

Method for integration of cooperative relaying into the 802.16 standard

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Purpose:

Accelerate integration of cooperative relaying into the 802.16 standard

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Cooperative relaying system

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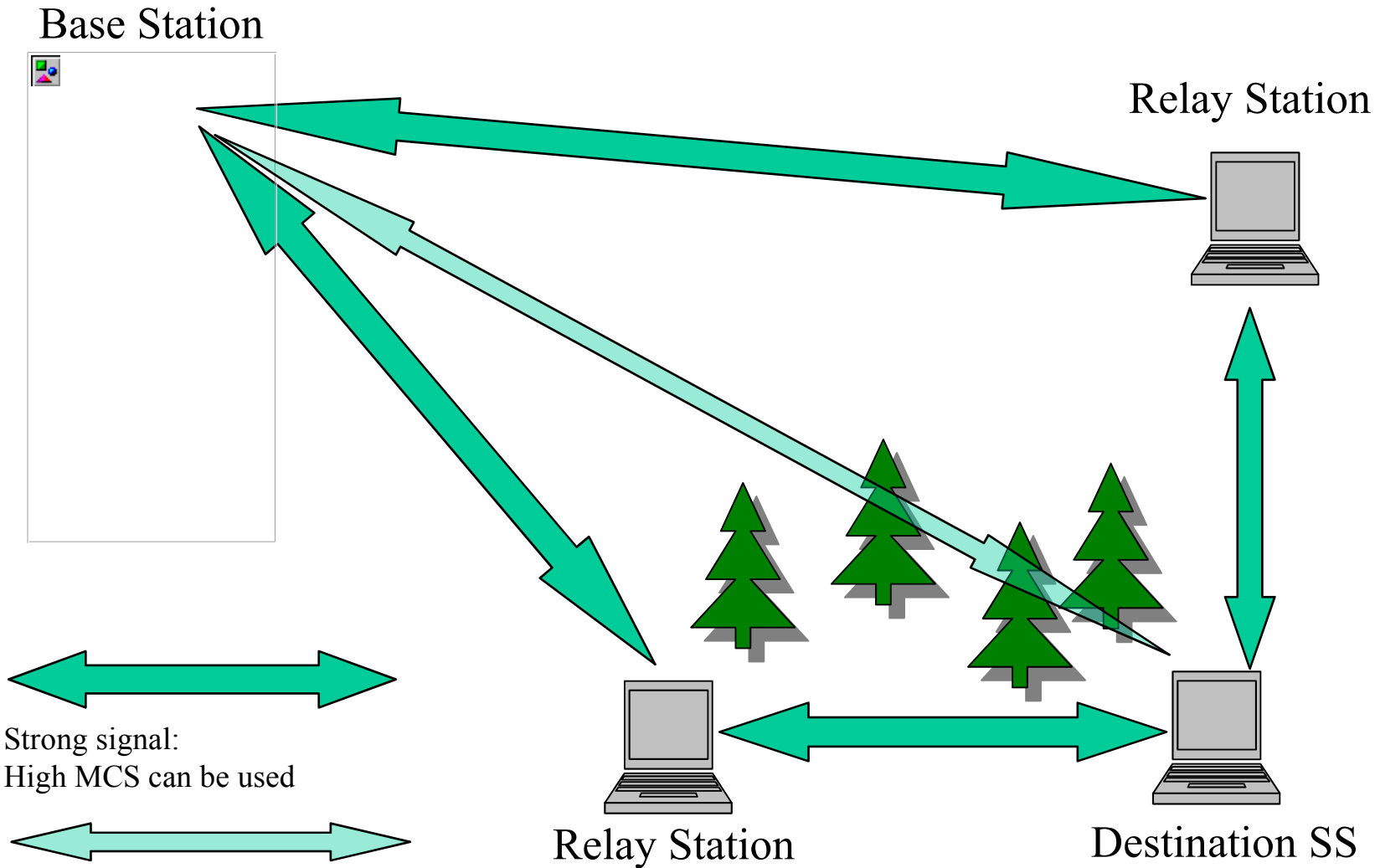
Problem description

- Strong competition with networks based on other technologies that operate at different frequencies
- Limitations of 802.16 aimed frequencies
 - Bypass obstacles and penetrate into buildings
 - Uncertain and fast changing channel conditions
- Solution Aim
 - Increase 802.16 system cell size, coverage and throughput
 - Backward computability and easy extension of 802.16e standard.

