Group 2: Seminar on ”The Future of the Internet”, unit 6

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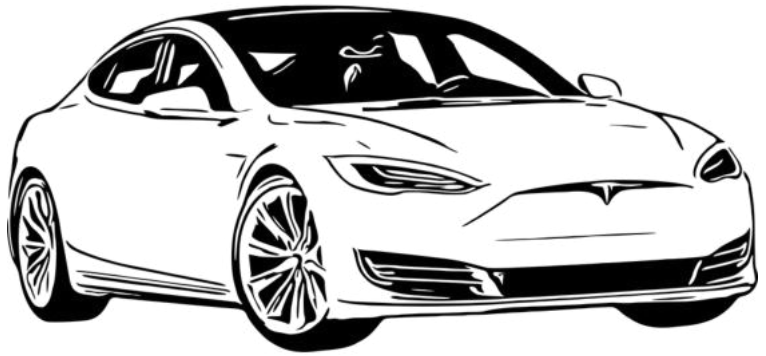
Allocated group's position

- "It is our belief that the future of the internet is based on peer-to-peer overlay-based networking (BitTorrent, TOR, Freenet, KAD)."

Opening argument in support of group's position

With the rise of **autonomous vehicles** (An *et al*., 2019), peer-to-peer overlay-based networks can enable to **securely share data between vehicles on the same network**, e.g., within Tesla's or Uber's cars, that can help passengers share travel-related details, receive up-to-date content on places they are visiting and access virtual entertainment too (Ameur *et al*., 2022).



Ameur, A. I., Lakas, A., Bachir, Y. M., & Oubbati, O. S. (2022) Peer-to-peer overlay techniques for vehicular ad hoc networks: Survey and challenges. *Vehicular Communications*, 100455.

An, S., Nam, D., & Jayakrishnan, R. (2019) Impacts of integrating shared autonomous vehicles into a peer-to-peer ridesharing system. *Procedia Computer Science*, 151, 511-518.

Traits that make peer to peer overlay-based networks beneficial

- Since peer to peer networks connect computers and devices without the need of server configuration, it results to it been highly scalable (you can easily add more peers to the network), more affordable and easily manageable because there is no need to create a server for everything.
- It is more reliable because it is hard to shut the network down unless you shut down all the peers existing in that network.
- It can handle sharing of large files over the internet, whereby the larger a peer-to-peer network is, the faster it is , for example:
  - Windows 10 updates(which is from Microsoft servers and through P2P),
  - Online gaming platforms,
  - Most of the Linux Operating Systems like Ubuntu, Manjaro etc.

References :

Shinde, A. & Chaware, S. M., 2018. *2018 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), 2018 2nd International Conference on.* Palladam, India, IEEE.

Neagu, C., 2019. What are P2P (peer to peer) networks and what are they used for [Online] Available at : https://www.digitalcitizen.life/what-is-p2p-peer-to-peer/ [Accessed 20 July 2022]

Traits that make peer to peer overlay-based networks beneficial

- Cost – in terms of cost the building and maintaining of a peer to peer network is inexpensive, because there is no central configuration
- Reliability – Peer to Peer networks are not dependent on a centralized system, which means that the connected computers can function independently, so if a single host goes down the rest can function as normal
- Implementation – Configuration is limited because all the connected computers can manage themselves
- Scalability – This is a major advantage, even if extra clients are added the performance is not impacted because each new host provides resources. P2P networks can include new clients easily, so P2P networks are more flexible and scaleable
- Administration – All users are given the right to manage their own system and so there is not a requirement for a specialized central network administrator

References : Roomi, M (2020). 7 Advantages and Disadvantages of Peer to Peer Networks. Available from: https://www.hitechwhizz.com/2020/11/7-advantages-and-disadvantages-drawbacks-benefits-of-p2p-network.html [Accessed 18th July 2022]

Disadvantages of Content Networking (CCN)

- Disadvantages of Content Networking (CCN) as mentioned by (Shindie & Chalware, 2018) is that CCN wastes resources in dispatching content and it needs some computational capabilities thus making it complex
- CCN is also still evolving, and so there is not much support available in terms of software and hardware
- In terms of complexity, the less TCP/IP is used the more middleware will be required
- Multi-path routing diverges too much information about the network users
- CCN is a different model to the 7 layer OSI model, and so it raises the question of how practical will it be to implement a different approach, rather than build on the existing OSI model

References : Shinde, A. & Chaware, S. M., 2018. *2018 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), 2018 2nd International Conference on.* Palladam, India, IEEE.

MPL, 2022. Failure of todays internet design and the solution of content centric networking. Available from: https://medium.com/@manbobo2012/failure-of-todays-internet-design-and-the-solution-of-content-centric-networking-cf357310b1f5 [Accessed 20th July 2022]

Peer-to-peer networking over MobilityFirst for autonomous vehicles

Although the MobilityFirst architecture can be made secure by leveraging PKI-based self-certifying addresses, its main drawback when applied to support networks of autonomous vehicles lies in its **limited routing aggregation** (Fang *et al.*, 2018).

In fact, differently from the MobilityFirst approach, a peer-to-peer network can enable the **aggregation of the itinerary-based intentions of autonomous vehicles** to help in predicting future traffic-related conditions and, thus, managing them more effectively (Varga, 2022).

Fang, C., Yao, H., Wang, Z., Wu, W., Jin, X., & Yu, F. R. (2018). A survey of mobile information-centric networking: Research issues and challenges. *IEEE Communications Surveys & Tutorials*, *20*(3), 2353-2371.

Varga, L. Z. (2022). Solutions to the routing problem: towards trustworthy autonomous vehicles. *Artificial Intelligence Review*, 1-40.