[Technical requirements and evaluation methodologies of relay system]

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:

IEEE C802.16j-06/030

Date Submitted:

2006-05-02

Source:

[Author Name] Yong Sun, Dharma Basgeet, Dimosthenis Kothris and Yuk Chow

[Company] Toshiba Research Europe Limited

[Address Line 1] 32 Queen Square

[Address Line 2] Bristol BS1 4ND, UK

Voice: +441179060700

Fax: +441179060701

E-mail: {Sun, Dharma Basgeet, Dimosthenis Kothris, Yuk Chow} @toshiba-trel.com

Venue:

IEEE 802.16 Working Group Session #43, Tel Aviv, Israel

Base Document:

None

Purpose:

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

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

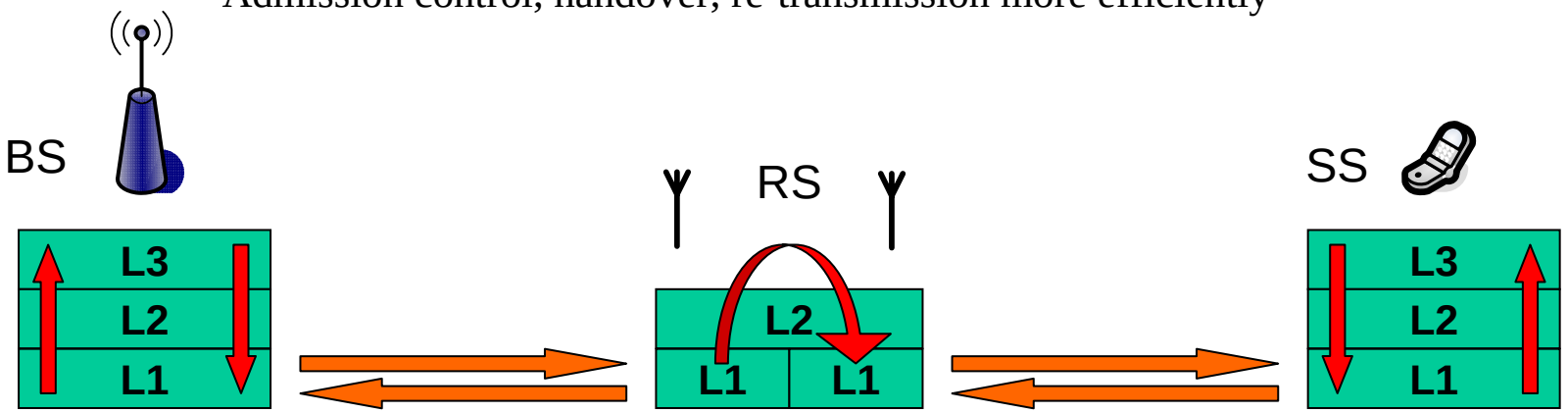
- Multiple antenna arrays supported (mandatory)
  - MIMO
  - Support adaptive array processing
- Directional antennas (mandatory)
  - Sectored antennas required for BS
  - Two antennas are required for the RS (Rx, Tx)
- Narrow-beam (pen-beam) (optional)

