

Performance Gains from Vectoring in EFM

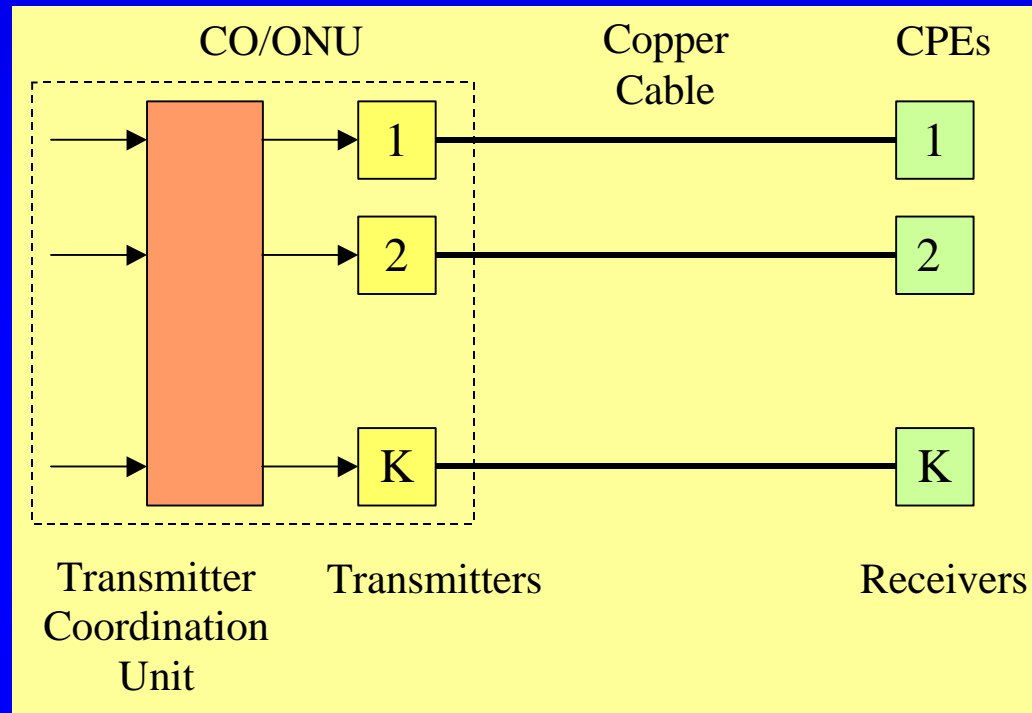
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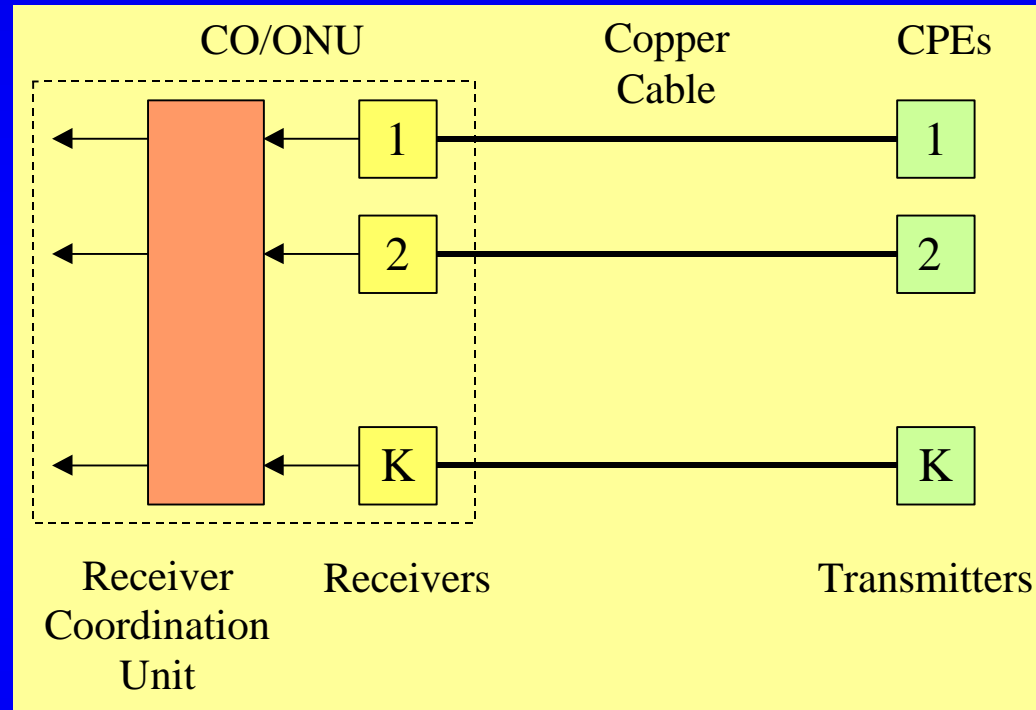
Downstream Vectoring



