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UNIVERSITÄT FREIBURG

Algorithms for Radio Networks

AODV

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AODV

► Perkins, Royer

- Ad hoc On-Demand Distance Vector Routing, IEEE Workshop on Mobile Computing Systems and Applications, 1999

► Reaktives Routing-Protokoll

► Reactive routing protocol

- Improvement of DSR
- no source routing
- Distance Vector Tables
 - but only for nodes with demand
- Sequence number to help identify outdated cache info
- Nodes know the origin of a packet and update the routing table

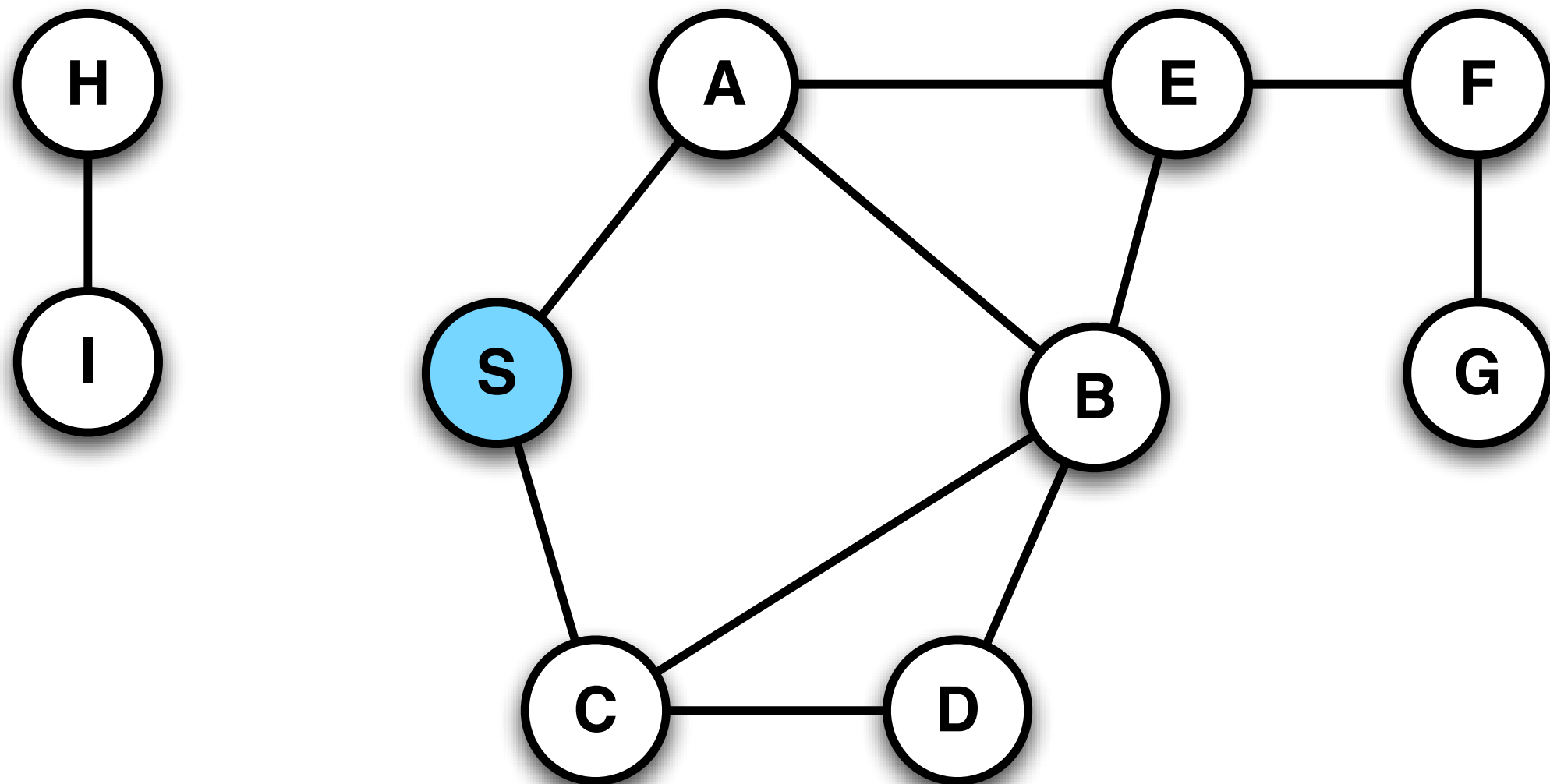
AODV

► **Algorithm**

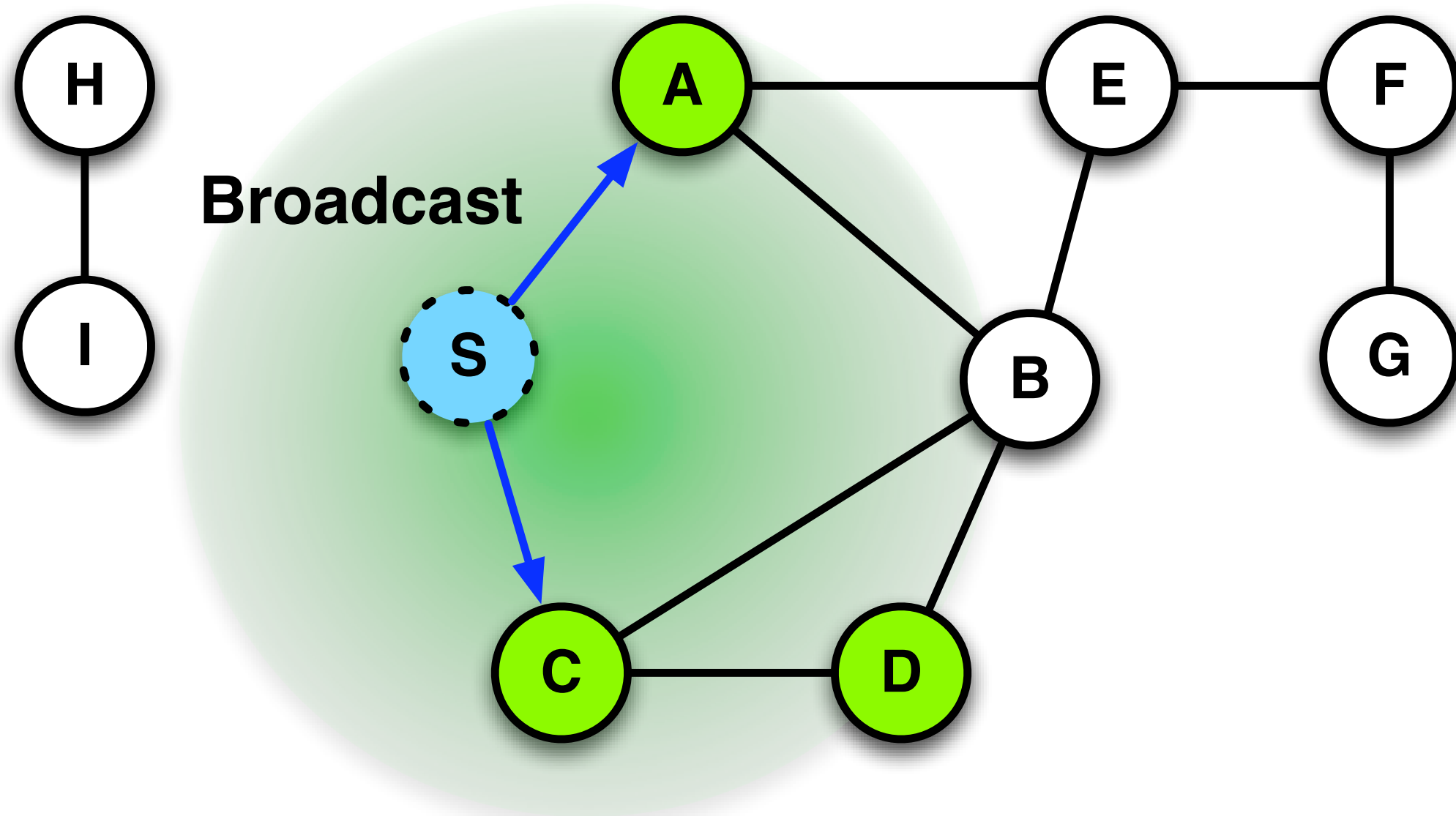
- Route Request (RREQ) like in DSR
- Intermediate nodes set a reverse pointer towards the sender
- If the target is reached, a Route Reply (RREP) is sent
- Route Reply follow the pointers

