Project

Service-Dependent Load and Resource Distribution in Multi-Channel Ad-Hoc Networks

(Bluetooth Scatternets: Scheduling, Formation, Routing, QoS)

DFG SPP 1140

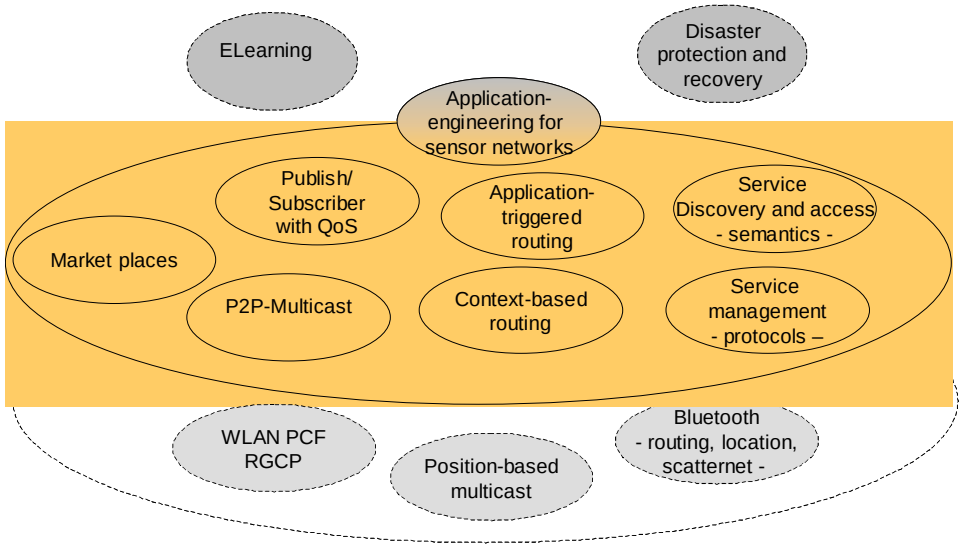
"Middleware for self-organizing infrastructures for networked mobile systems"

http://www.tm.uka.de/forschung/SPP1140/

Prof. Dr. Peter Martini, Simon Baatz, Christoph Scholz

Institute of Computer Science IV, University of Bonn

Topics and Project Partners in SPP 1140



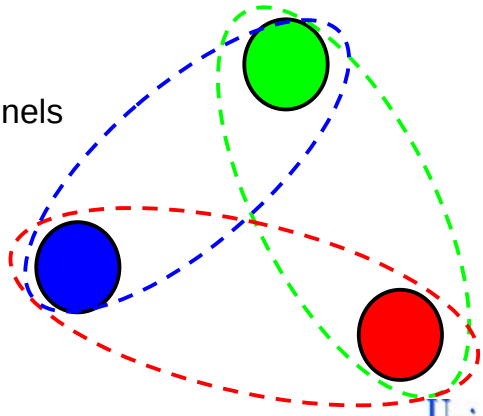
Oswald Drobnik, University of Frankfurt
Wolfgang Effelsberg, University of Mannheim
Stefan Fischer, TU Braunschweig
Bernhard Freisleben, University of Marburg
Birgitta König-Ries, University of Karlsruhe
Norbert Luttenberger, University of Kiel
Peter Martini, University of Bonn

Martin Mauve, University of Düsseldorf
Edgar Nett, University of Magdeburg
Jochen Schiller, FU Berlin
Heinz Schweppe, FU Berlin
Otto Spaniol, RWTH Aachen
Peter Sturm, University of Trier
Dirk Timmermann, University of Rostock
Martina Zitterbart, University of Karlsruhe

Multi-Channel Ad-Hoc Networks

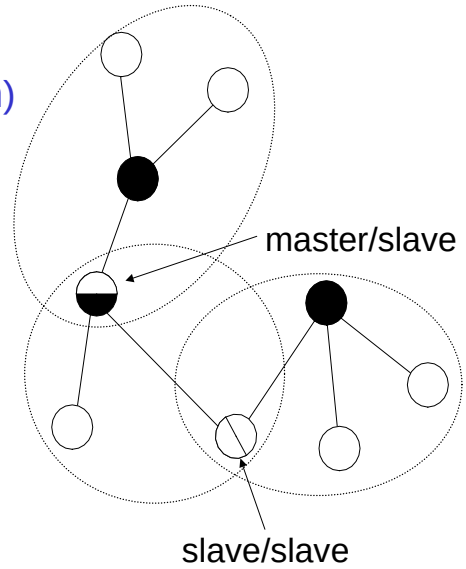
- Assumptions
  - Multi-channel ad-hoc network (e.g., Bluetooth)
  - single transceiver per device: **either** send **or** receive on a **single** channel
  - each pair of devices uses its **own channel**

  Channels may be separated by different types of multiplexing:
  e.g. FDM, TDM, CDM, ...
- Advantages
  - Small, simple and inexpensive devices
  - Use multiple simultaneously active channels in order to improve overall capacity
- Disadvantages
  - Complex coordination
    - Scheduling of links
    - Network formation



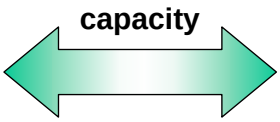
Bluetooth “Scatternets”

- MAC: Link Oriented TDMA Scheme
  - master: **central role** in star-shaped piconet
  - slaves: synchronized with master (up to 7 slaves)
  - time division multiplexing (**TDM**)
- FHSS (Frequency Hopping Spread Spectrum)
  - 79 channels in the 2.4 GHz ISM band
  - master defines hop-sequence
  - channel multiplexing: **different sequences**
- Scatternets
  - devices may participate in several piconets on a TDM basis
  - devices in several piconets are
    - master in up to one piconet
    - slave in one or multiple piconets

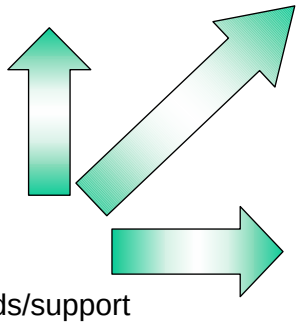


Project outline

Scheduling



- basic principles
- developed scheduler:
  - optimized for best-effort traffic
  - considers fairness
  - different priorities



Quality of Service

- definition of QoS demands/support
- realization of QoS in scheduling, network formation and routing

Network formation

- properties of different topologies
- self organizing formation/maintenance of networks
- application orientation

Routing

- applicability of standard protocols
- design of new protocols and combination with network formation