- Coordinate transmission to cancel FEXT.
 - ◆ “Partial coordination”: treat subset of pairs.
 - ◆ “Full coordination”: treat all pairs in bundle.



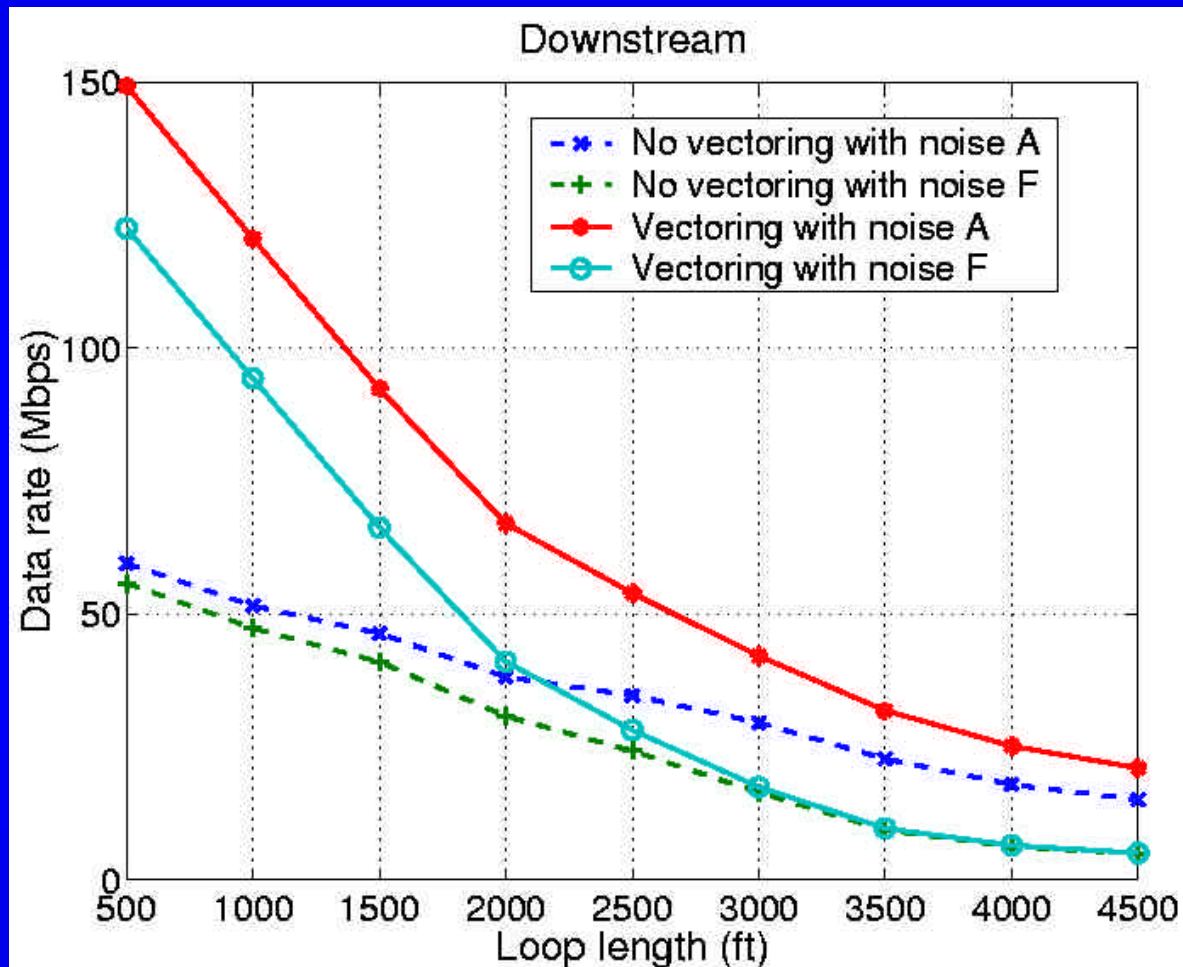
Upstream Vectoring



- Coordinate reception to remove FEXT.



