

Cloudless Skies? Decentralizing Mobile Interaction

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ABSTRACT

Mobile interaction is now almost exclusively dependent on an in-transparent cloud infrastructure beyond the users' control, resulting in multiple issues related to security, privacy, and availability. While alternative approaches based on decentralized network architectures exist, these have their own set of issues such as lack of usability or content moderation. In this workshop, we bring together researchers from related, but rarely interconnected fields to discuss issues and opportunities related to decentralization. We will develop and discuss current and future scenarios for decentralized mobile interaction, both utopian and dystopian. We invite researchers interested in implementation and networking aspects of mobile decentralization as well as those focusing on ethical, legal and social implications (ELSI) of these alternative approaches to the mobile ecosystem.

CCS CONCEPTS

• **Security and privacy** → **Human and societal aspects of security and privacy**; • **Human-centered computing** → **Ubiquitous and mobile computing**.

KEYWORDS

mobile computing; decentralization; peer-to-peer networks; ELSI; social aspects of computing; cloud services

ACM Reference Format:

Britta Schulte, Sujay Shalawadi, Max van Kleek, and Florian Echtler. 2020. Cloudless Skies? Decentralizing Mobile Interaction. In *22nd International Conference on Human-Computer Interaction with Mobile Devices and Services (MobileHCI '20 Extended Abstracts)*, October 5–9, 2020, Oldenburg, Germany. ACM, New York, NY, USA, 3 pages. <https://doi.org/10.1145/3406324.3424598>

1 INTRODUCTION

There is a growing consensus that our current cloud-centric mobile ecosystem is unsustainable in the long term [9]. In this context, "unsustainable" can refer to the significant energy consumption of data centers, but also to a lack of sustainability on a meta-level. Data leaks, privacy breaches, and service shutdowns occur on a weekly basis, leaving sensitive customer data exposed to malicious

actors or "bricking" expensive hardware.

Even when the cloud infrastructure is working as intended, the users' personal information is still routinely data-mined and analyzed for targeted advertising. Mobile devices are indispensable "extensions of the self", and have access to highly private and valuable data. Even though this data has significant potential to help people, it is mostly locked away in individual proprietary apps, and under exclusive control by the respective companies.

While the recent introduction of Europe's General Data Protection Regulation (GDPR) has mitigated some of the most egregious privacy violations, it did not have a noticeable impact on the advertisement-centric business model as a whole [3]. This issue will be even more pronounced as IoT devices become widespread in people's homes, collecting data on even more potentially sensitive aspects of our lives [5, 8, 11].

Alternative mobile apps based on various peer-to-peer communication protocols exist in the research community, but are not widely used, e.g. due to a lack of potential communication peers [2, 10], due to an often pronounced lack of usability [1] or because of issues related to spam and toxic content ("tragedy of the commons"). [7] In the IoT context, research into "edge computing" [6] or personal clouds attempts to mitigate these issues, but places additional responsibilities on the users that they may not be prepared to take on [4].

2 GOALS OF THE WORKSHOP

In this workshop, we will discuss existing and novel solutions for decentralization (e.g. P2P communication protocols, blockchains, decentralized infrastructures), focussing on their advantages, drawbacks, and implications for users and society by developing fictional scenarios using these technologies. To do so, we aim to bring together a wide range of researchers from varying backgrounds, research fields and experiences. In addition to researchers working in the field, we also encourage those who have practical experience with decentralised services, either from a development or a user perspective to learn from best and worst practices. In addition, we are interested in responses from those who take a critical stance towards future technologies coming from a sociology, philosophy or design background.

We invite participants to submit a position paper of up to 4 pages length in CHI extended abstract format (excluding references). Potential topics include, but are not limited to:

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MobileHCI '20 Extended Abstracts, October 5–9, 2020, Oldenburg, Germany

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ACM ISBN 978-1-4503-8052-2/20/10.

<https://doi.org/10.1145/3406324.3424598>

- (Lack of) incentives for using decentralized social systems, “tragedy of the commons”
- Utopian and dystopian design fiction on decentralized systems
- Content moderation in decentralized networks (both positive recommendations, and spam/abuse removal)
- Network protocols and software architectures for decentralization of mobile and IoT systems (peer-to-peer, blockchain, edge computing, ...)
- User-centric analysis of decentralized architectures; improving the usability of decentralized systems
- Decentralization in resource-constrained environments, e.g. with limited Internet access
- Emerging topics, e.g. secure multiparty computation

As this topic sits at the intersection of many fields as we outlined above, this workshop will be an excellent opportunity to foster connections between technically-focused researchers working on decentralized mobile infrastructure and apps, and those looking into the implications for users and society as a whole. These novel connections have the opportunity to foster future collaborations and publications.

All position papers will be collected and published in the CEUR Workshop Proceedings series. In addition, we plan a subsequent collaboration with interested workshop participants to condense our results into an extended survey paper, to be submitted to IMWUT in late 2020.

3 AUDIENCE

Our target audience is any researcher and practitioner who is interested in the topic of decentralization. Ideally, we hope to achieve a roughly 50:50 balance of technically-focused and ELSI-focused participants.

We aim for a total of 14-18 participants, including the organizers, to allow for focussed discussion and interaction.

We plan to create a dedicated workshop website, and will announce our Call for Participation over Twitter, Facebook, and various HCI-related mailing lists.

