

# Side-effects of MANET characteristics on real-time cooperation

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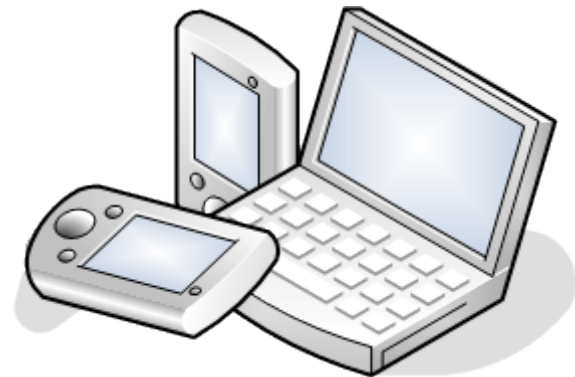
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## Content

- Introduction
- MANET
  - Session management
  - Multimedia-streaming
- KopAN
- Sideeffects
- Outlook
- Summary

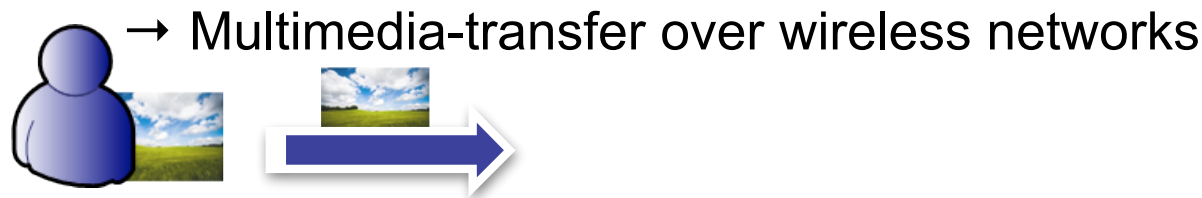
## Introduction

- Amount of portable computers significantly increase
  - Powerful hardware
  - 802.11 based network adapters
- Devices already wide spread
- Change of mobile inter person communication and cooperation



## Introduction

- Needs of mobile cooperation
  - Wired network infrastructure independent
    - Aware of possible lack of infrastructure
    - Cost efficiency
    - Simplicity of usage
  - Sharing multimedia content between devices
    - Via streaming
    - Within specific user-groups
    - In Realtime



## Introduction - KopAN

- Mobile realtime multimedia group cooperation software
- Distributed cooperation between mobile devices
- Without Infrastructure
  - 802.11b in ad-hoc mode
  - Over a MANET
- Multicast support
- Group / User based
  - MANET SIP
- Multimedia transfer in realtime

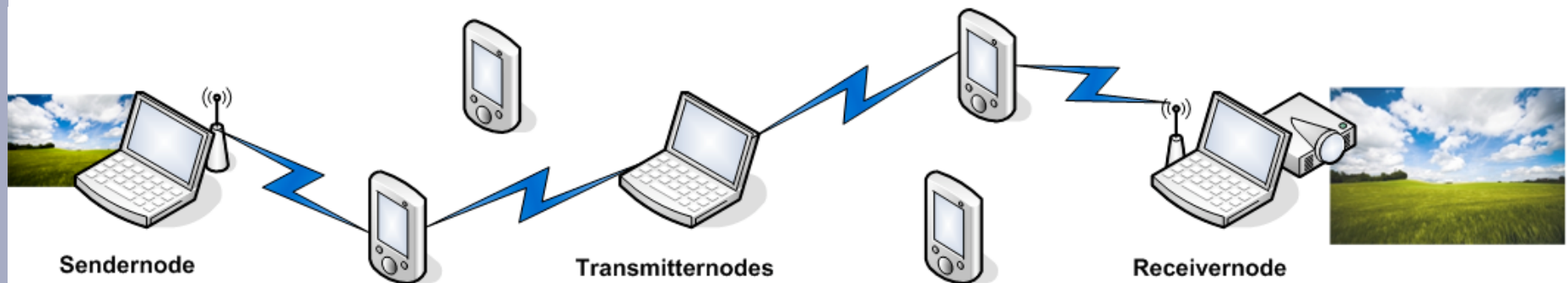


## MANET

- Wireless communication without routing infrastructure
- Multi-hop based communication
  - Larger communication distances
- Node mobility

