

Computer Networks

Border Gateway Protocol (§5.6.7)



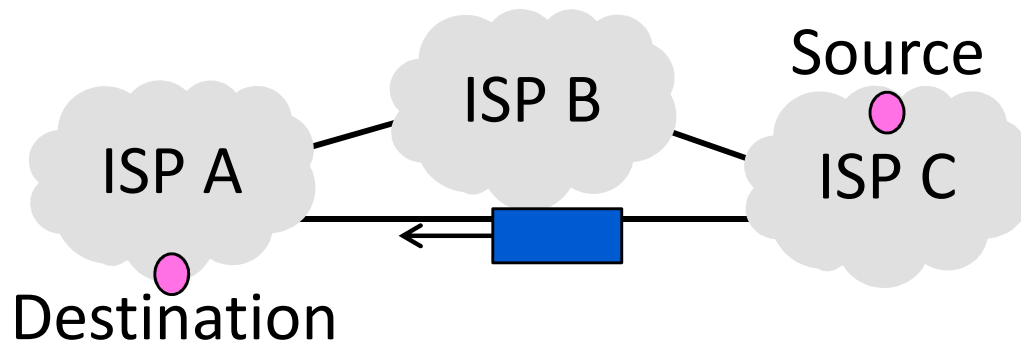
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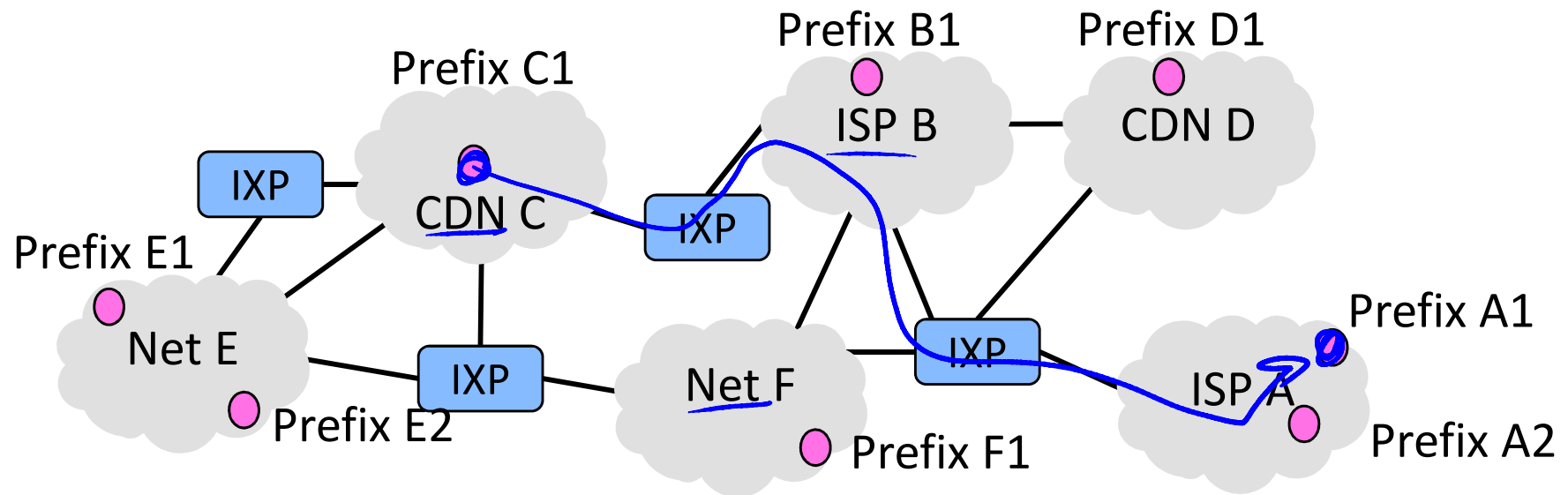
Topic

- How to route with multiple parties, each with their own routing policies
 - BGP computes Internet-wide routes



