(Edge Computing and) Decentralization

Breakout Session

MIR³, September 25, 2018
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