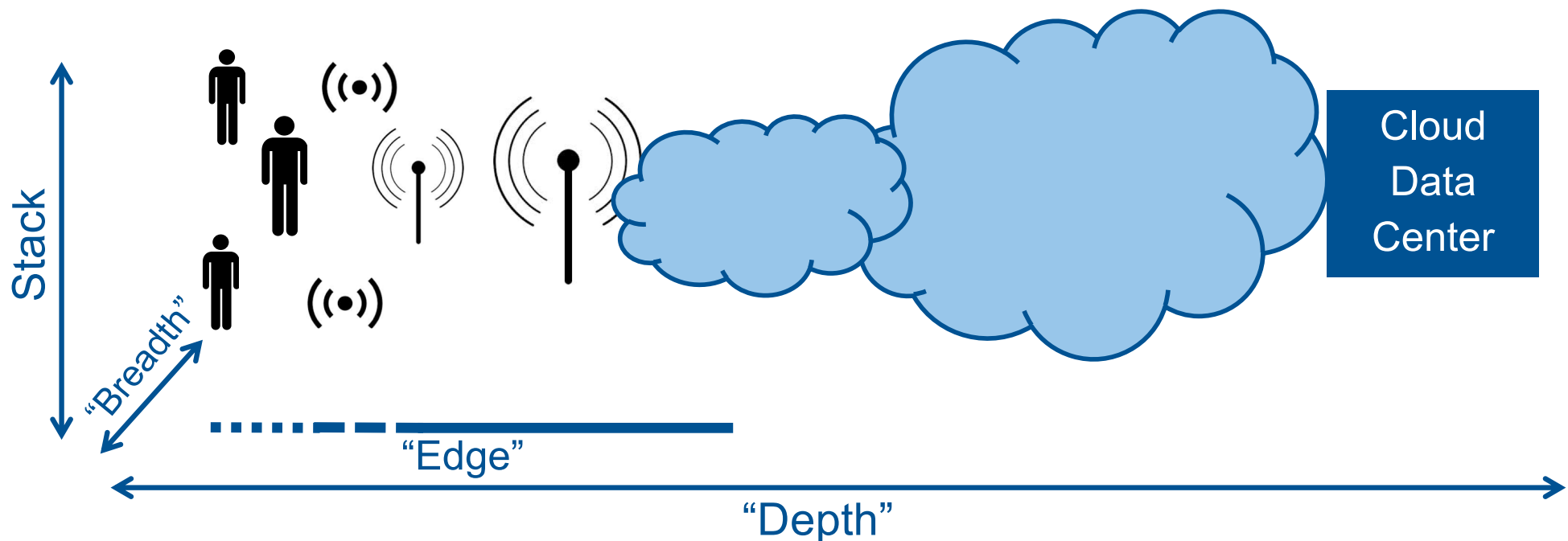
Chair of Connected Mobility

Technische Universität München

SLICES workshop, 4 March 2021

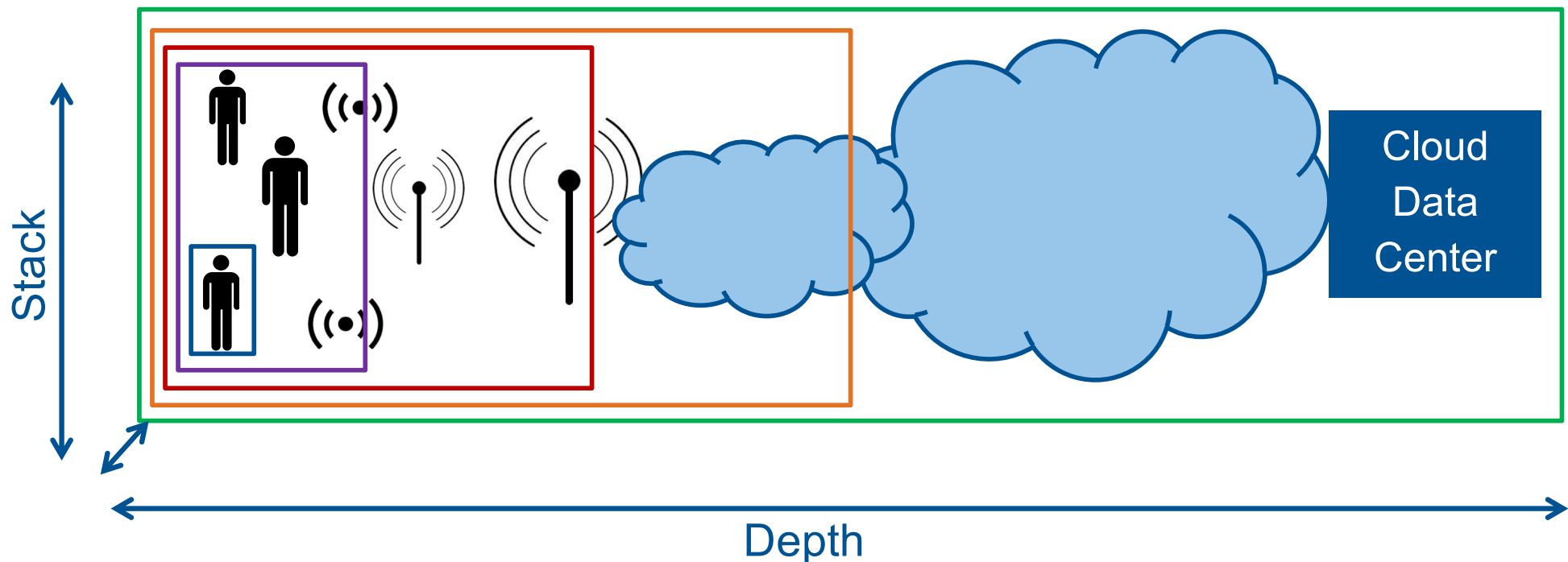
Context: edge and in-network computing

- Mobile users
- Mobile services and mobility services
- Service provisioning infrastructure
- Protocols and systems



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Sample testbeds

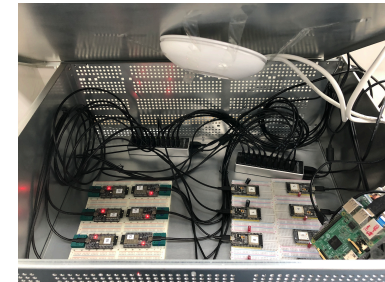
Dense Wi-Fi networks

- v1: 45 Intel Edisons
- v2: 120 APUs w/ switched Ethernet backbone for control



Microcontroller environment

- 20–50 nodes
- Lightweight virtualization for in-network compute



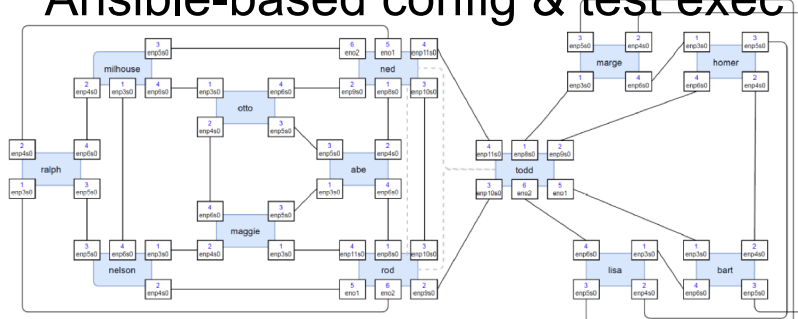
Mobile node emulation

- Up to 1-10K nodes
- Running as VMs
- Connectivity controlled via simulator / traces



In-vehicle network testbed

- Software-defined topology
- Ansible-based config & test exec



Scaling...

- Automation
 - Engineering effort vs. scientific results
- Numbers & topology: interconnecting sites
 - Controlled experiments? Physics?
- Diversity I: Device and platform heterogeneity
 - How / what to compare?
- Diversity II: Users/machines and mobility
 - Numbers? Behavior?
- Network architectures and protocols
 - Incl. domain specifics

Sharing...?!

- Automation (again) + documentation
- Target “audience”
 - Individuals – within the group – collaborators – students – world
- How to?
 - Access to infrastructure
 - Blueprint to replicate infrastructure: standalone vs. interconnected
- Interconnecting: community infrastructure
- “Slicing”: in time, in space
 - Validation? Do I know what I get?
- Experiments and results...

Some challenges

Practical ↑
Scientific ↓

- Space, scale
- Radio interference
- Ops & maintenance (people, funding)
- Inputs: measurements, living labs, models (realism)
- Experimental explosion (complexity, time)
- Usability (“error-free” even at 2am)
- Ease of sharing (repos, formats, tool chains)
- Reference models (benchmarks, metrics)
- Reproducibility
- Representativeness
- Interpretation, generalization
- Feedback loops



Energy



Perspectives

- Go for it
- How-to across different testbeds
- Evolving infrastructure
- Eating our own dogfood
- Embracing other disciplines