Recall

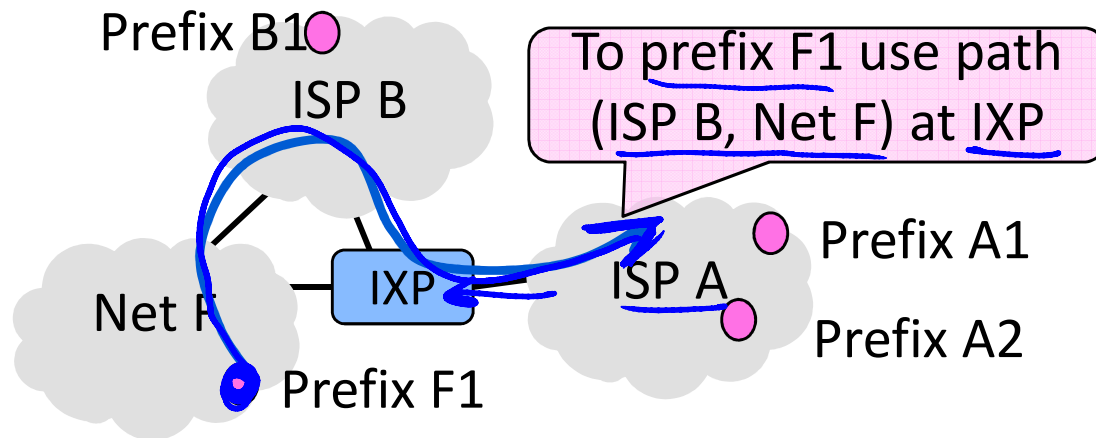
- Internet is made up of independently run networks
- Each network has its own route preferences (policies)



BGP (Border Gateway Protocol)

- BGP is the protocol that computes interdomain routes in the Internet

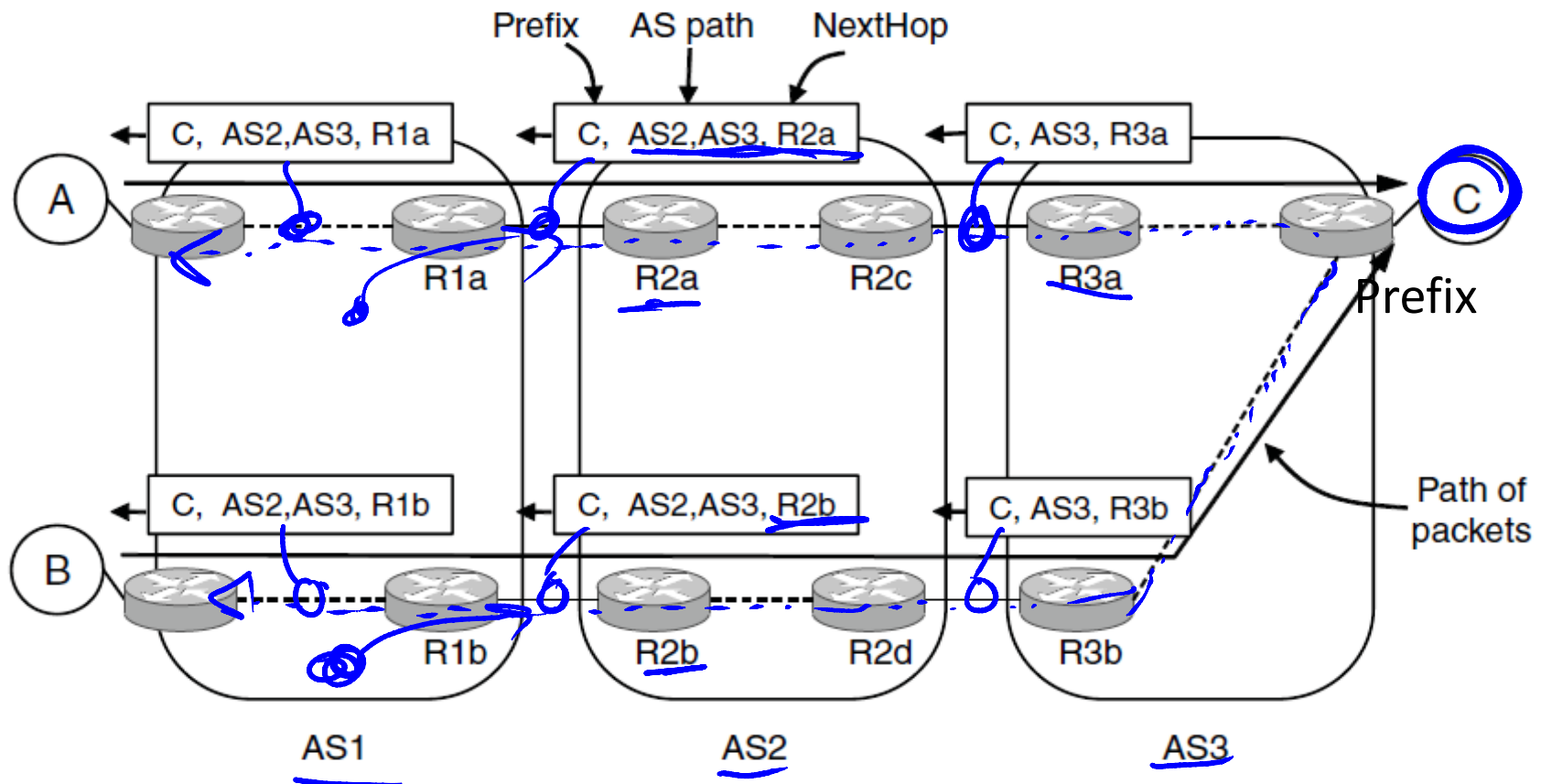
➔ Path vector, a kind of distance vector



