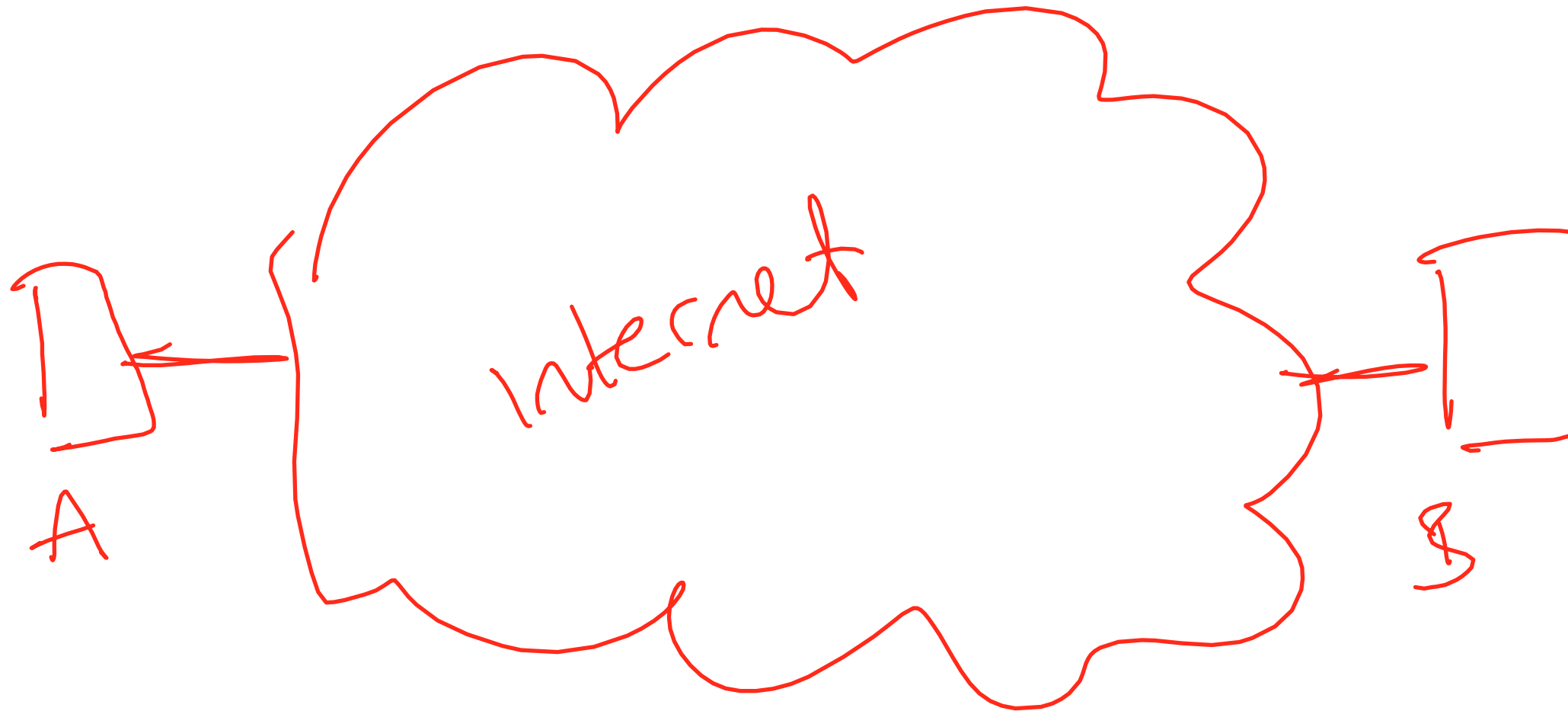# The End-to-End Principle

Application View of the World

# Why Doesn't the Network Help?

- Compress data?
- Reformat/translate/improve requests?
- Serve cached data?
- Add security?
- Migrate connections across the network?
- Or one of any of a huge number of other things?

The End-To-End Principle

The function in question can completely and correctly be implemented only with the knowledge and help of the application standing at the end points of the communication system. Therefore, providing that questioned function as a feature of the communication system itself is not possible. (Sometimes an incomplete version of the function provided by the communication system may be useful as a performance enhancement.) We call this line of reasoning…"the end-to-end argument."