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

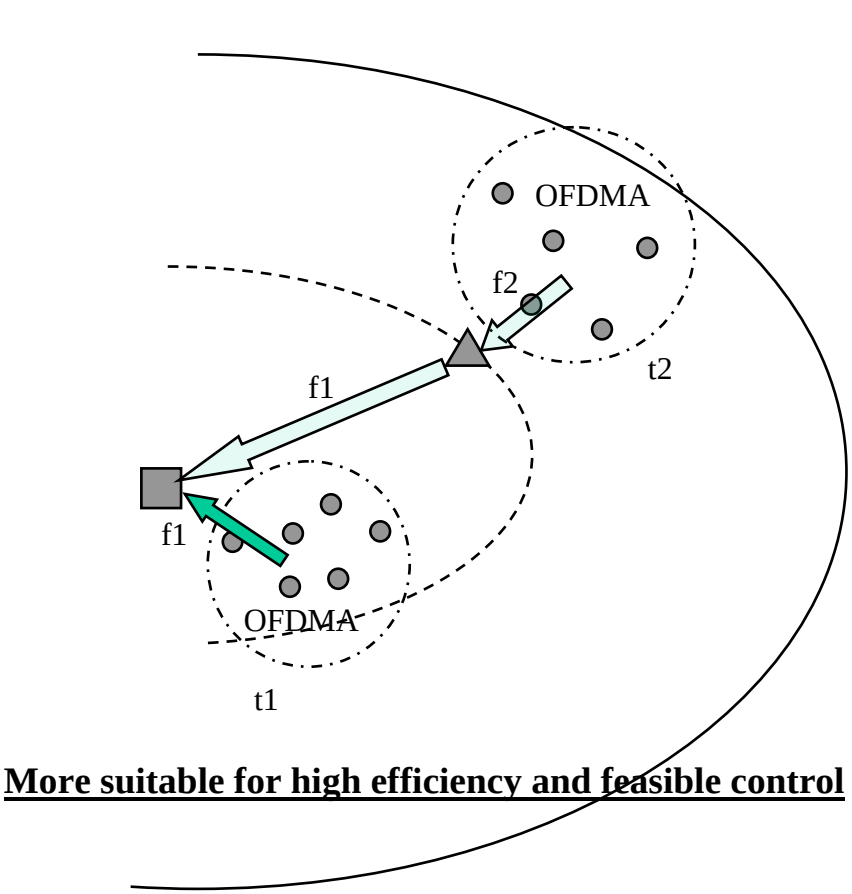
- Amplify and forward
  - Simple, but might not be intelligent enough to exploit link diversity and provide QoS. Error propagation is also an issue?
  - Cannot support RS L2 re-transmission
- Decode and Forward
  - Requires
    - Buffering (for L2 retransmission, scheduling)
    - Scheduler (QoS, better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



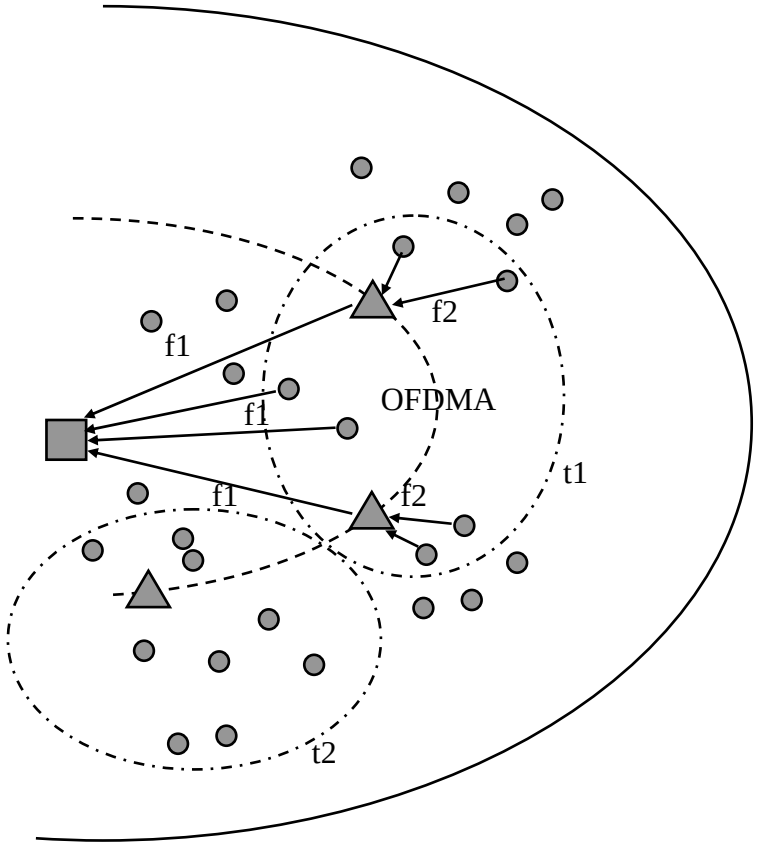
OFDMA and multiuser access
(1) OFDMA relaying concept

- 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