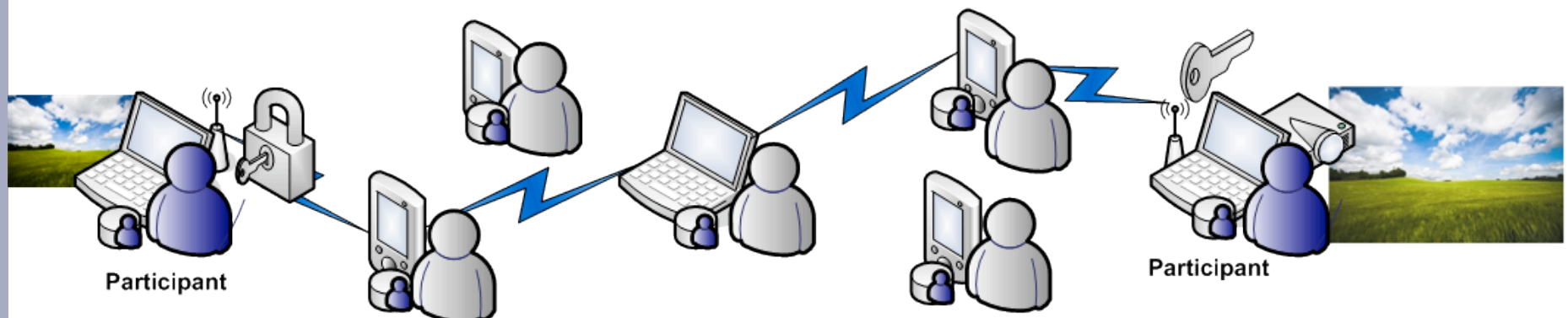
### → MANET

- Route selection is depending on link quality calculations
  - Route-loss quota, bandwidth



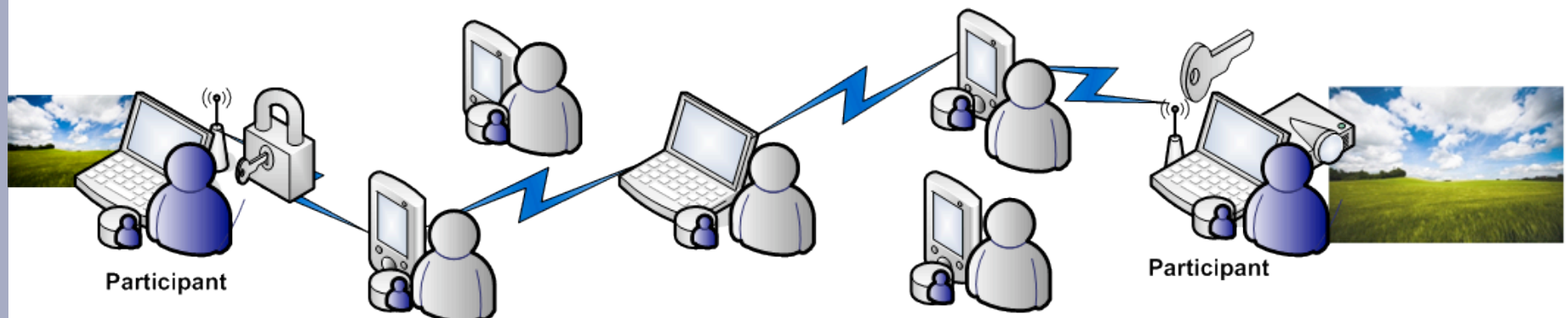
## MANET - Session management

- Extern messages are SIP conform
- Each node contains a SIP proxy
- Selected nodes contain Registrar Server (RS) additionally
- RS nodes inform all proxies frequently
- Session management from application via local proxy