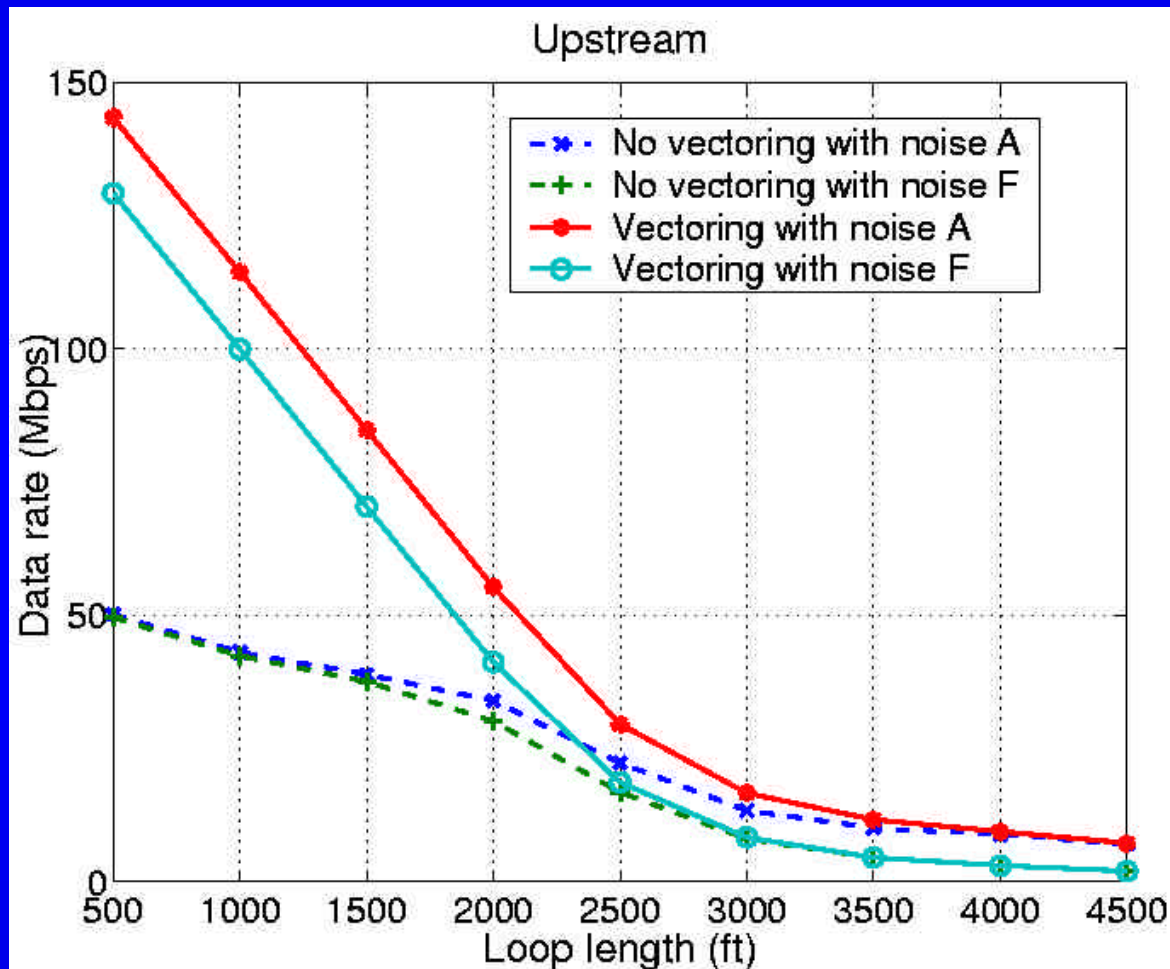
Downstream Rate vs. Reach



- ◆ VDSL parameters.
- ◆ FDD plan 998.