BGP (2)

- Different parties like ISPs are called AS (Autonomous Systems)
- Border routers of ASes announce BGP routes to each other
- Route announcements contain an IP prefix, path vector, next hop
 - Path vector is list of ASes on the way to the prefix; list is to find loops
- Route announcements move in the opposite direction to traffic

BGP (3)



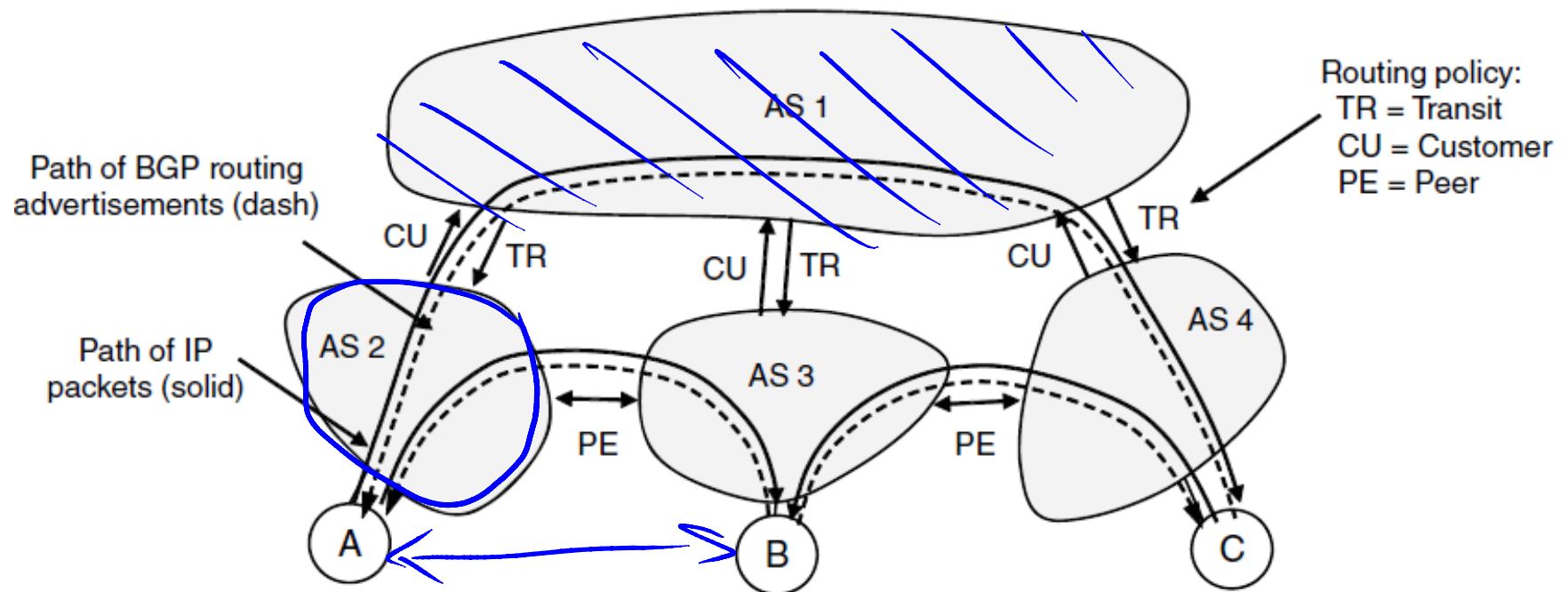
BGP (4)

Policy is implemented in two ways:

1. ↘ Border routers of ISP announce paths only to other parties who may use those paths
 - Filter out paths others can't use
2. ↘ Border routers of ISP select the best path of the ones they hear in any, non-shortest way