► **Assumption: symmetric connections**

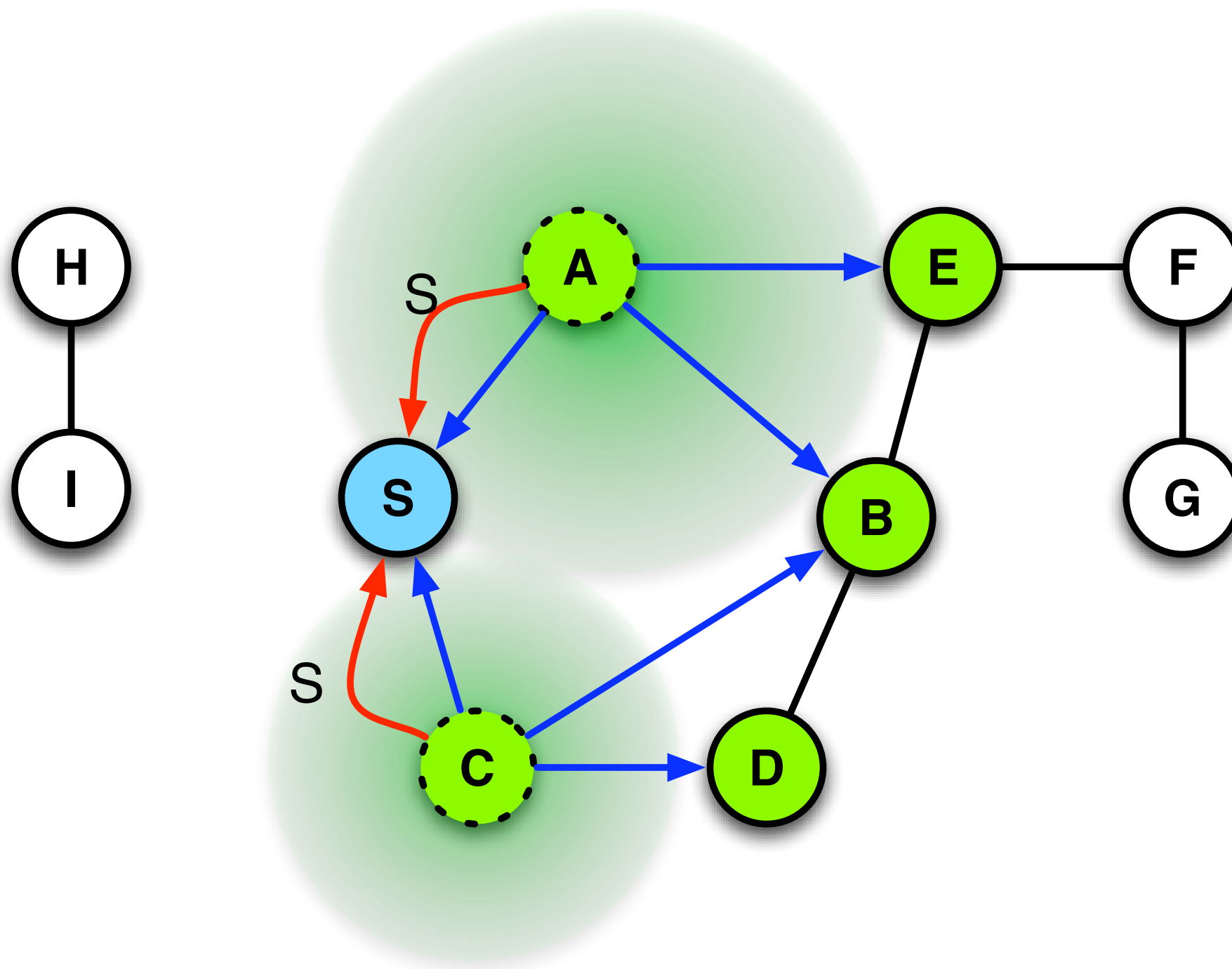
AODV: Example



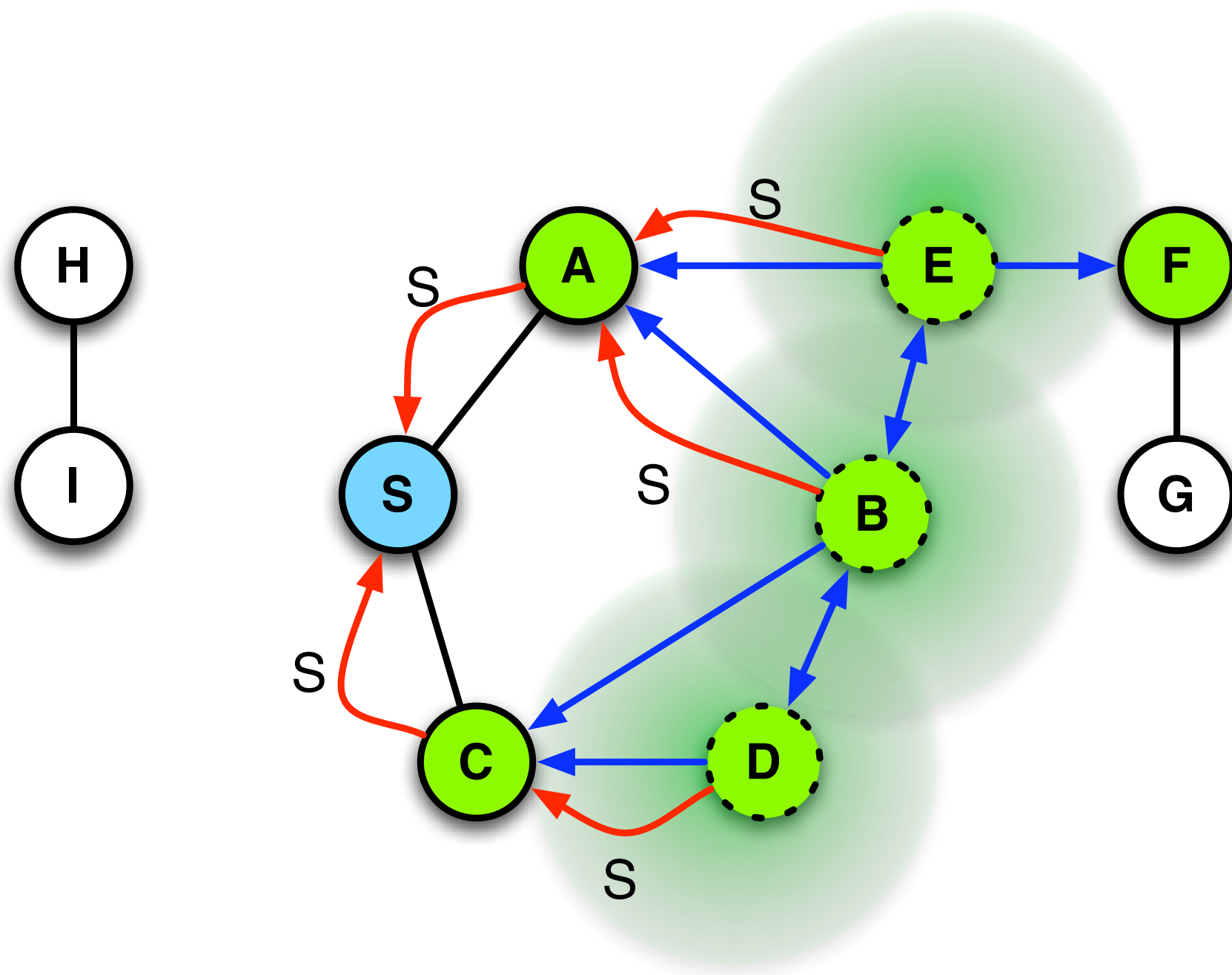
AODV: Example



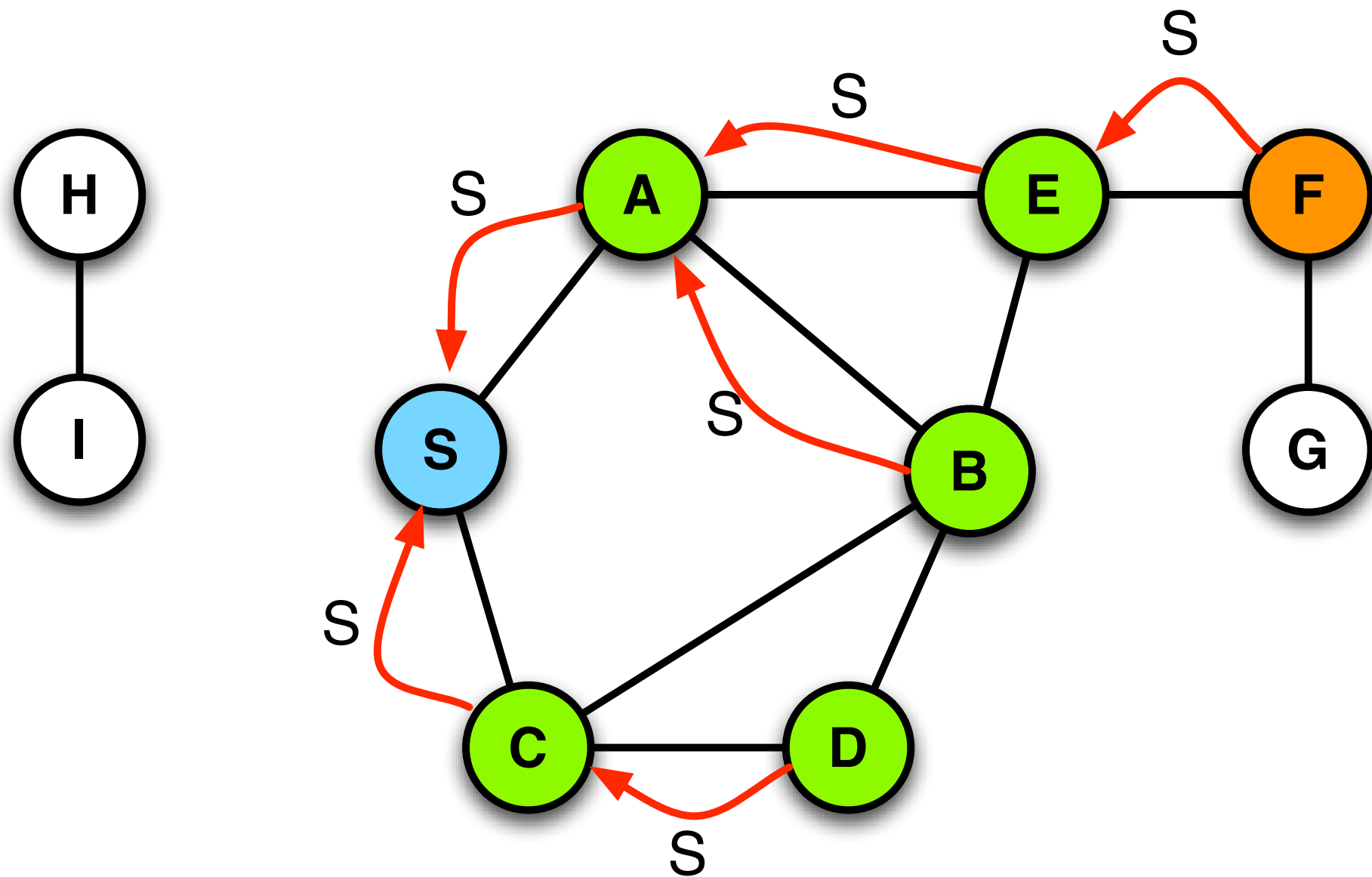