## MANET - Session management

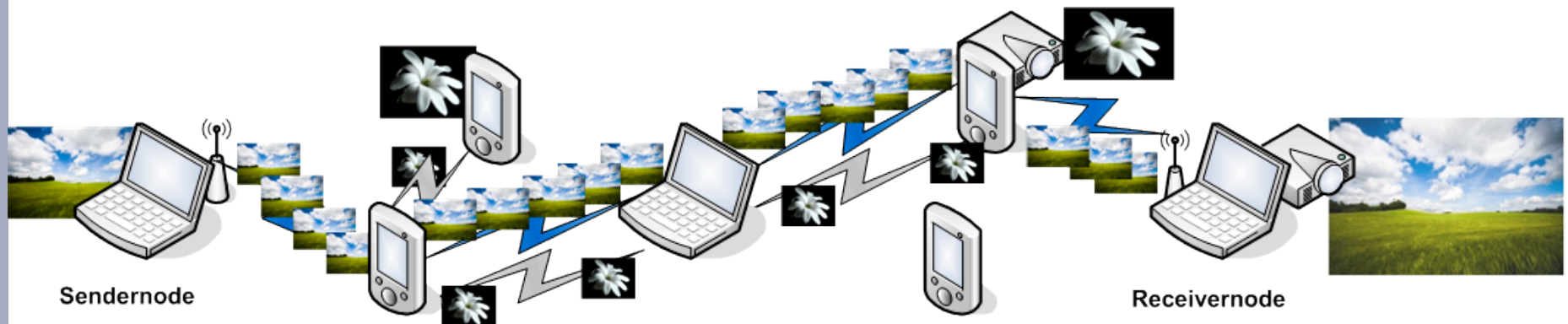
- Registration data is forwarded to all RS nodes
- If IP unknown, Session Invitation Messages, ... either
  - If SIP-user is known by RS message is sent to this node
- Response Messages are sent to nodes directly





## MANET – Multimedia streaming

- Media-encoding
- Multicast (mc) channel initialized between participants
  - Route calculation
- Media is transferred over an RTP stream via mc channel
- RTP based on UDP
  - No lost Pakets are retransmitted

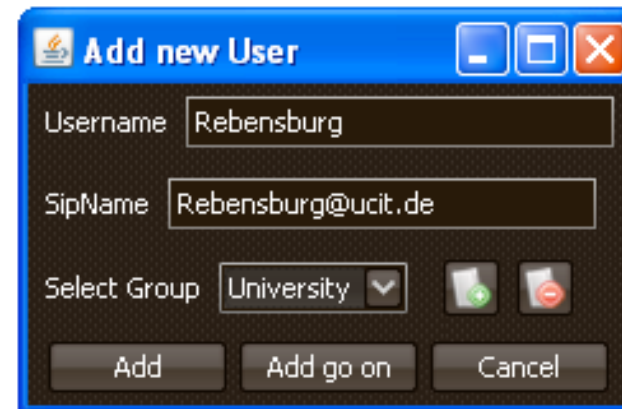
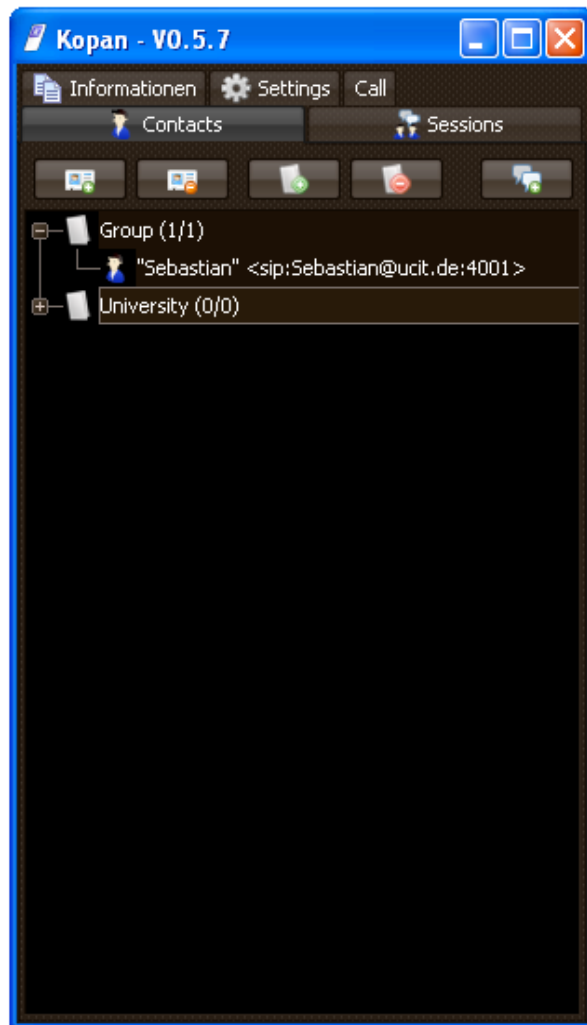


