A critical review of mobile D2D communication

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Angus & Bob wanna share Kool Thing

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DAIS Conference — 19th June 2025

Introduction

D2D explained

The way forward

Conclusion

What is Kool Thing?

- Punchy rock'n'roll song
- From American band **Sonic Youth**
- Released **June 1990**

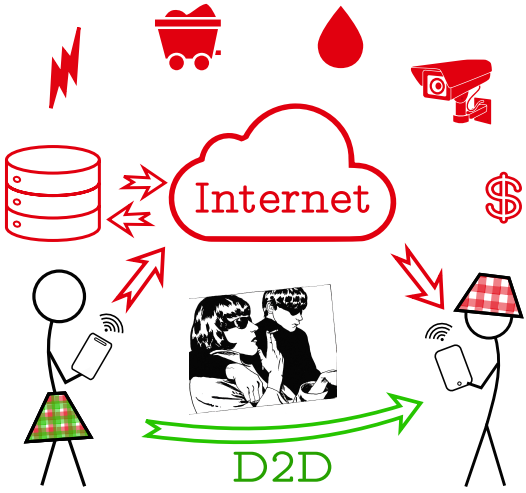
$\Longrightarrow$ Wanna share

Who are Angus & Bob?

Two dangerous pirates

- Physically close friends
- Both owning *devices*
- Wanna share Kool Thing

Who are Angus & Bob?



Two dangerous pirates

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Why prefer D2D?

- Ecological
- No surveillance
- No data cost

Who cares for D2D?

From online survey: `d2dsurvey.luxeylab.net`

Respondants' stats

- From Nov. 21 to Jan. 22
- 364 participants
- 64 % being IT professionals

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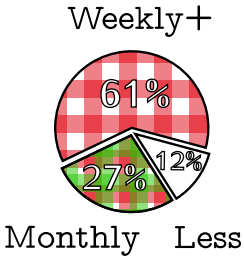

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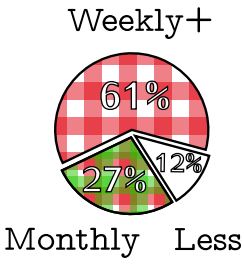

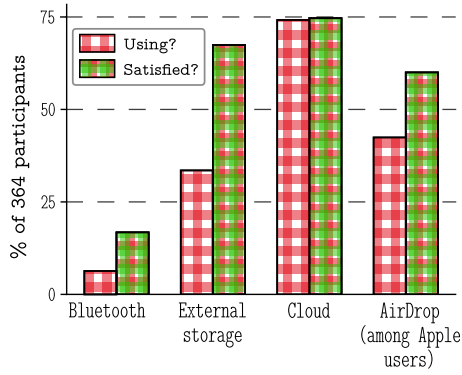

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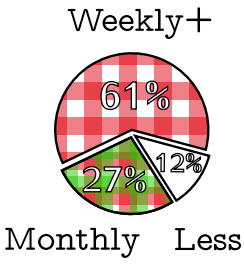
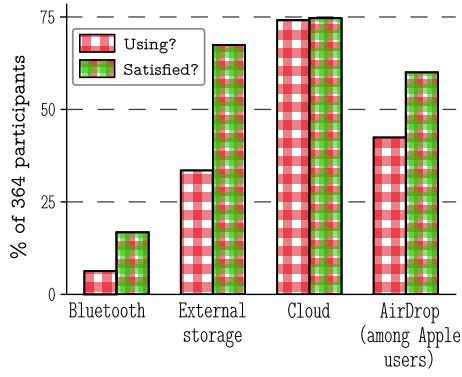
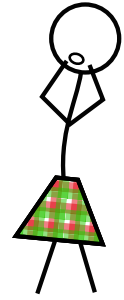