AODV: Example



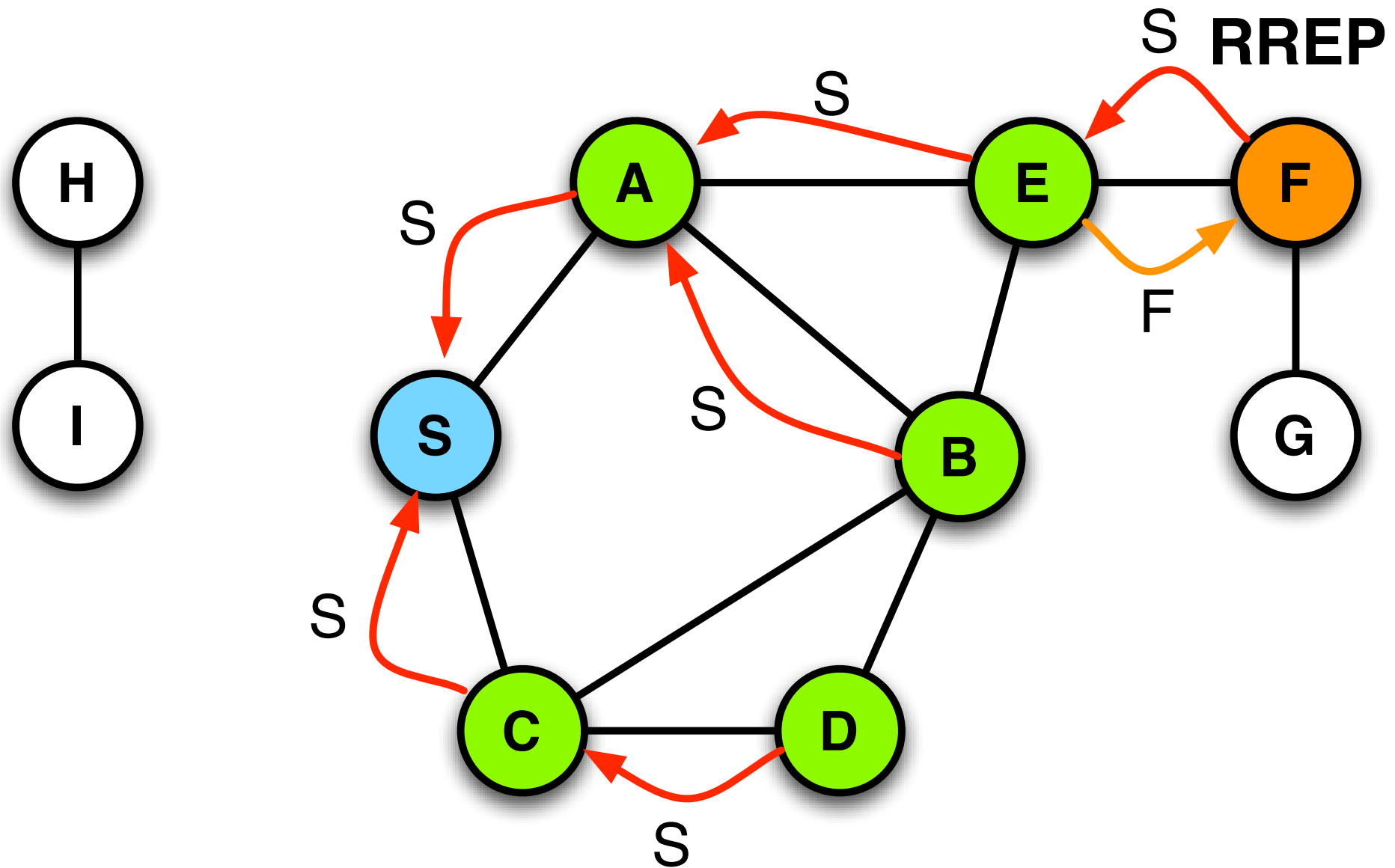
AODV: Example



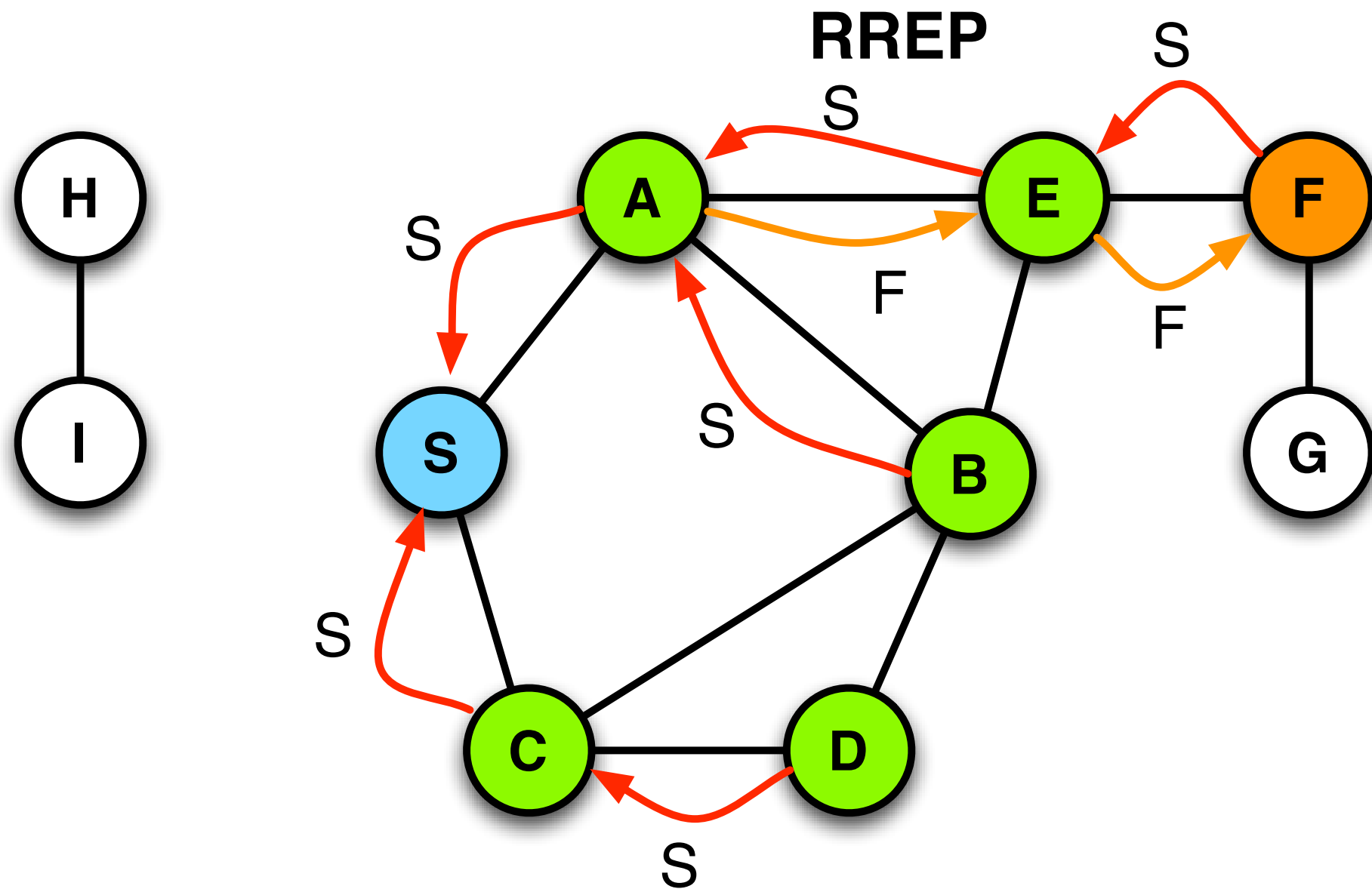
AODV: Example



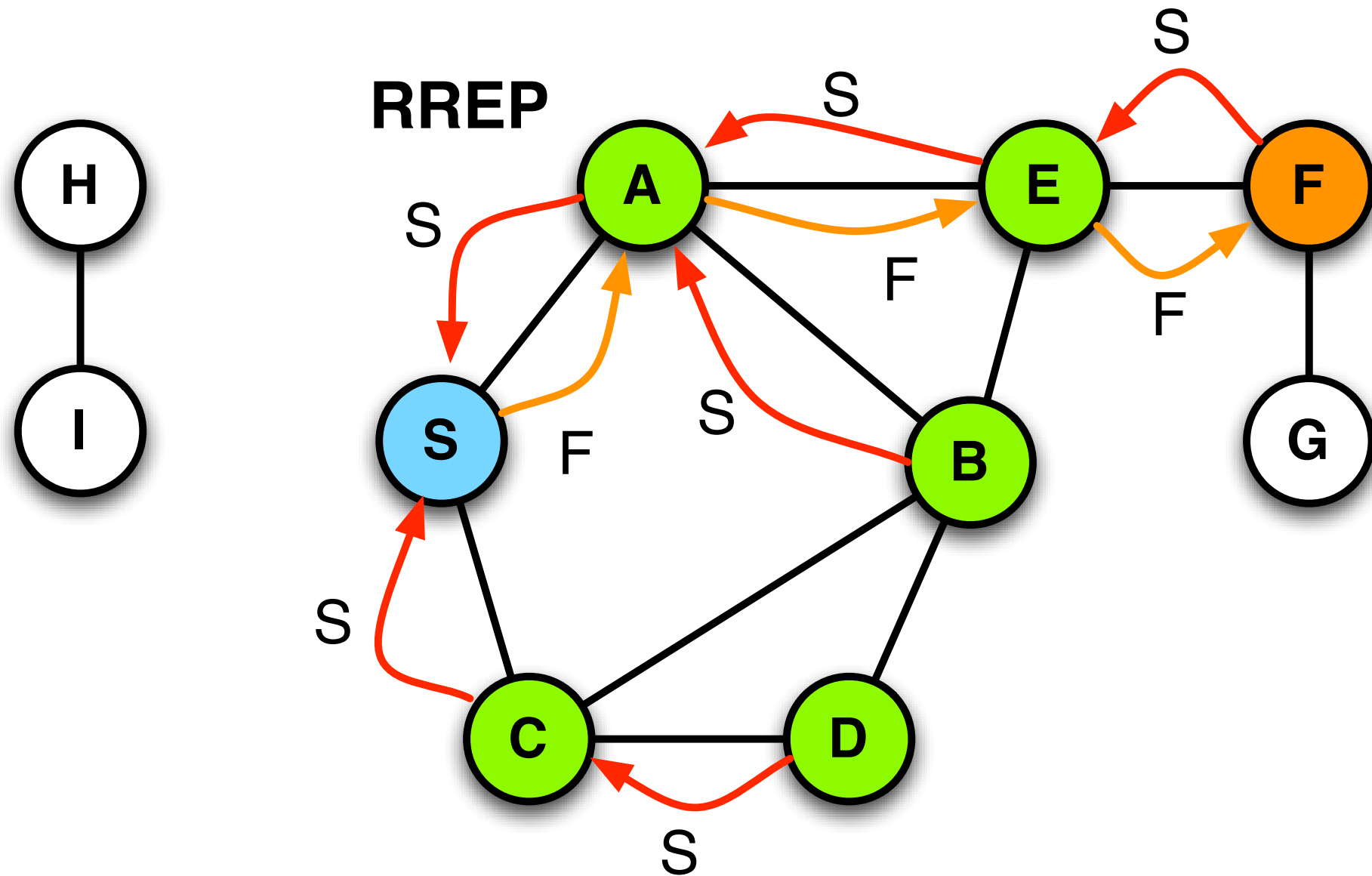