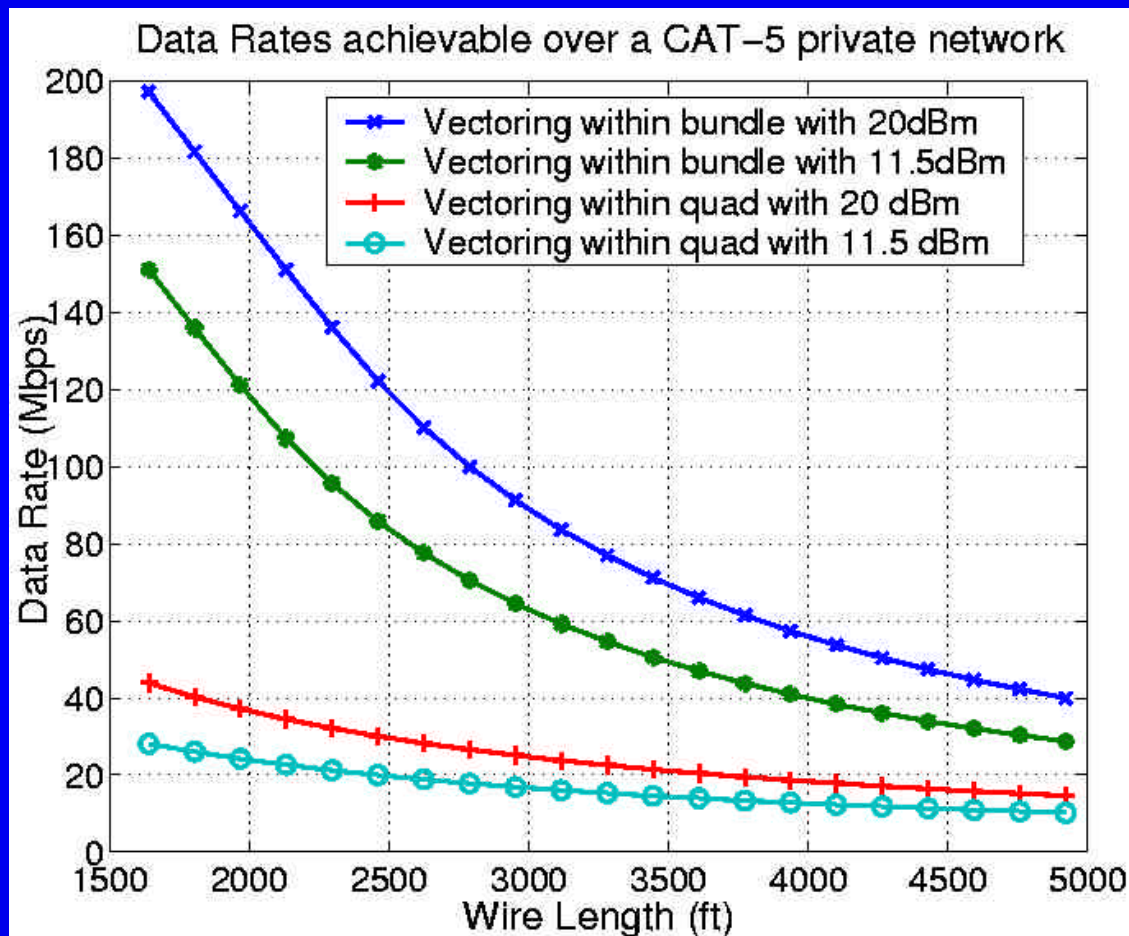
Upstream Rate vs. Reach



- ◆ VDSL parameters.
- ◆ FDD plan 998.