- Saltzer, Reed, and Clark,
End-to-end Arguments in System Design, 1984

Example: File Transfer
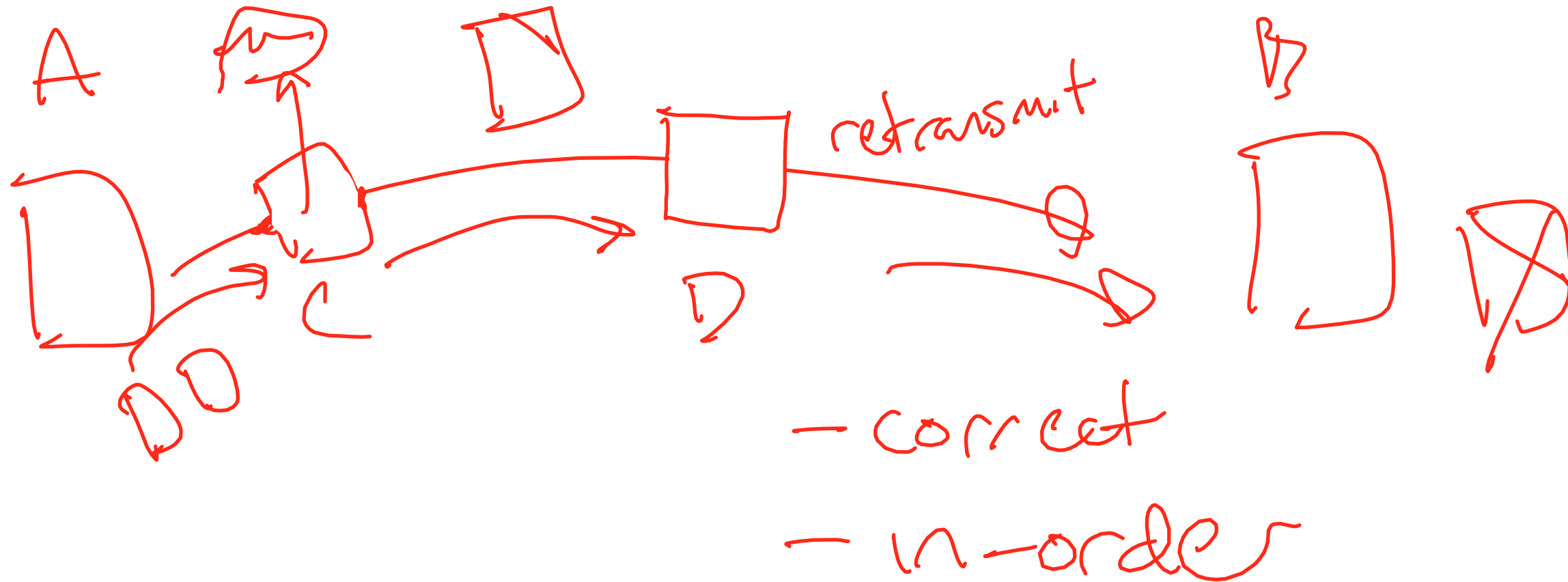
Example: Link Reliability

6
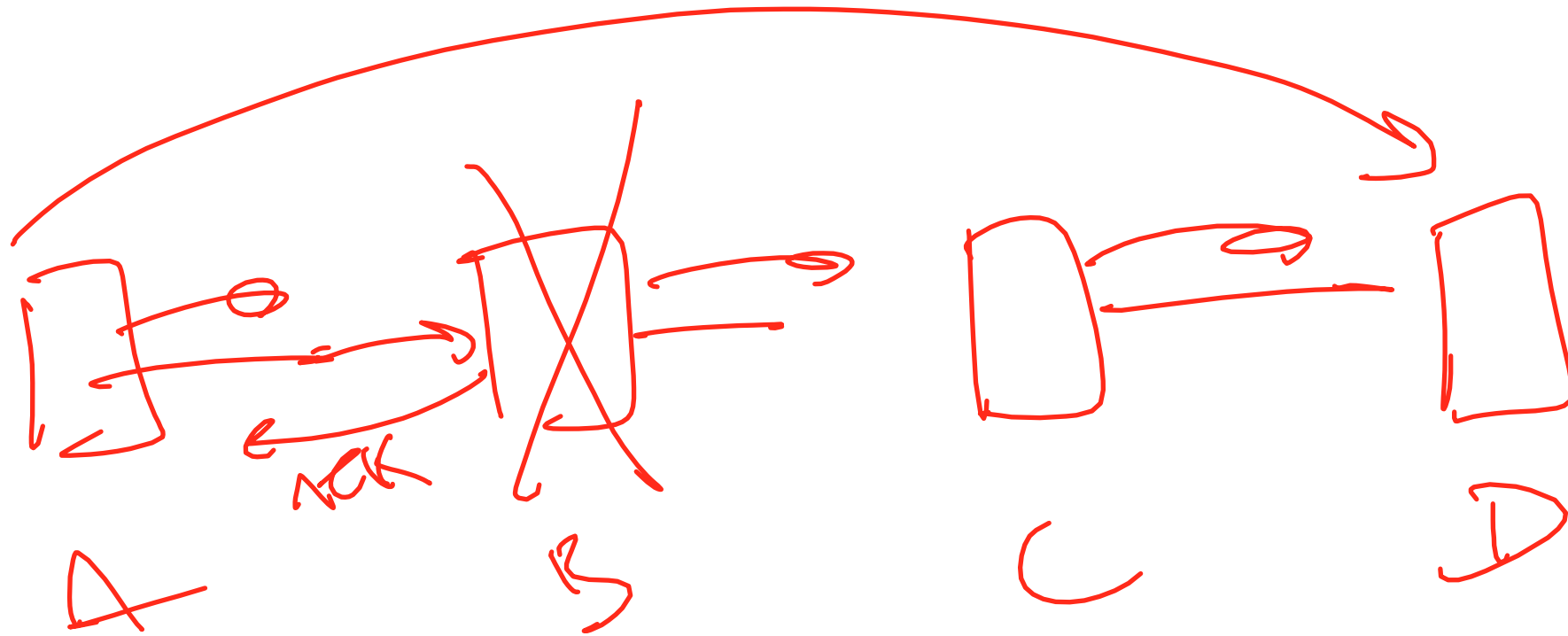
"Strong" End to End

The network's job is to transmit datagrams as efficiently and flexibly as possible. Everything else should be done at the fringes…

– [RFC 1958]

Link encryption?

Packet replication?

Net Neutrality

"Allowing broadband carriers to control what people see and do online would fundamentally undermine the principles that have made the Internet such a success."

- Vinton Cerf in testimony before Congress February 7, 2006

"I am totally opposed to mandating that nothing interesting can happen inside the net."

- Bob Kahn, speaking at the Computer History Museum, January 9, 2007