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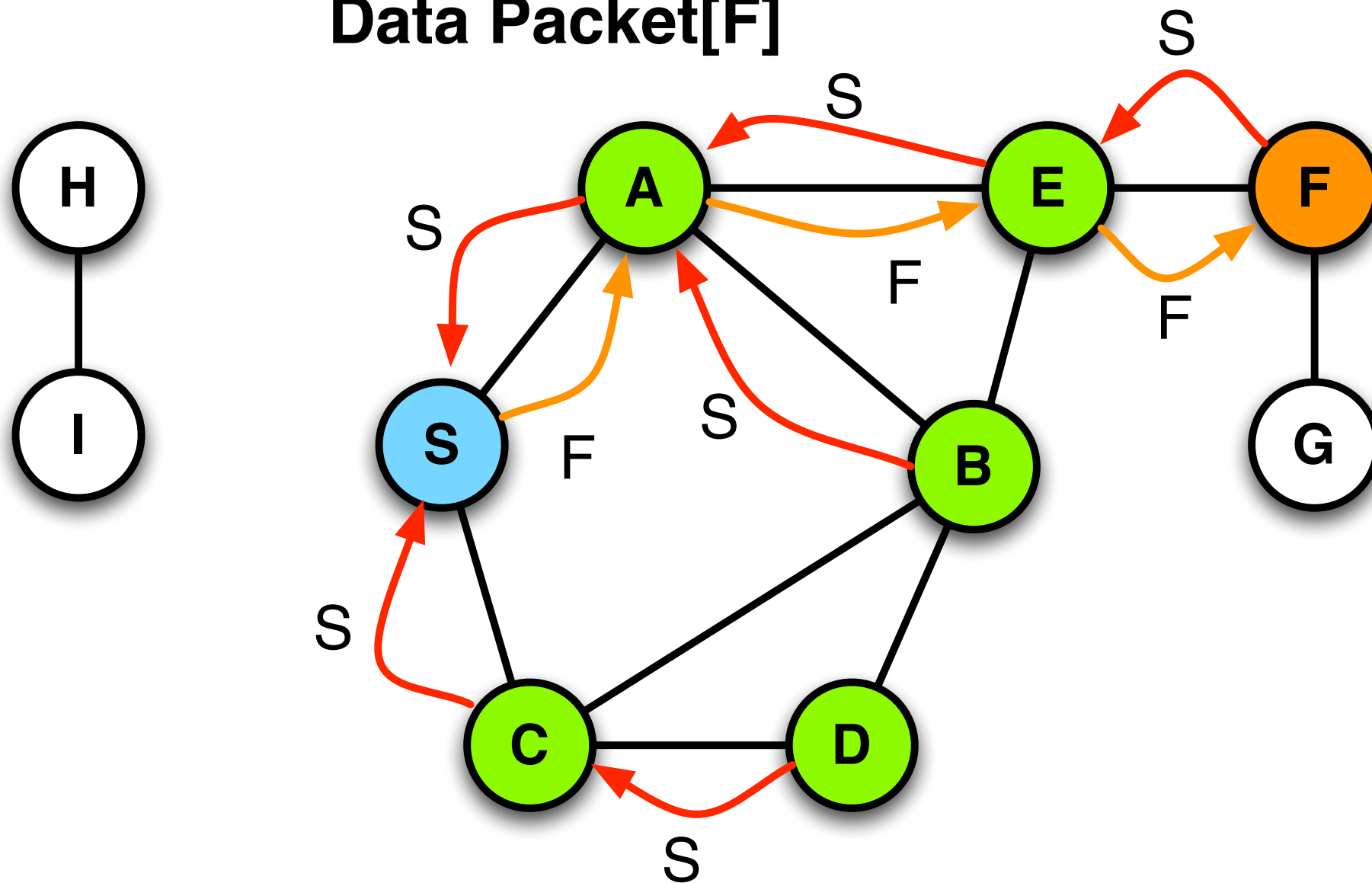


AODV: Example



AODV: Example

Data Packet[F]



Route Reply in AODV

► Intermediate nodes

- may send route-reply packets, if their cache information is up-to-date

► Destination Sequence Numbers

- measure the up-to-dateness of the route information
- AODV uses cached information less frequently than DSR
- A new route request generates a greater destination sequence number
- Intermediate nodes with a smaller sequence number may not generate a route reply (RREP) packets