4 WORKSHOP STRUCTURE

In this workshop we plan to provide both space for open discussion as well as structured work sessions. An outline of our planned schedule is as follows:

- 9:30 - 10:00 Welcome from the organizers
- 10:00 - 11:00 Lightning talks from participants (Pecha Kucha style)
- 11:00 - 11:30 Coffee break
- 11:30 - 12:30 Paired discussions between all participants (5 minutes per pair, “speed dating”)
- 12:30 - 13:30 Lunch break
- 13:30 - 14:00 Plenary: agenda setting from previous one-on-one discussions
- 14:00 - 15:00 Hands-on session: development of fictional scenarios, either utopian or dystopian

- 15:00 - 15:30 Coffee break
- 15:30 - 16:30 Presentation of scenarios & group discussions about potential ways forward
- 16:30 - 17:00 Wrap up

5 PLANNED OUTCOMES

The workshop will facilitate discussions, exchange, and collaboration in the area of decentralization by bringing together researchers with a common interest, working in separate fields which are currently only loosely connected. These discussions will be captured in written scenarios that can be made available to others through future publications, both in print and online, and can therefore support future research projects.

We plan to create a mailing list or Slack channel, and a wiki for future exchange and collaboration between workshop participants. As a first step, we will use these tools for coordination and development of the extended position paper mentioned above, which will present a survey of existing and planned decentralization approaches, and an in-depth discussion of their advantages and drawbacks.

6 ORGANIZERS

Britta Schulte is a postdoctoral research assistant at the Bauhaus-Universität Weimar. In her own work, she explores scenario building and design fiction as a tool to explore and discuss future technologies. Britta is very active on Twitter, but has never used Mastodon or the Fediverse.

Sujay Shalawadi is a PhD candidate in the Mobile Media Group at Bauhaus-Universität Weimar. His research focuses on tangible interfaces, IoT in the home, and seamless interaction with distributed devices and sensors.

Max Van Kleek is Associate Professor of Human-Computer Interaction in the Department of Computer Science at the University of Oxford. His research focuses on expanding end-user individuals’ capabilities for understanding, managing, and using data, towards the preservation and enhancement of their personal autonomy.

Florian Echtler is associate professor in the Human-Centered Computing group at Aalborg University. His research interests are decentralized mobile interaction and ad-hoc creation of ubiquitous computing environments. Additional topics covered by his research include computer vision for HCI applications, sensor technology, and rapid prototyping.

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REFERENCES

- [1] Gus Andrews. 2019. *Expert review: Briar, a P2P messaging app*. Medium. Retrieved Oct 18, 2020 from <https://medium.com/@gusandrews/expert-review-briar-a-p2p-messaging-app-33413034005f>
- [2] Florian Echtler. 2016. CalendarCast: Setup-Free, Privacy-Preserving, Localized Sharing of Appointment Data. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) (CHI '16). Association for Computing Machinery, New York, NY, USA, 1374–1378. <https://doi.org/10.1145/2858036.2858100>

- [3] Stéphane Guilloteau and Venkatesen Mauree. 2012. *Privacy in Cloud Computing*. ITU-T Technology Watch Report. Retrieved Oct 18, 2020 from https://www.itu.int/dms_pub/itu-t/oth/23/01/T23010000160001PDFE.pdf
- [4] D. N. Kalofonos, Z. Antoniou, F. D. Reynolds, M. Van-Kleek, J. Strauss, and P. Wisner. 2008. MyNet: A Platform for Secure P2P Personal and Social Networking Services. In *2008 Sixth Annual IEEE International Conference on Pervasive Computing and Communications (PerCom)*. IEEE, 135–146.
- [5] Huichen Lin and Neil Bergmann. 2016. IoT Privacy and Security Challenges for Smart Home Environments. *Information* 7, 3 (Jul 2016), 44. <https://doi.org/10.3390/info7030044>
- [6] Jozef Mocnej, Winston K.G. Seah, Adrian Pekar, and Iveta Zolotova. 2018. Decentralised IoT Architecture for Efficient Resources Utilisation. *IFAC-PapersOnLine* 51, 6 (2018), 168 – 173. <https://doi.org/10.1016/j.ifacol.2018.07.148> 15th IFAC Conference on Programmable Devices and Embedded Systems PDeS 2018.
- [7] Adi Robertson. 2019. *How the biggest decentralized social network is dealing with its Nazi problem*. The Verge. Retrieved Oct 18, 2020 from <https://www.theverge.com/2019/7/12/20691957/mastodon-decentralized-social-network-gab-migration-fediverse-app-blocking>
- [8] Britta F. Schulte. 2016. Using Design Fiction to Reflect on Autonomy in Smart Technology for People Living with Dementia. In *Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing: Adjunct (Heidelberg, Germany) (UbiComp '16)*. Association for Computing Machinery, New York, NY, USA, 1110–1113. <https://doi.org/10.1145/2968219.2972717>
- [9] Rebecca Sommer. 2019. *GDPR Compliant is not enough*. Boxcryptor. Retrieved Oct 18, 2020 from <https://www.boxcryptor.com/en/blog/post/privacy-and-data-security-cloud-comparison/>
- [10] Tim Weißker, Erdan Genc, Andreas Berst, Frederik David Schreiber, and Florian Ehtler. 2017. ShakeCast: Using Handshake Detection for Automated, Setup-Free Exchange of Contact Data. In *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services (Vienna, Austria) (MobileHCI '17)*. Association for Computing Machinery, New York, NY, USA, Article 88, 8 pages. <https://doi.org/10.1145/3098279.3122131>
- [11] Charlie Wilson, Tom Hargreaves, and Richard Hauxwell-Baldwin. 2015. Smart Homes and Their Users: A Systematic Analysis and Key Challenges. *Personal Ubiquitous Comput.* 19, 2 (Feb. 2015), 463–476. <https://doi.org/10.1007/s00779-014-0813-0>