## KopAN

- Realtime content distribution to several devices in area  
→ Content focuses cooperations
- Use Wireless (802.11) MANETs on layers 1-3
  - 802.11b
  - OLSRD (proactiv, MPR, ETX)
- Multicast transfer
  - On Demand Multicast Routing Protocol (ODMRP)
- Decentralized SIP service
- Plugin Structure

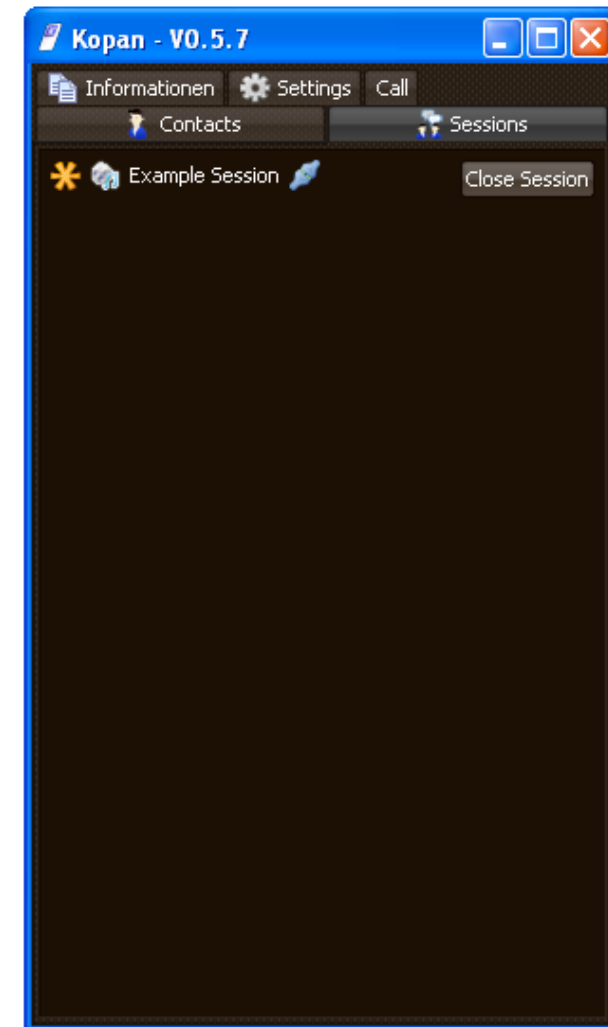
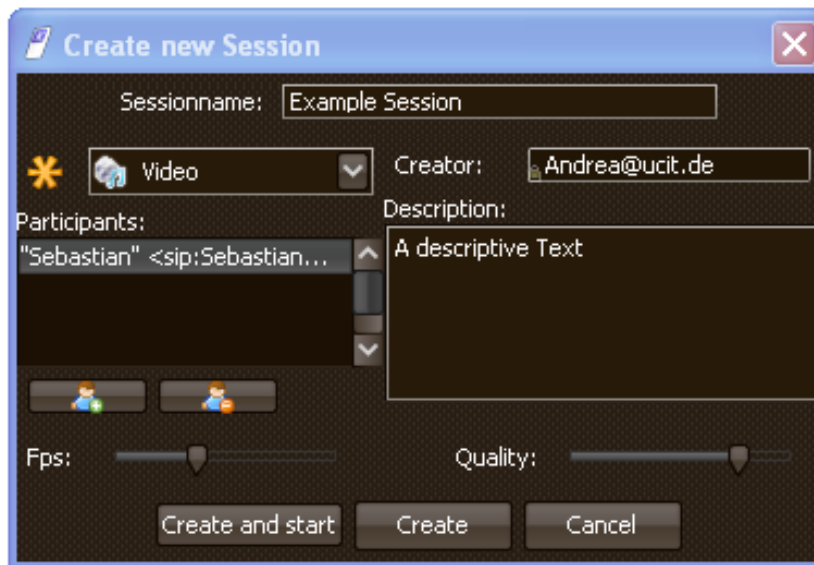
# RT-multimedia-streaming sideeffects in MANETs

## KopAN



# RT-multimedia-streaming sideeffects in MANETs

## KopAN



## Sideeffects

- Wireless connections
  - Reduced bandwidth
    - 802.11b 11mBit -> 5. netto
    - less available throughput
  - Reduced link-stability
    - Higher packetloss

## Sideeffects

- MANETs
    - More routing messages (OLSRD , Ethernet)
    - Frequent topology changes
    - Regular bandwidth variations
    - Increased netload, less available throughput, packetloss
  
