Evaluation of Sector Throughput for Relay Frame Structures

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Re: Comment 165 and Contribution C80216m-08_1058 on evaluation of relay frame structures and recommendation for changes.

Purpose: Compare sector throughputs of Option 1 and Option 2 for relay frame structure.

Introduction

- Sector throughput shall be evaluated jointly for DL and UL (rather than separately) when relay infrastructure is present.
  - UL throughput can be boost at the cost of slightly degraded DL throughput, thanks to advanced MIMO-based interference cancellation technique.
  - Both UL and DL throughput can be boosted when network coding technique is enabled in Option 2.
- It is too optimistic and not accurate to calculate throughput only based on BS incoming/outgoing data.
  - Subsequent relay scheduling constraints shall be taken into account (see next slides).

Deployment Scenario

Option 1

BS

Orthogonal Resource Allocation

50

MS-1

100

RS-1

25

MS-2

50

RS-2

50

MS-3

50

MS-1

100

25

MS-2

50

MS-3

50

It is not accurate to only count on BS incoming/outgoing traffic as throughput, because bottleneck could be RSs.
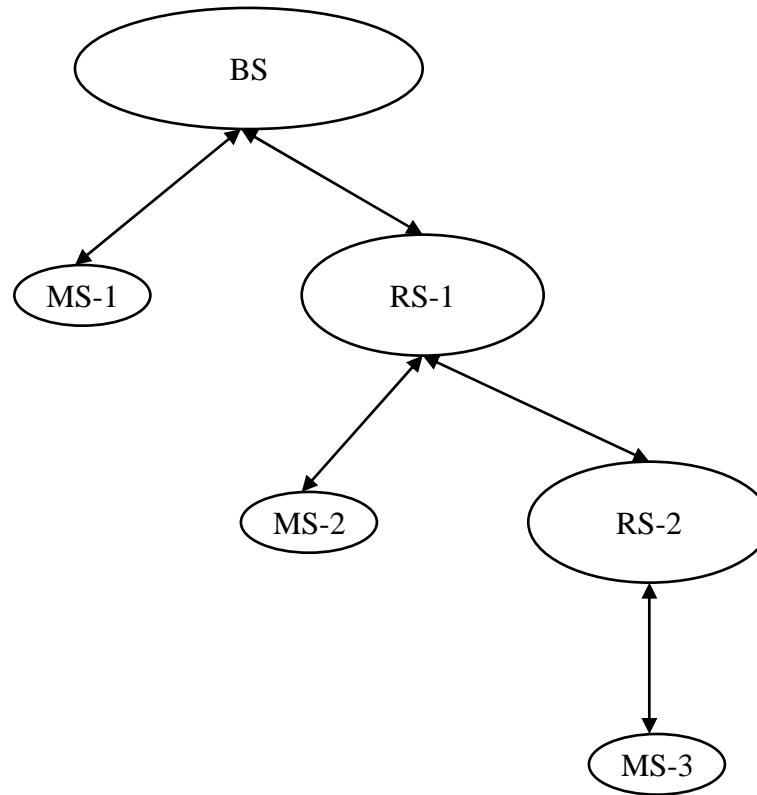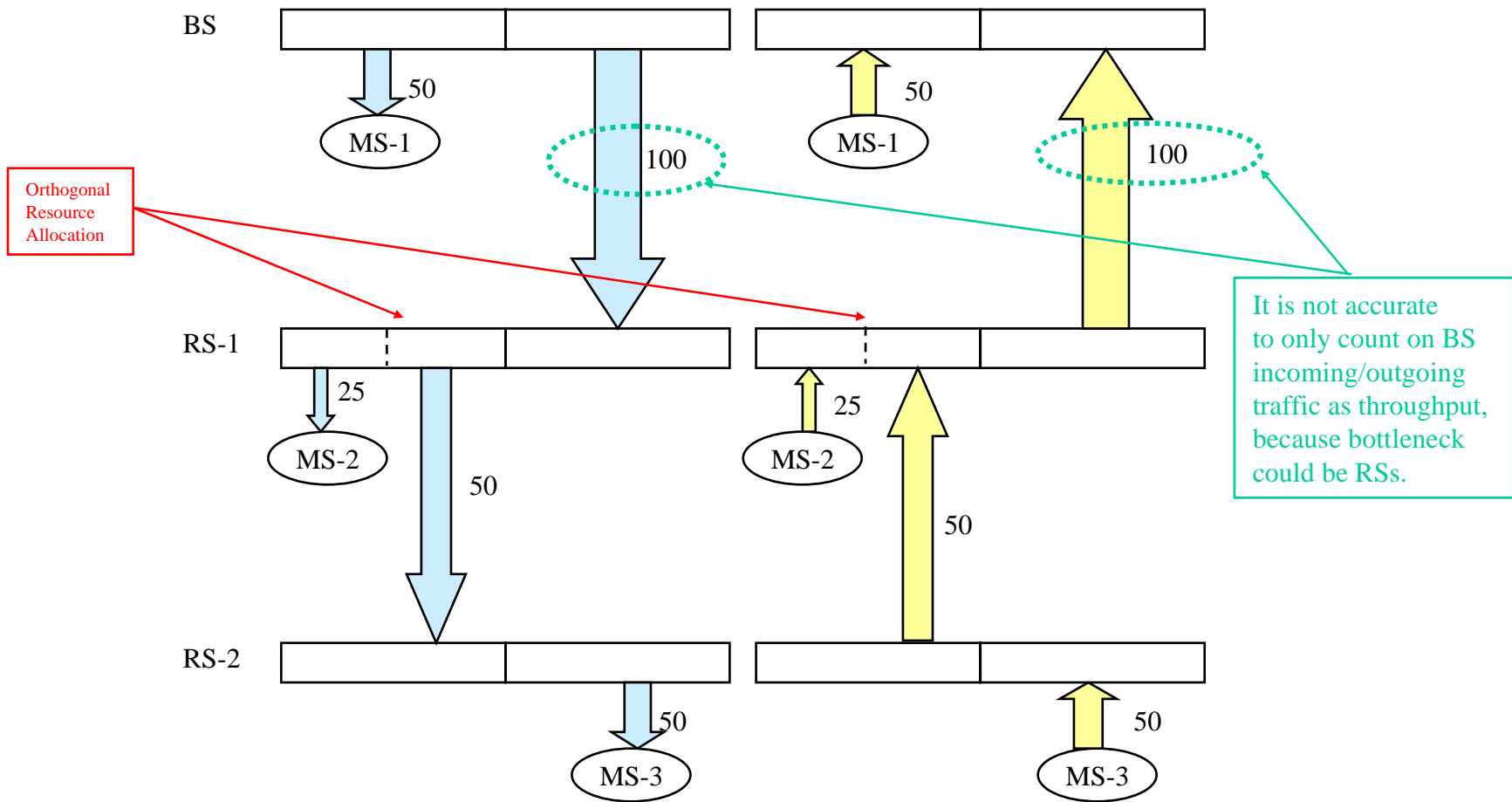
DL throughput: 50(BS → MS-1) + 25(RS-1 → MS-2) + 50(RS-2 → MS-3) = 125