Suggested solution – cooperative relaying based

- Cooperative relaying means multiple synchronized transmissions from spatially distributed relaying stations of bursts originated at BS and/or multiple MSs
- The BS indicates all relaying transmissions for relayed bursts
- The relaying stations may be MS with relaying capability or dedicated relay stations (RS)

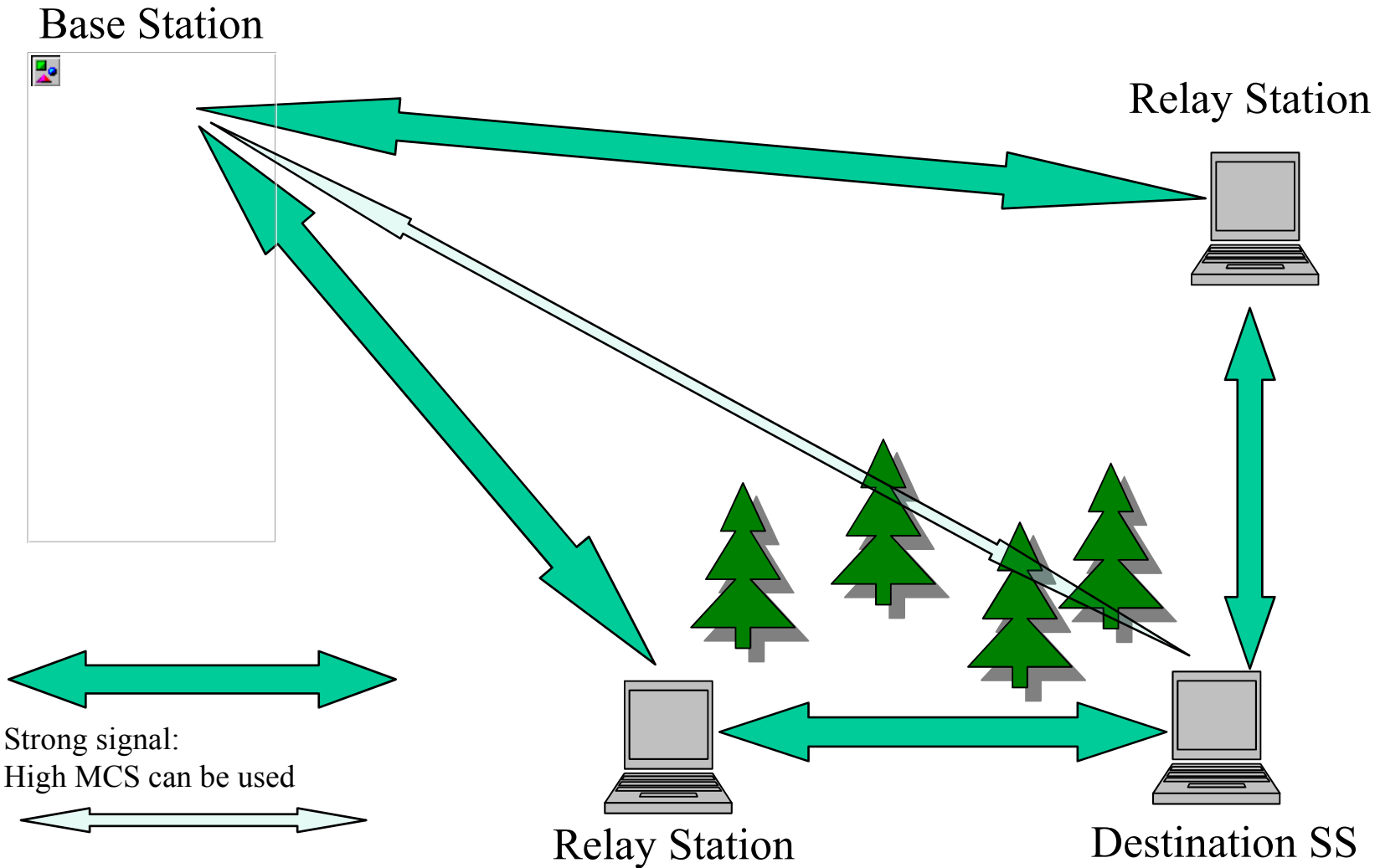
Scenario 1: Simple Cooperative Relaying



Strong signal:
High MCS can be used

Weak signal:
Received preamble and maps in the DL
Received CDMA, FFB and HARQ ACK/NACK in the UL

Scenario 2: Advanced Cooperative Relaying



Very weak signal:
Not received preamble and maps in the DL
Not received CDMA, FFB and HARQ ACK/NACK in the UL