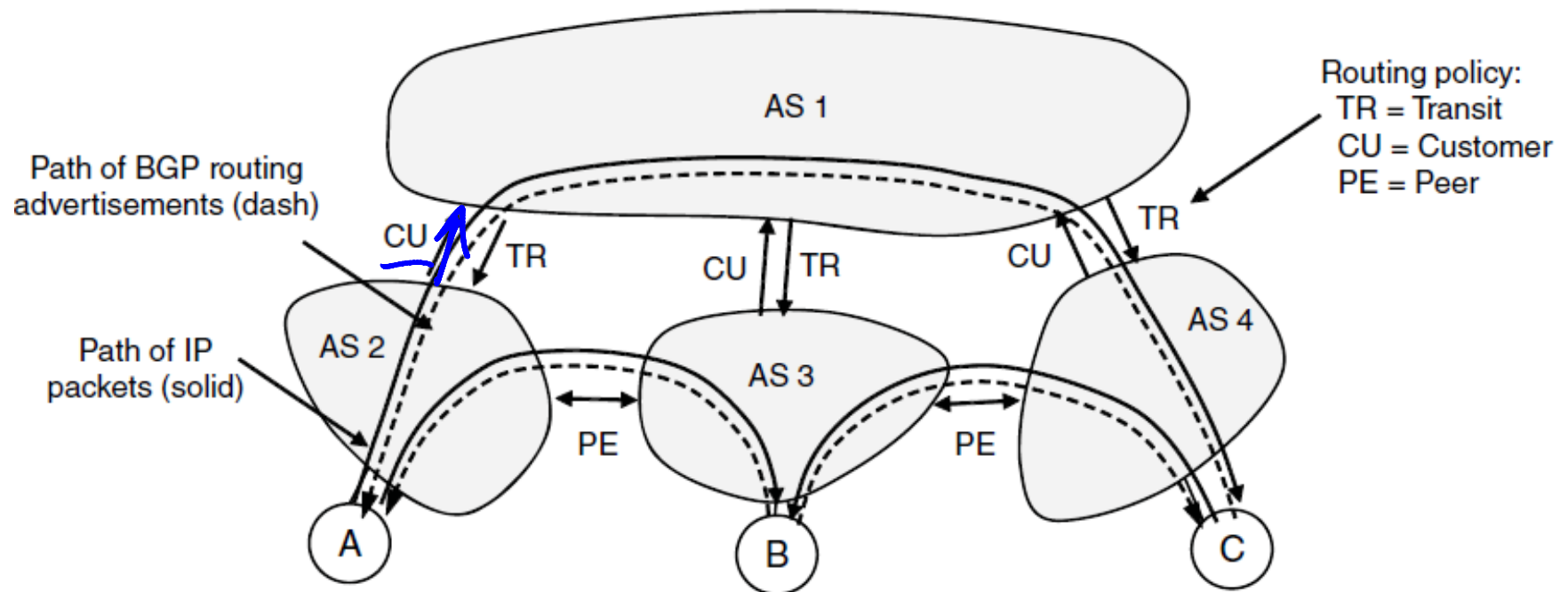
BGP Example

- AS2 buys TRANSIT service from AS1 and PEER service from AS3



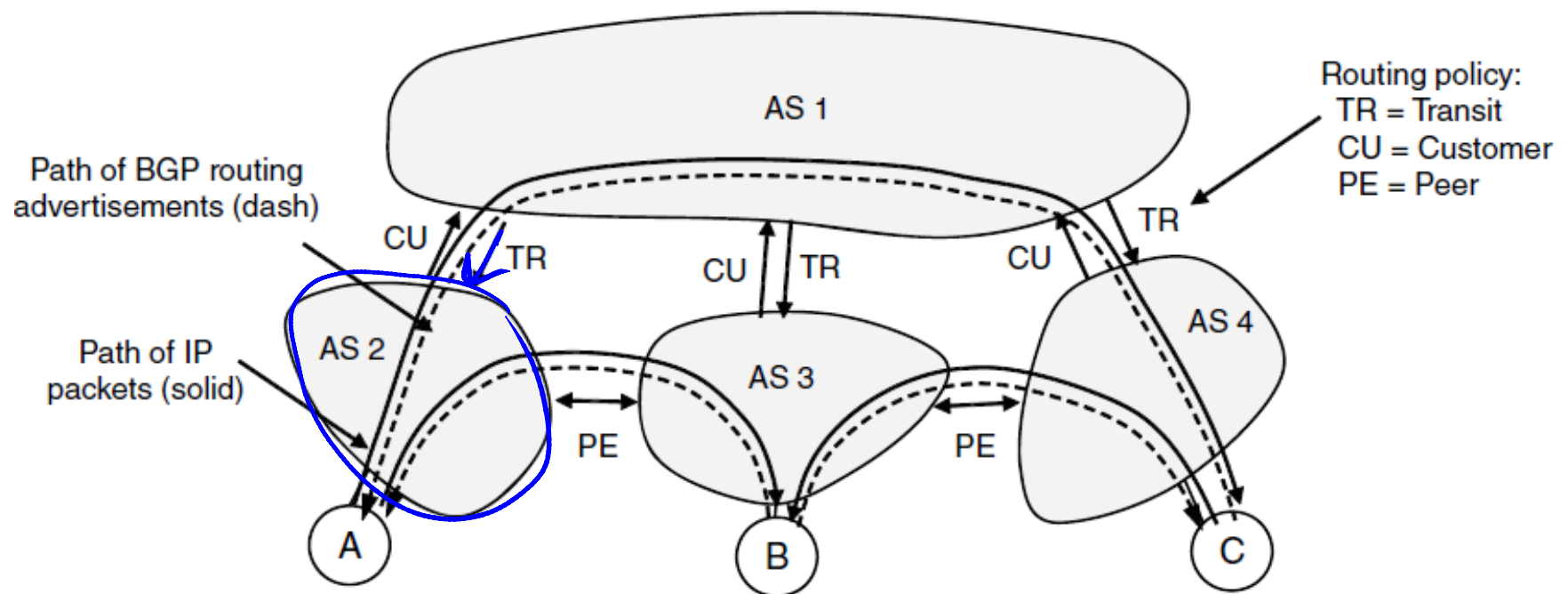