UL throughput: 50(MS-1 → BS) + 25 (MS-2 → RS-1) + 50(MS-3 → RS-2) = 125

Option 2

BS

50

MS-1

75

Orthogonal
Resource
Allocation

RS-1

50

MS-2

25

RS-2

25

MS-3

50

MS-1

75

50

MS-2

25

25

MS-3
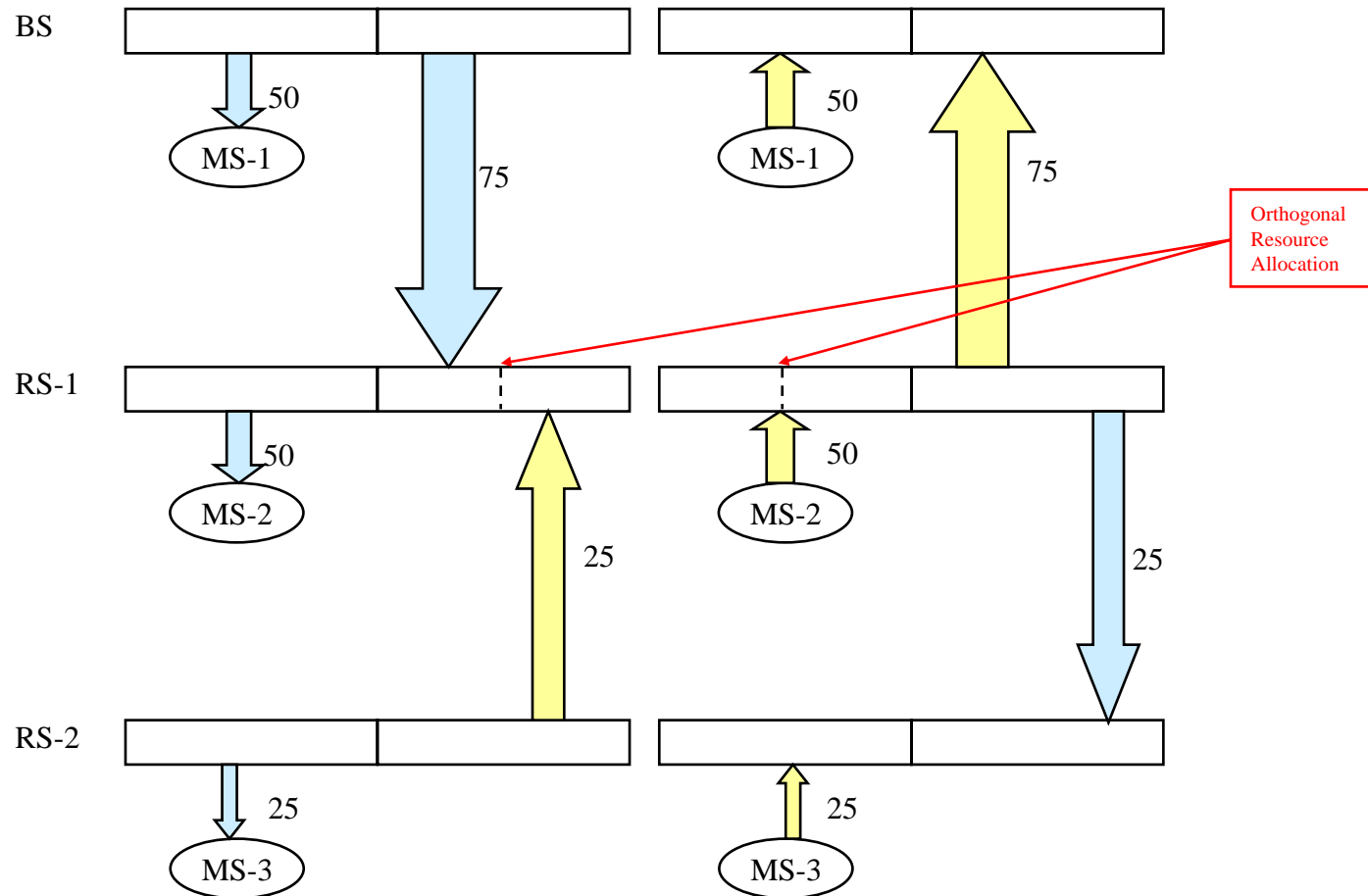
DL throughput: 50(BS → MS-1) + 50(RS-1 → MS-2) + 25(RS-2 → MS-3) = 125

UL throughput: 50(MS-1 → BS) + 50(MS-2 → RS-1) + 25(MS-3 → RS-2) = 125

Option 2 has the same sector throughput as Option 1.

Option 2 with advanced MIMO and network coding technique

BS

Consider DL (or UL) separately is not appropriate for RS infrastructures.

Slightly less throughput in DL could boost more throughput in UL with advanced MIMO-based interference cancellation technique.

50

MS-1

90

50

MS-1

100

Non-orthogonal Resource Allocation

RS-1

MIMO SIC

Network Coding

50

MS-2

50

MS-2

50

40

Network coding based transmissions boost both DL and UL throughput.

