

# [Technical requirements and evaluation methodologies of relay system ]

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Purpose:

For discussion and definition on technical requirements and evaluation methodologies relay system.

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# Evaluation methodologies

## quantitative metrics (a)

- SNR & SNIR histograms
  - Defines the ratio of the received signal power to the sum of the interference and noise power.
- Resources utilisation
  - Ratio of resources used to total available resources available - dependant on demand
- End-to-end delay
  - Delay defined between traffic source to traffic destination
- Blocking probability
  - This can be given based on the type of access requested (Should be better for the relay case!)
- Drop probability
  - Handover, coverage holes (for the relay case this should be better! – depend on mobility characteristics)
- Latency for re-transmission techniques
- Packet loss statistics
- Interference statistics
- System throughput
  - Quoted in bps of the useful traffic, spectral efficiency can be used supplementary

# Evaluation methodologies

## qualitative metrics (b)

- Resources utilisation
  - Ratio of resources used to total available resources available - dependant on demand
- QoS Support
  - Types and quantity of streams supported, percentage of conformance
- Overhead evaluation
  - Feedback and control overhead and effectiveness
- Complexity – cost issues
  - Hardware complexity, processing needs, amplifiers
- Cell-edge QoS
  - Types of applications that can be supported at the edge, SINR statistics, packet loss

# Technical requirements

## (1) RF and antenna

- Multiple antenna arrays supported (mandatory)
  - MIMO
  - Support adaptive array processing
- Directional antennas (mandatory)
  - Sectorized antennas required for BS
  - Two antennas are required for the RS (Rx, Tx)
- Narrow-beam (pen-beam) (optional)

# Technical requirements

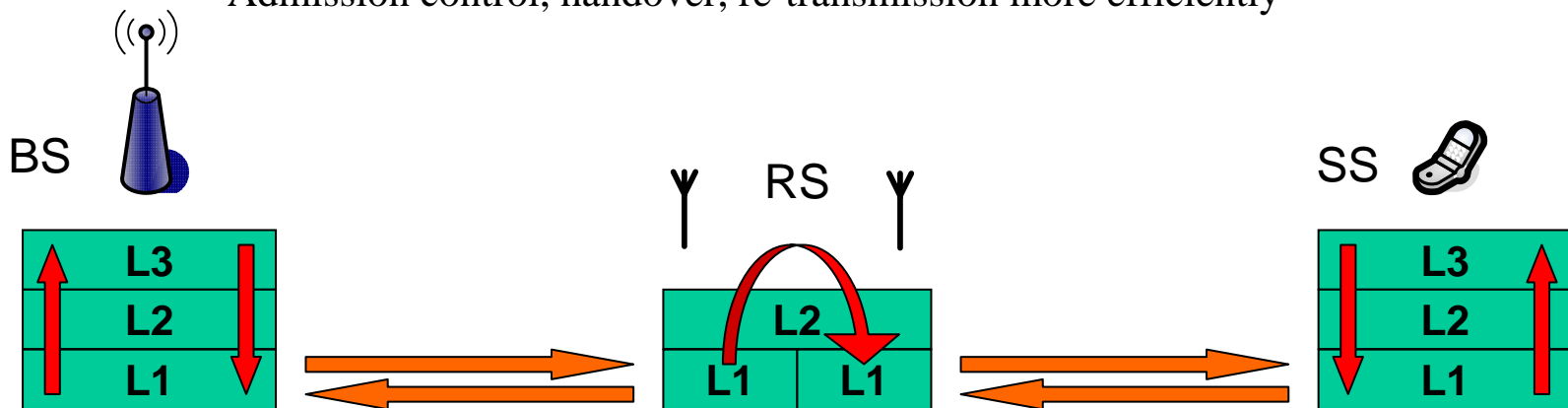
## (2) Radio resource management

- Two or more radio resource units should be available to support relaying (time, frequency)
- Dynamic sharing of radio resource sharing should be considered
- Spatial filtering may be used to increase re-usability
- Inner, outer zone decoupling makes frequency planning easier and more efficient.