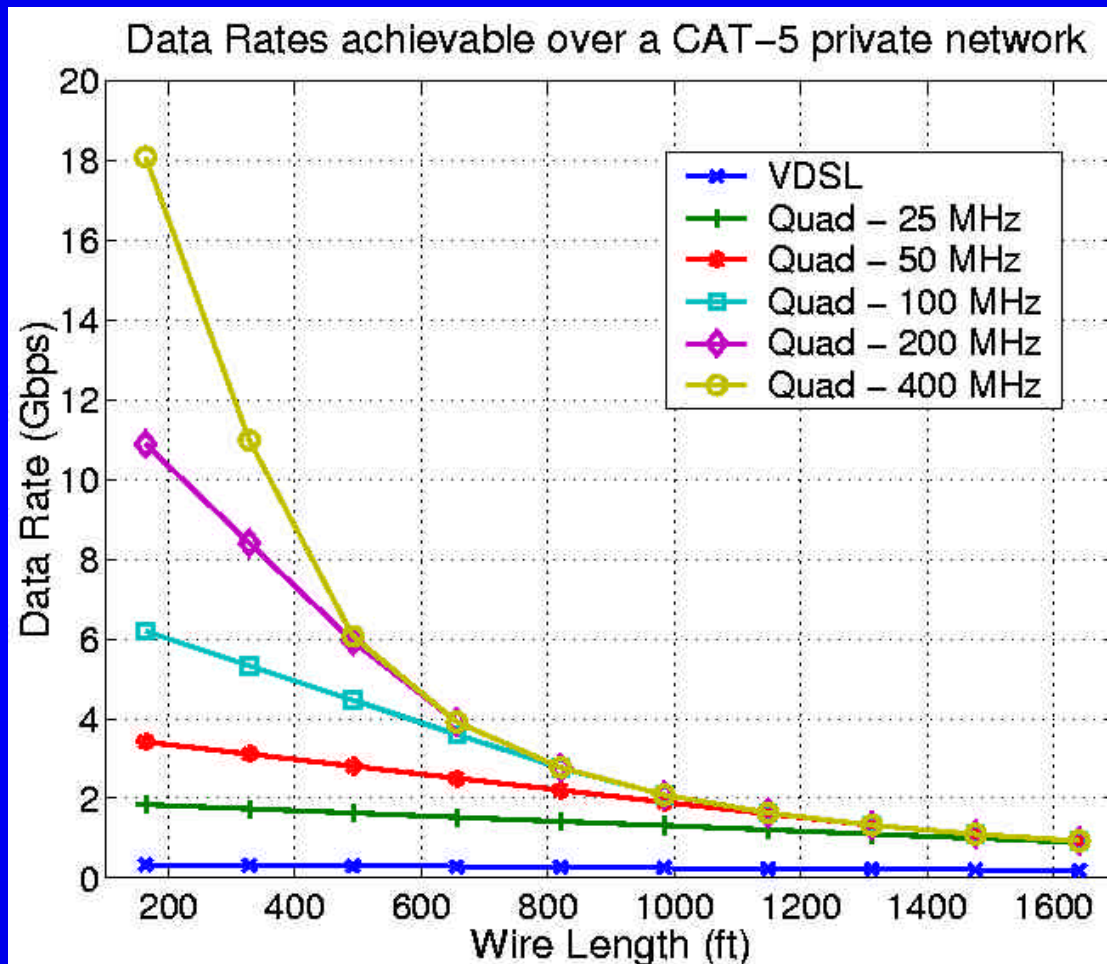
Vectoring in Private Networks



- ◆ 1 line easily allows 10Mbps at 5000ft.
- ◆ 2 lines enable 100Mbps at 3500ft.
- ◆ 4 lines enable 100Mbps at 5000ft.



Vectoring with Extra Bandwidth



- ◆ Wider bandwidth.
- ◆ 4 lines combined.



Cost Issues

- Vectoring allows a huge data rate/loop reach improvement for a moderate cost.
 - ◆ Including vectoring capabilities only requires adding an extra module to existing VDSL DMT implementations.
 - ◆ Computational complexity can be reduced thanks to the “sparseness” of the channel matrix.
 - ◆ Complexity increase is distributed over multiple lines.



Conclusion

- EFM performance is constrained by FEXT.
- Vectoring enables large performance gains.
 - ◆ 50Mbps downstream at 2500ft with 1 line.
 - ◆ 100Mbps at 3500ft with 2 lines.
 - ◆ 100Mbps at 5000ft with 4 lines.
- Extra design complexity is moderate.

