(Edge Computing and) Decentralization

Breakout Session

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Decentralization from different backgrounds

- Concerns due to consolidation/centralization of power
  - In conflict with the initial design of the Internet (E2E communication)
  - Powerful actors nowadays that "replace" individuals
- Vehicular networks
  - Decision making and consensus in VANET
- Edge Computing, IoT
  - Service capabilities of sensors and actuators

What does decentralization mean?

- Different notions
  - Internet infrastructure on a smaller scale?
  - "Everything that is not centralized"
  - Distribution vs Decentralization?

- Who contributes?

- Who makes decisions?

- Who has authority?

Two main areas of discussion

- Trust
- Motivations, Incentives

Trust (1)

- Nowadays quite centralized: PKIs, root CAs, …
  - Difficulty: deploying trust anchors on devices, updating them consistently
- Though also decentralized alternatives, e.g. Web of Trust
- How do we find a trust anchor? Communication vs human layer?

- Example: V2V communication: needs to be fast and secure
  - What about unknown vehicles? How flexible is this? Who is trusted?
  - Which actors? Cars, pedestrian, infrastructure/objects?
  - How do they communicate? What protocols?
  - Trust on a per-entity basis, or group? Trust all members of a group?

Trust (2)

- Trust may not be a good starting point
    - Maybe we should care about technical details first (protocols, resources, …)
    - Driving currently not centralized; maybe simply wrong use case?
    - Is trust a root problem?
        - Simply connecting to each other does not require trust, e.g. in mesh networks

    - Trust models: quite complicated
    - E.g. trust through traceability:
      incentivize behaving correctly, punish misbehaving, facilitated by traceability

Incentives and Motivations (1)

- Why would one want to decentralize things?
  - Centralized solutions perform well
  - However, gaining censorship-resistance and privacy

- The Internet used to be decentralized
  - E.g. sharing a photo with friends: simply putting it on a host, shareable with everyone through URL
  - Nowadays, sharing it on multiple platforms ("bubbles") required, shareable through ?
  - Which one is more convenient?

Incentives and Motivations (2)

- What hinders us from decentralizing things again?
  - Costs: marginal costs for adding users/nodes
  - Responsibility when running your own things, why would one want that?
  - Friction between research and industry

- → Missing incentives
  - Cryptocurrencies could help here: giving coins/tokens for participating
  - Combine cryptocurrencies and smart contracts with previous P2P research that was not sustainable back then
  - Partially solves the trust problem

- → find lightweight solutions that offer trust and incentives

Takeaways (1)

- Trust:
  - root of problem, or not related at all?
  - Communication vs human layer?

  - "Solved" statically for companies internally
    - However: dynamic addressing? IPv6? DNS required?
    - DNS as grayzone

- Incentives: long-term problem; coins/token might solve that
- Strong drivers to move to a decentralized Internet