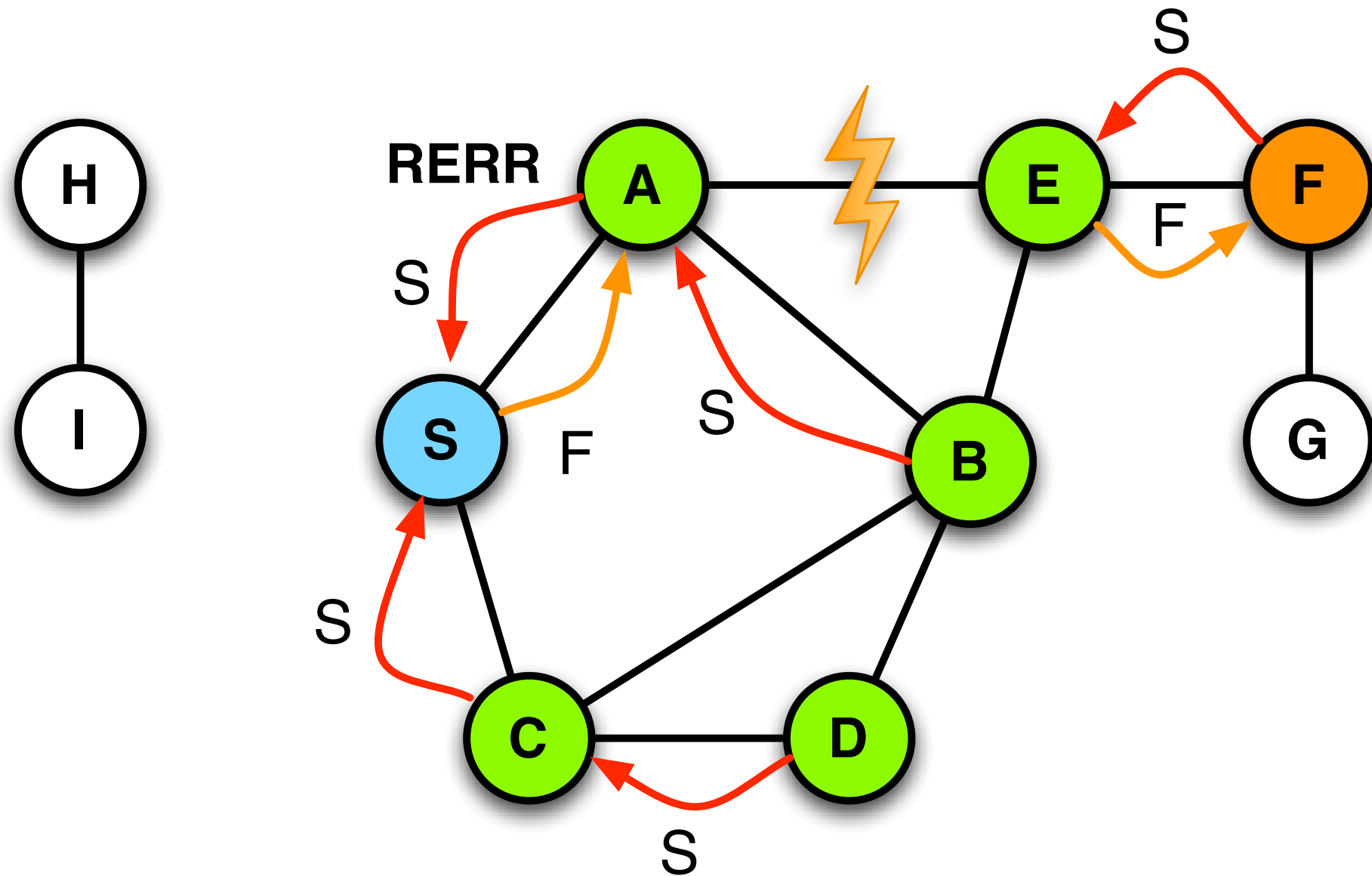
Timeouts

- ▶ **Reverse pointers are deleted after a certain time**
 - RREP timeout allows the transmitter to go back
- ▶ **Routing table information to be deleted**
 - if they have not been used for some time
 - Then a new RREQ is triggered

Link Failure Reporting

- ▶ **Neighbors of a node X are active,**
 - if the routing table cache are not deleted
- ▶ **If a link of the routing table is interrupted,**
 - then all active neighbors are informed
- ▶ **Link failures are distributed by Route Error (RERR) packets to the sender**
 - also update the Destination Sequence Numbers
 - This creates new route request

AODV: Example



Detection of Link Failure

▶ **Hello messages**

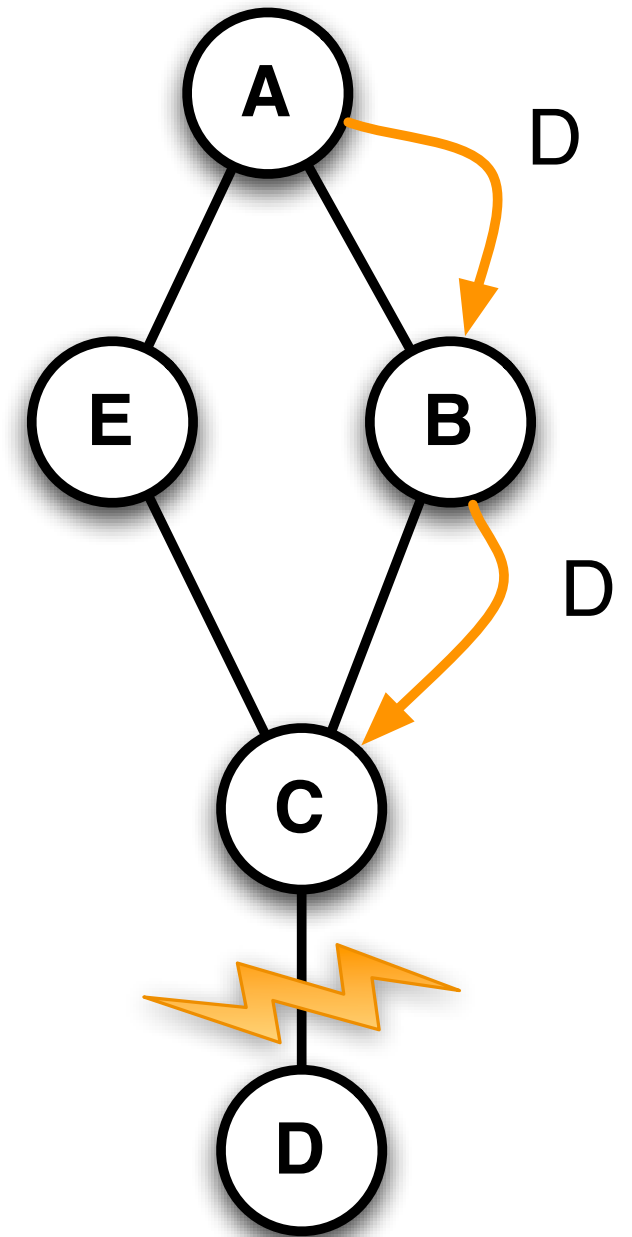
- neighboring nodes periodically exchange hello packets from
- Absence of this message indicates link failure