RS-2

40

MS-3

50

MS-3
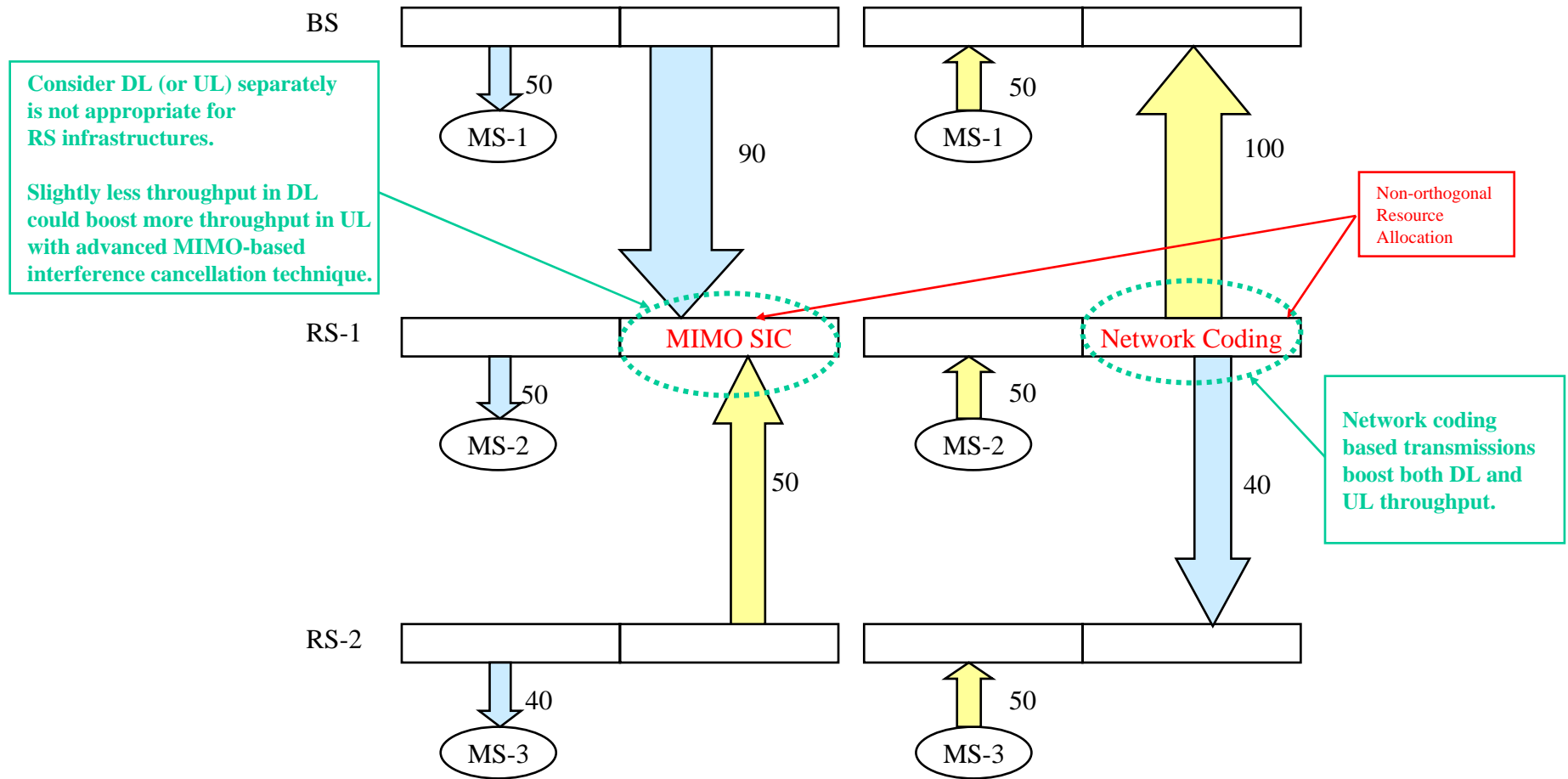
DL throughput: 50(BS → MS-1) + 50(RS-1 → MS-2) + 40(RS-2 → MS-3) = 140 (12% gain)

UL throughput: 50(MS-1 → BS) + 50(MS-2 → RS-1) + 50(MS-3 → RS-2) = 150 (20% gain)

Option 2 achieves more DL (+12%) and UL (+20%) sector throughput, thanks to advanced MIMO and network coding techniques.

Conclusions

- Option 2 has at least the same sector throughput (downlink and uplink), comparing to Option 1.

- Option 2 facilities the application of advanced MIMO and network coding techniques, hence achieving higher throughput, comparing to Option 1.