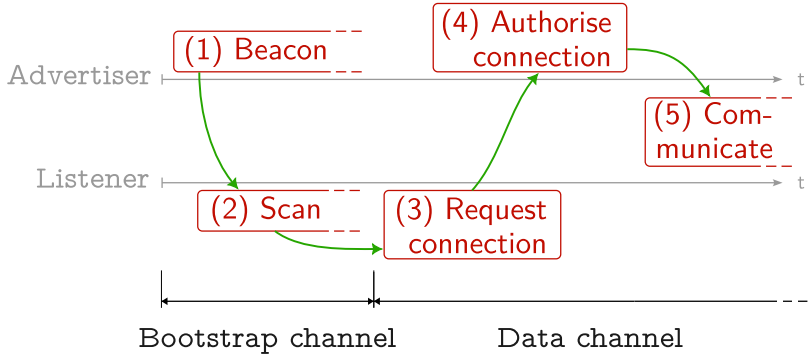
Suggested alternatives

D2D communication characteristics

D2D Channel	Inception	Max dist.	Max data rate	Frequency
Optical				
Infrared (IrDA)	1994	—	16 Mb/s	0.3-430 THz
QR-Code flashing	—	—	23.6 kb/picture	440-790 THz
Wi-Fi				
802.11 (legacy)	1997	100 m	1-2 Mb/s	2.4 GHz
802.11ax (Wi-Fi 6E)	2021	100 m	1.2 Gb/s	1-7.125 GHz
802.11ay	2021	10 m	100 Gb/s	60 GHz
Bluetooth				
Bluetooth Core v1	1999	100 m	1 Mb/s	2.4 GHz
Bluetooth Core v5	2016	100 m	1-3 Mb/s	2.4 GHz
RFID				
NFC	2004	20 cm	106-424 kb/s	13.56 MHz
Utra-WideBand				
UWB	2007	200 m	27 Mb/s	3.1-10.6 GHz

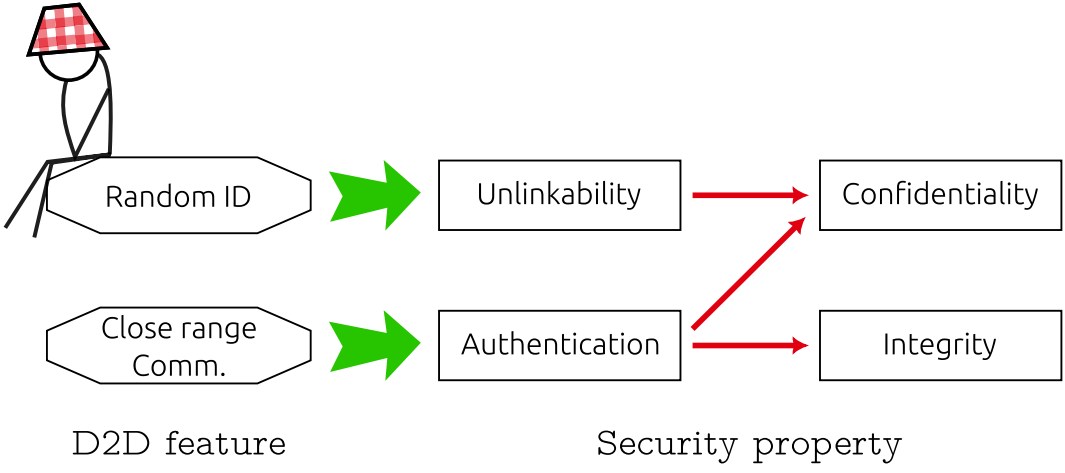


General process



Channel type	**Infrared**	**QRCode**	**Wi-Fi**	**Bluetooth**	**UWB**	**RFID**
Bootstrap	☑	☑	≃	☑	☑	≃
Data	≃	☐	☑	☑	≃	≃

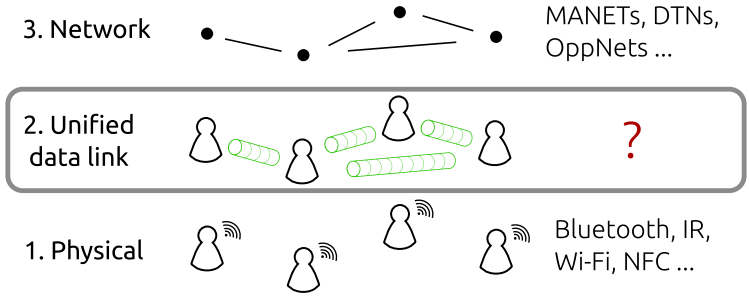
Security properties

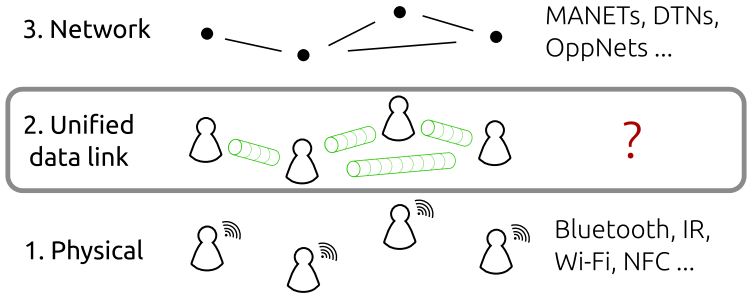


So why ain't D2D popular?!