BGP Example (2)

- CUSTOMER (other side of TRANSIT): AS2 says [A, (AS2)] to AS1



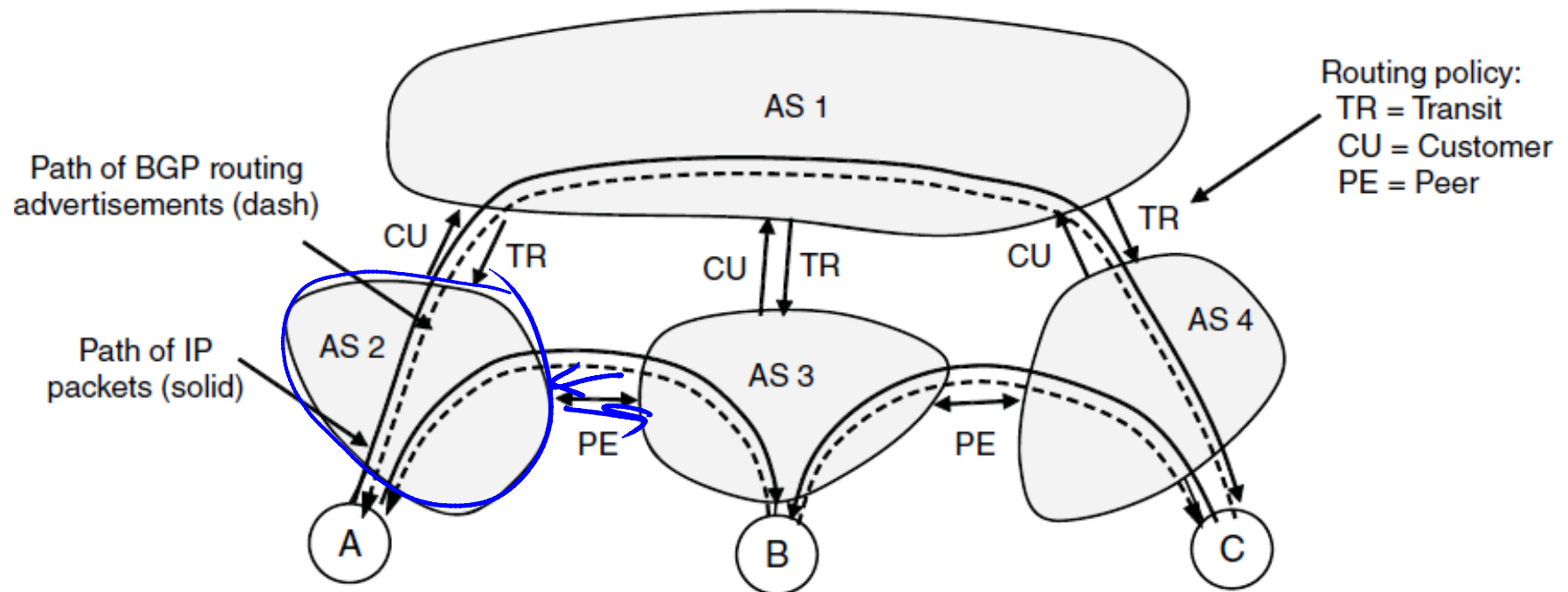
BGP Example (3)

