Implementing proximity based device-to-device communication in commercial LTE networks in The Netherlands

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Agenda

▶ Introduction
  ▶ What?
  ▶ Why?
  ▶ When?
▶ Research
▶ Use cases
▶ Results
  ▶ Implementation options
  ▶ Conclusion
▶ Questions
Introduction ("What?")

- Proximity based services (ProSe)
- Device-2-Device Communication (D2D)
Introduction (“Why?”)

- More efficient spectrum use towards 5G
- Opens new possibilities for smartphone users
- Generating revenue for operators
Introduction ("Why?") (2)

- Social networking (who is nearby?)
- Advertising
- Intelligent traffic / parking systems
- Network offloading
- Public safety
Introduction (”When?”)

- Currently being standardized by 3GPP
- 3GPP Release 12 includes public safety (December 2014)
- Release 13 scheduled for March 2016
”What are the organizational and technical requirements for enabling proximity based services based on device to device communication on- and between the commercial LTE network operators in the Netherlands?”

- Limited to literature study
- Based on two use cases
- Focus on inter-operator scenario
Use case: advertising

- Local business communicating daily offers
- Local restaurant communicating today's menu
- Cinema wanting to sell last empty seats
- ...
Use case: social networking

- See who of your friends is nearby
- Find people to share a taxi ride
- ...

...
Radio communication

- Licensed spectrum
  - Network assisted
  - Autonomous
- Unlicensed spectrum
  - Network assisted
  - Autonomous
Challenges

- Inter-operator usage
- Battery consumption
- Interference
- Quality of service
- Up-front investment
Challenges (1): Inter-operator usage

Imagine KPN customer, using ProSe / D2D to discover a Vodafone customer

- KPN customer transmits on spectrum resources belonging to Vodafone?
- Vodafone customer listens on KPN spectrum resources?
- Communication over dedicated spectrum?
- Communication out of band (e.g. bluetooth)?
Challenges (2): Battery consumption

- Main issue when using OTT service
- Operators can add value on this point
Challenges (3): Interference

- Issue on inband communication
- Can be avoided by network assistance (coordination)
- Can be avoided by dedicated spectrum
Challenges (4): Quality of Service

- Issue on outband communication
- Main item to add value for operators
Challenges (5): Investment up-front

- Infrastructure
- Research and development
- Spectrum resources
Summary: implementation options

- Licensed non-dedicated spectrum
- Unlicensed spectrum
- Licensed dedicated spectrum
- Network (EPC) based discovery
Summary: implementation options (2)

- Network (EPC) based discovery: step-up and two-step approach
  - Preliminary vendor support
  - Could improve efficiency
- Using LTE radio in non-dedicated licensed spectrum
  - Value adding
  - Opens up D2D communication
Requirements
Requirements (2)

- Authorization for discovery
- Discovery of nearby UEs
- Authorization for identity
- Identity lookup
- Authorization for D2D communication
- Transport of user-plane data for D2D communication
- Reservation of resources

1 Depends on use case
2 Depends on implementation model chosen
Conclusion

- Promising technique, first signs of industry take-up visible
- Operators: get organized!
  - Exchange peering model?
  - Working group to be established, as part of GSMA network 2020?
- More research needed on commercial models, privacy and (radio) protocols
Questions?