  - Packetloss
    - F. Schmidt-Eisenlohr:: in close-up range : 20-40%
    - KopAN: 22% 2-Hop
- Essential differences regarding network use

## Sideeffects - SIP

- Robust messagflow -> confirmation of messages
- Delays -> message retransmission
  - Higher delays till retransmissions
  - More frequent updates cover topology changes

## Sideeffects - Video (high quality)

- High datarate
- Codec
  - Datasize
  - Performance (Delay)
  - Acceptable packetloss ratio
- MJPEG
  - High video quality
  - Not robust
  - Performant encoding/decoding



## Sideeffects - Video (high quality)

- H264
  - Encoding is ideal for lower-bandwidth
  - Higher rate of packetloss acceptable
  - Inperformant encoding/decoding
- Redundant Audiotransmission (Dr. Heinz)
- Redundant Videotransmission ☹️

## Outlook

- H264
- Analyse robust Video-Codecs
- Route characteristics (linklosses → quality update)
- Session description protocol
  - Adjust maximum videoquality
  - Rescaling during Multicast (→ delay increasement)

## Summary

- Kopan
  - Realtime content distribution to several devices in area→ Content focuses cooperations
- Multimedia streaming over MANETs
  - Reduced databandwidth
  - Robust codecs (~ 22% Packetloss)
  - Small datapackages ( 980byte Payload )
  - Quality adjustment (Videoresolution, Route quality)
- SIP messaging over MANETs

**Thank you for your attention**

**Questions / Ideas**

## Concept

- Distributed cooperation between mobile devices
- Via captured multimedia-data
  - Real-time media streaming
- Multi-hop wireless networks
- No necessity of access to wired network infrastructure
- Including group-based Session Management

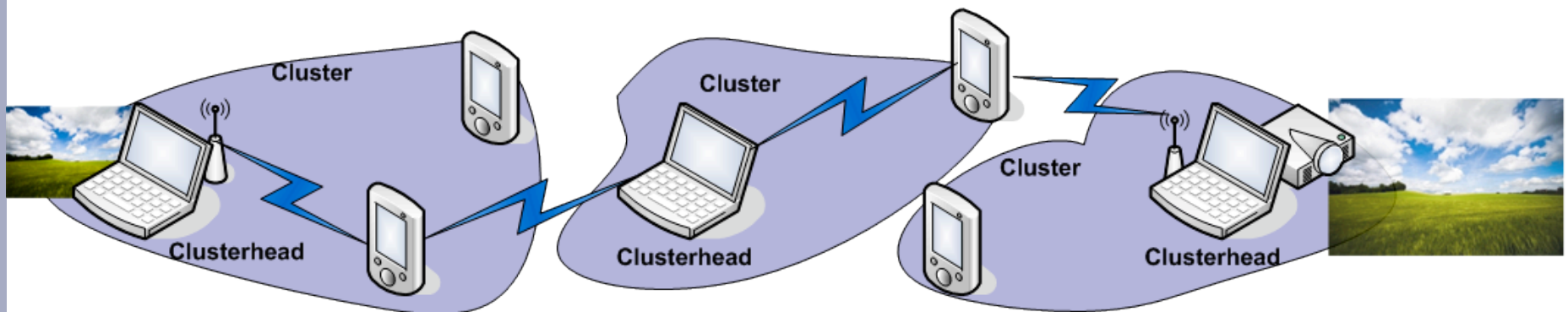


## Review

- Prof. Schiller:
  - Funkwellen breiten sich nicht kreisförmig aus!
  
- Dr. Heinz :
  - Packetverlust durch Dopplereffekt / Reflektionen  
→ Redundante Übertragung
  
- Prof. Cycoon
  - Vielfalt mobiler Geräte
  - Pädagogische Aspekte Video basiertes Mobiles Lernen
    - Videoqualität muss hoch sein
  - Mobile multimedia group conferencing /realtime communications

## MANET

- Mobile ad-hoc network protocol
  - OLSR
    - Proactive routing protocol
    - MPR based during topology-generation
    - fast route recovery, but reduction of message overhead



## Outlook

- Integration of SIP based session-/user-management
  - Without necessity of connection to wired networks
- Integration of SDP based Quality management
  - enables reduction of transferred media to minimal required quality
- Encryption of media-streams during transfer



# RT-multimedia-streaming sideeffects in MANETs

- Proactive vs. Reactive routecreation
- Flooding,