- TRANSIT: AS1 says [B, (AS1, AS3)], [C, (AS1, AS4)] to AS2



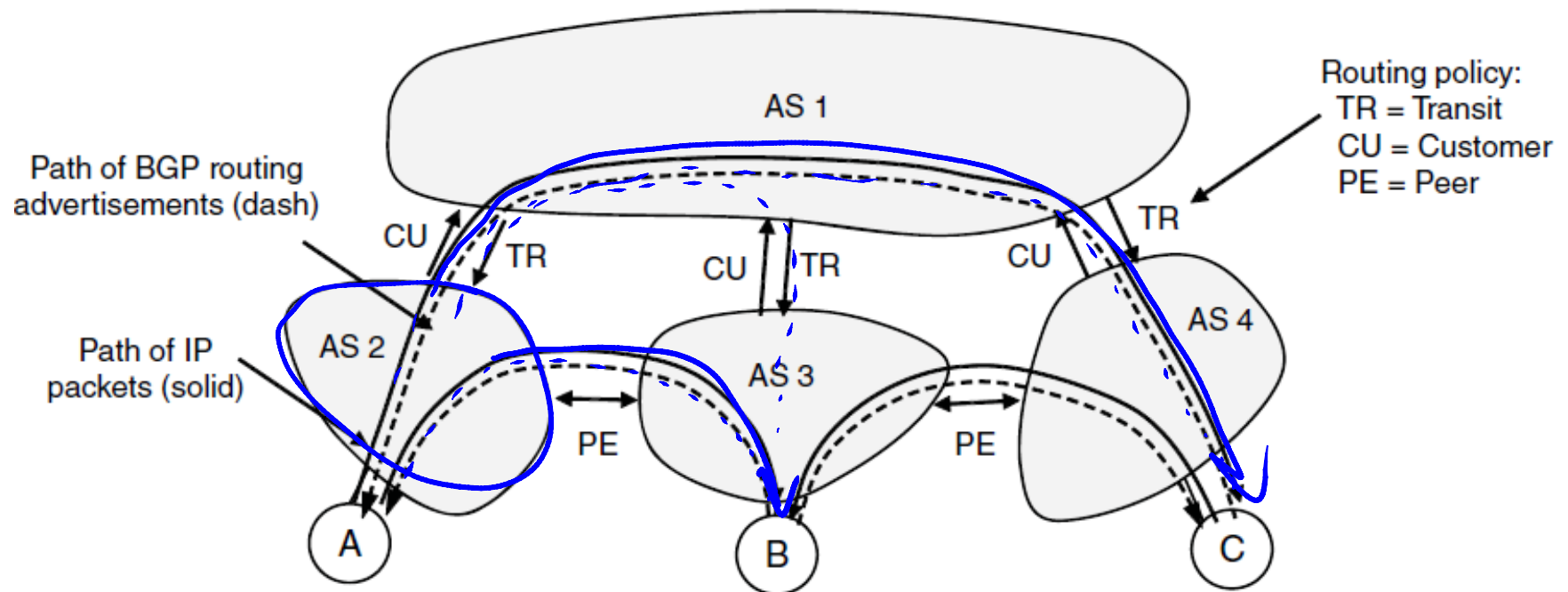
BGP Example (4)

- PEER: AS2 says [A, (AS2)] to AS3, AS3 says [B, (AS3)] to AS2



BGP Example (5)

- AS2 hears one route to C, and two routes to B (chooses AS3!)



Closing Thoughts

- Much more beyond basics to explore!
- Policy is a substantial factor
 - Can we be sure independent decisions will yield sensible overall routes?
- Other important factors:
 - Convergence effects
 - How well it scales
 - Integration with routing within ISPs
 - And more ...

END

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