▶ **Alternative**

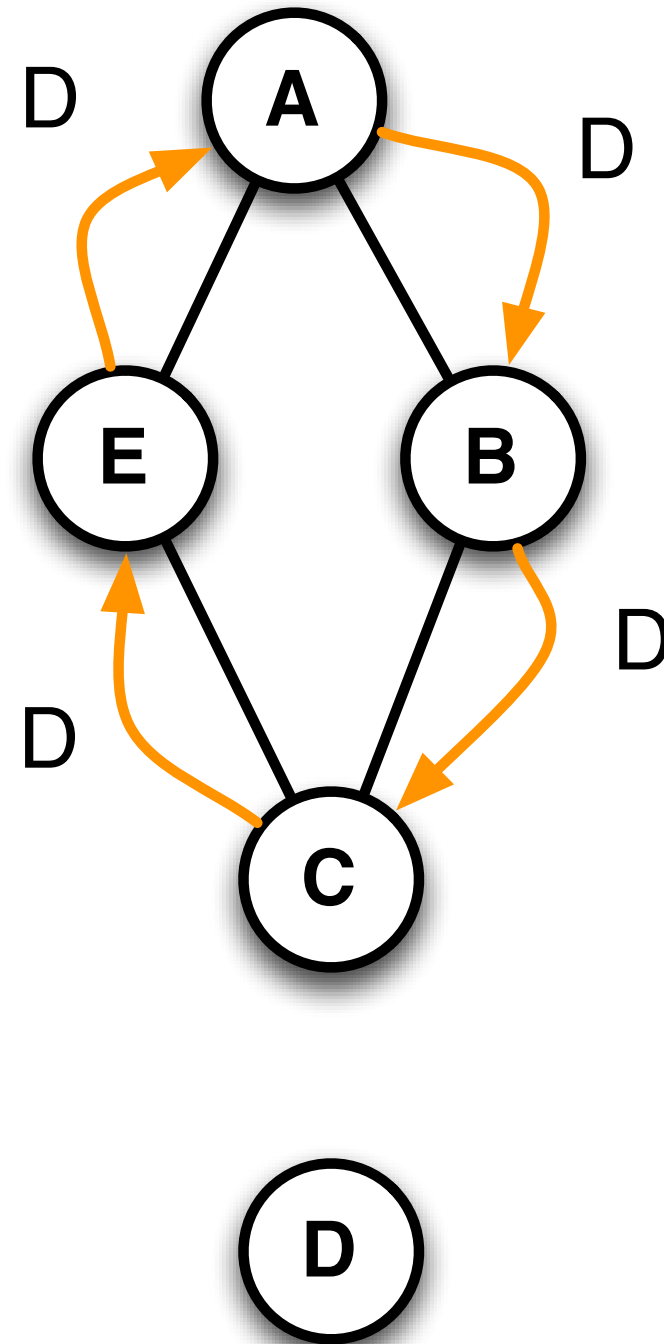
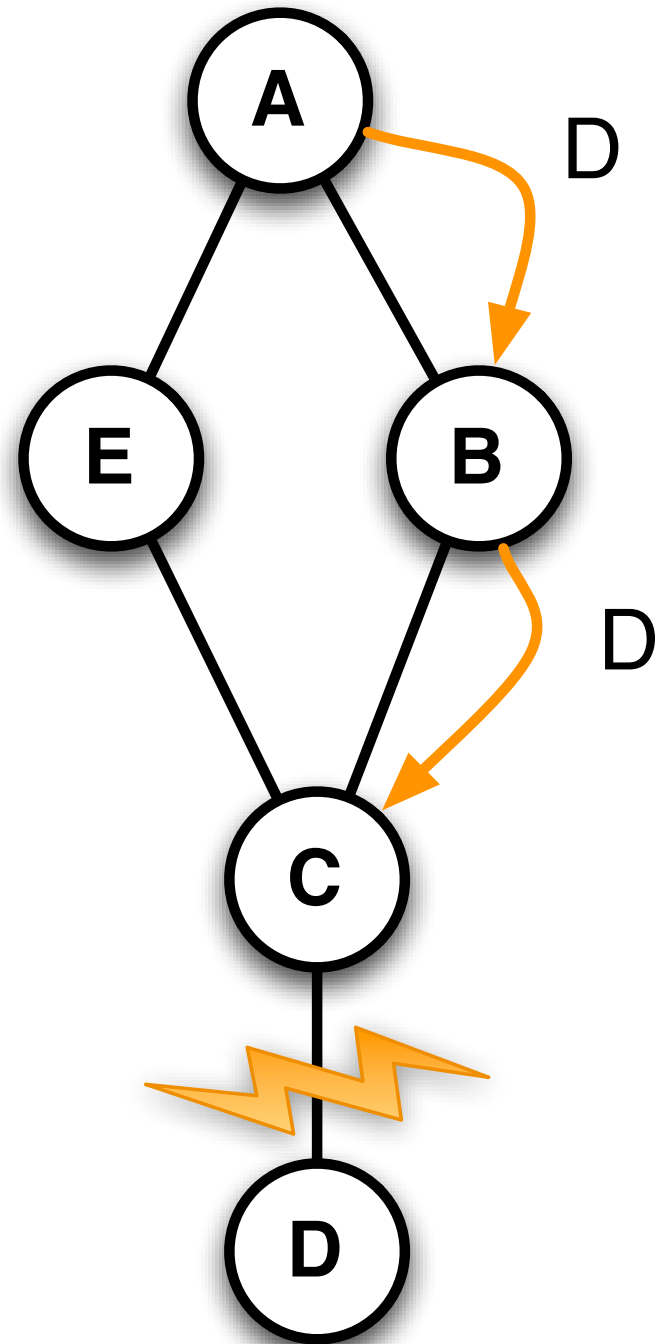
- use information from MAC protocol

Sequence Numbers

- ▶ **When a node receives a message with destination sequence number N**
 - then this node sets its number to N
 - if it was smaller before
- ▶ **In order to prevent loops**
 - If A has not noticed the loss of link (C, D)
 - (for example, RERR is lost)
 - If C sends a RREQ
 - on path C-E-A
 - Without sequence numbers, a loop will be constructed
 - since A "knows" a path to D, this results in a loop (for instance, CEABC)



Sequence Numbers



Optimization

Expanding Ring Search

► Route Requests

- *start with small time-to-live value (TTL)*
- if no Route Reply (RREP) is received, the value is increased by a constant factor and resent

► This optimization is also applicable for DSR



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