# Technical requirements

## (3) RS specifications

- Amplify and forward
  - Simple, but might not be intelligent enough to exploit link diversity and provide QoS. Error propagation is also an issue?
  - Cannot support RS L2 re-transmission
- Decode and Forward
  - Requires
    - Buffering (for L2 retransmission, scheduling)
    - Scheduler (QoS, better exploitation of bandwidth)
    - Decoder is needed
  - Can support
    - Admission control, handover, re-transmission more efficiently



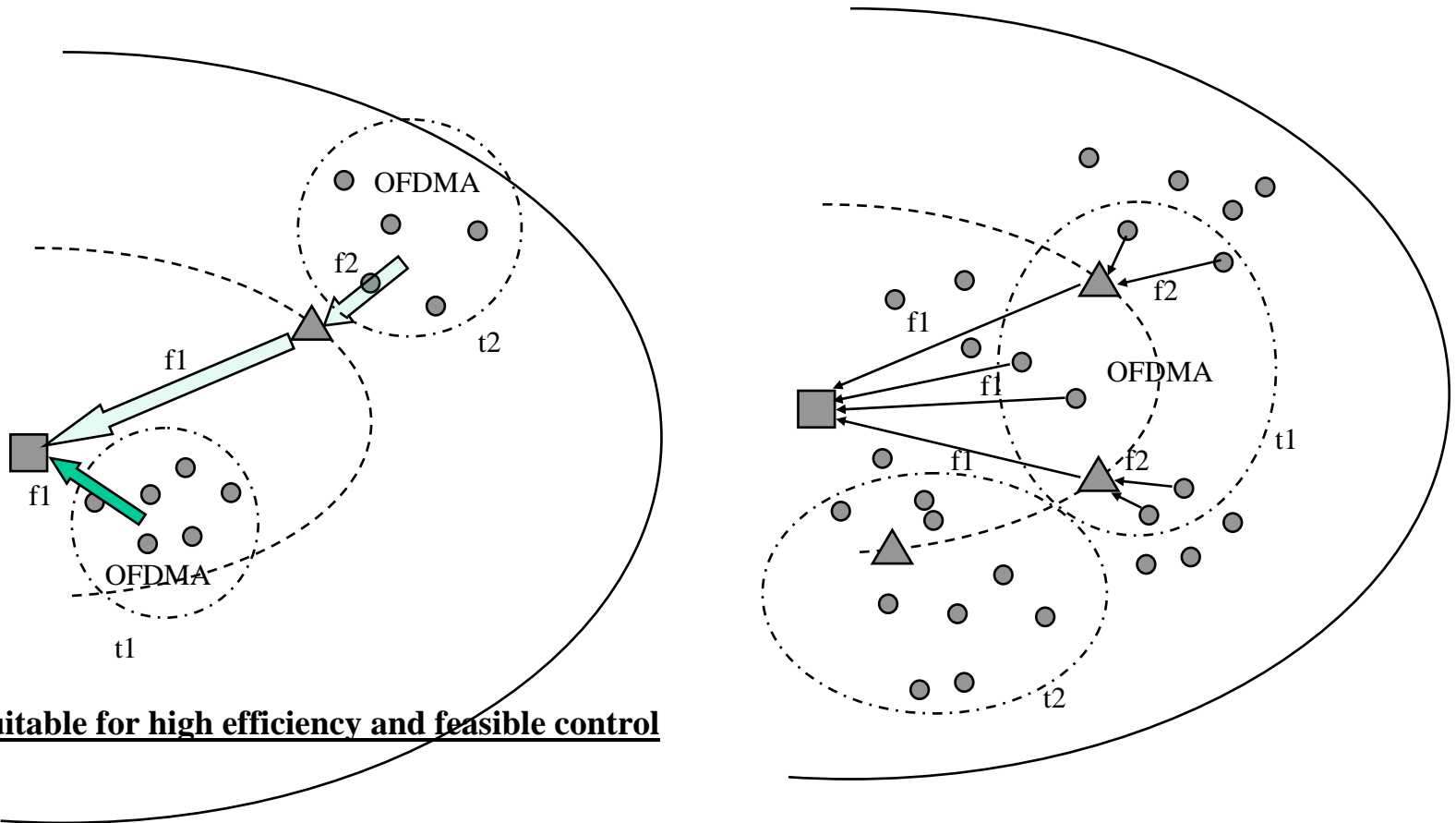
# OFDMA and multiuser access

## (1) OFDMA relaying concept

- One OFDMA multiuser access (mandatory)
- Multiple OFDMA multiuser access (mandatory)
- Grouped SSs via one OFDMA relaying (mandatory)
- OFDMA-SDMA (optional)
- Mixed SS/RS OFDMA relaying (optional)

# OFDMA and multiuser access

## (2) Illustration of OFDMA and multiuser access



More suitable for high efficiency and feasible control



# Channel model requirements for Both desired signal and interference

- BS-RS: Fixed wireless channel
  - IEEE802.16-2004: SUI channel model
- BS-SSs, RS-SSs
  - Typical urban channel model (shadowing)
  - Short-term multipath fading
- RS-RS
  - Will depend on different proposals
  - Need to compare performance with both environments
- Measurement channel
  - Might be important for modelled channel verification
- Ray-tracing based channel
  - Might be important for a specific and practical relaying environment for comparison of various proposals within selection procedure