From Trifunovic *et al.*, "A Decade of Research in Opportunistic Networks", 2017:

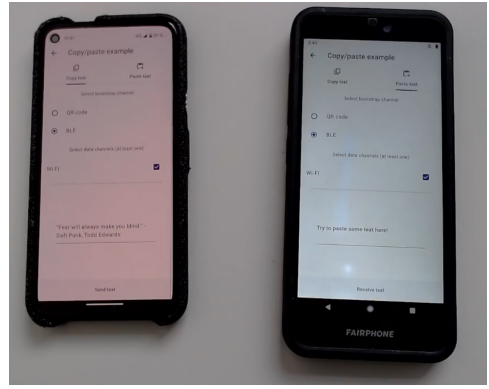
- "researchers should address the **economical benefits** of [...] OppNets"
- "understood in a **broader sense than simply monetizing** the OppNet concept"
- Emerging use-cases:
  - offloading network traffic
  - proximity-based services


3. Network
MANETs, DTNs,
OppNets ...
2. Unified
data link
?
1. Physical
Bluetooth, IR,
Wi-Fi, NFC ...



Various evolving poorly-documented system APIs per OS

Goal: Cross-platform D2D API

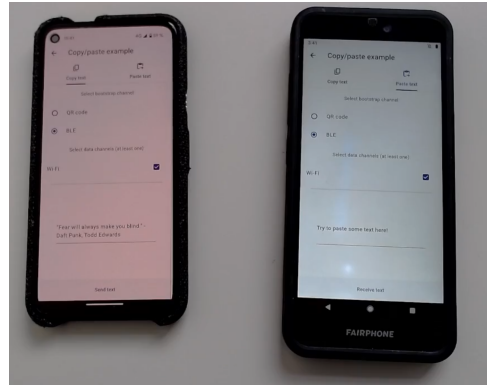


Props to Daniel Romero Acero & Rémy Raes!

Goal: Cross-platform D2D API

Implies:

- A "driver" per channel & platform
- Channel negociation protocol



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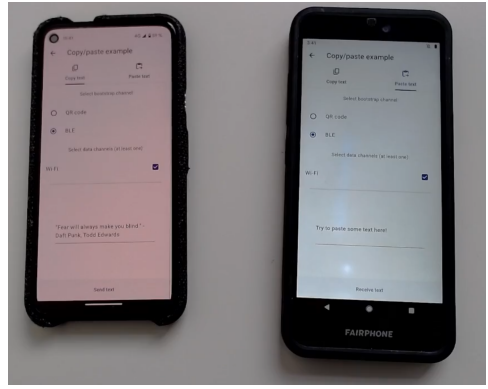
Channels' roadmap:

- ☑ Wi-Fi, Bluetooth
- ☒ QR-Code
- ☐ NFC, UWB...

Platforms':

- ☑ Android
- ☒ Linux
- ☐ Win., macOS, iOS



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What's left to say?

Through with bad industrial decisions

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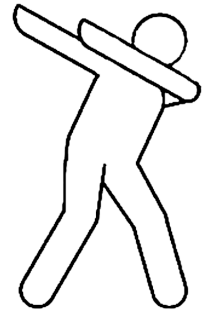
- We are **intellectuals**
- We have **teeth**
- Let's **right some wrongs**



See `garagehq.deuxfleurs.fr`
for some **distributed systems research/action**.

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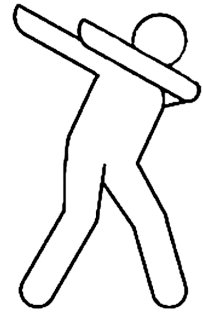

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Thanks for your attention, DAIS & DisCoTec! <3

Get the slides at `luxeylab.net`