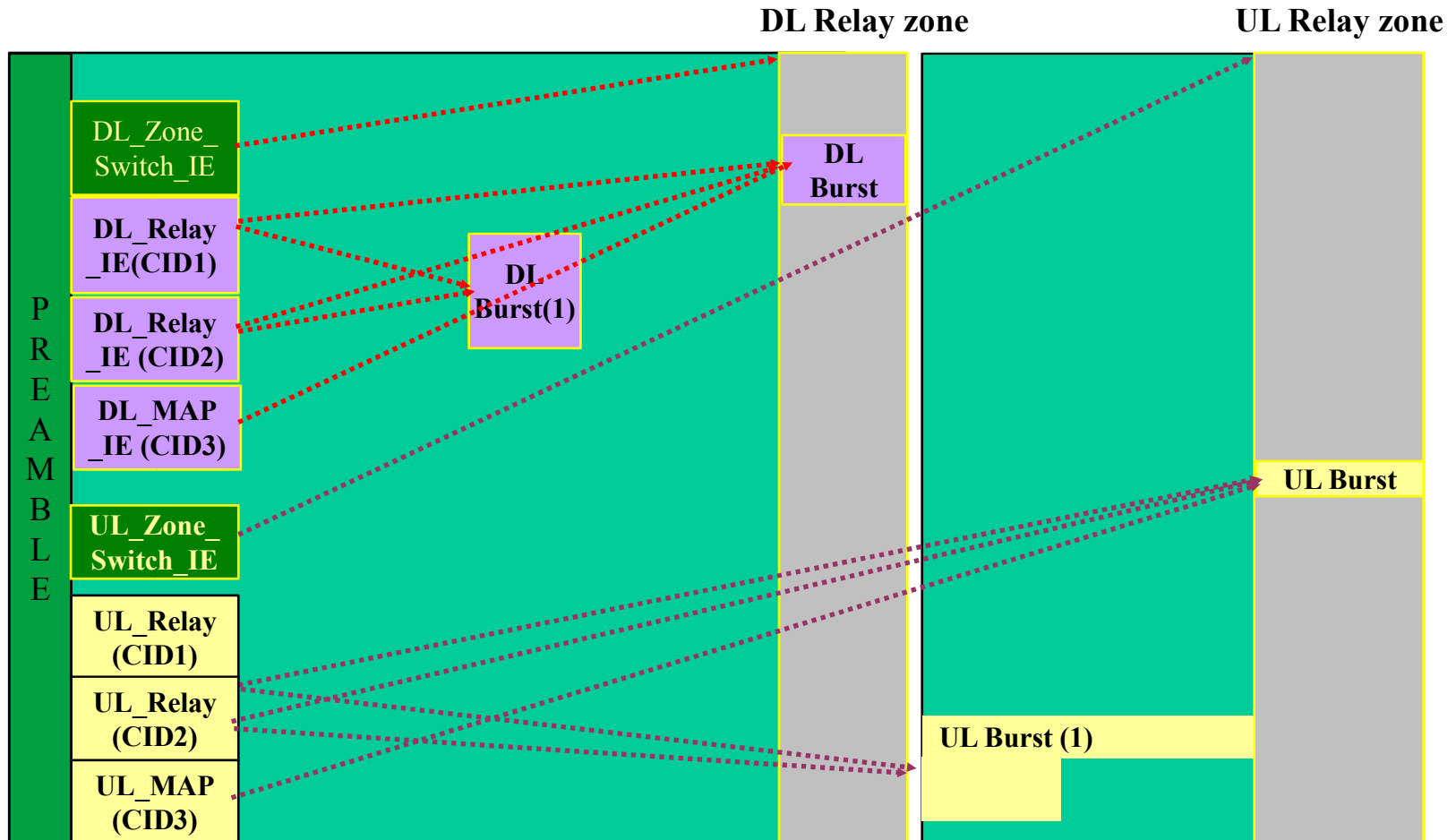
Simple Cooperative Relaying

- Aims SS that communicates directly with BS
 - Preamble and maps from BS and ranging from SS are received
 - Only bursts are relayed
- Relaying transmission and receptions are in dedicated zones
- BS transmits in maps all the allocations of relay transmissions for each relayed burst.

Simple Cooperative Relaying frame structure

Downlink sub frame

Uplink sub frame



CID 1&2 of Relay Station, CID 3 for regular MS.
DL/ UL burst (1) to be repeated in the relay zone burst allocation.

Simple relaying benefits

- Low cost relays
 - Dedicated relays may cost less than SS since MAC is not handled
- Increased cell size
- Higher throughput with higher MCS
- Suitability for higher RF frequencies
 - Bypassing obstacles is improved by far
- Allows direct SS transmissions to other SS without reception at base station

Advanced relaying with respect to simple relaying

- More labor is required for implementing
- Higher coverage inside the cell
 - For example outdoor and indoor penetration
- Increased cell size
 - Limited by efficiency of protocol and not by physical channel
- Consumes more power from relaying stations
 - Additional relaying transmissions (mid-amble, maps, FCH, CDMA for ranging and for bandwidth request, FFB and HARQ ACK/NAK or some of them)