

OMNI: an Overlay Mobile ad-hoc Network at the edge of the Internet

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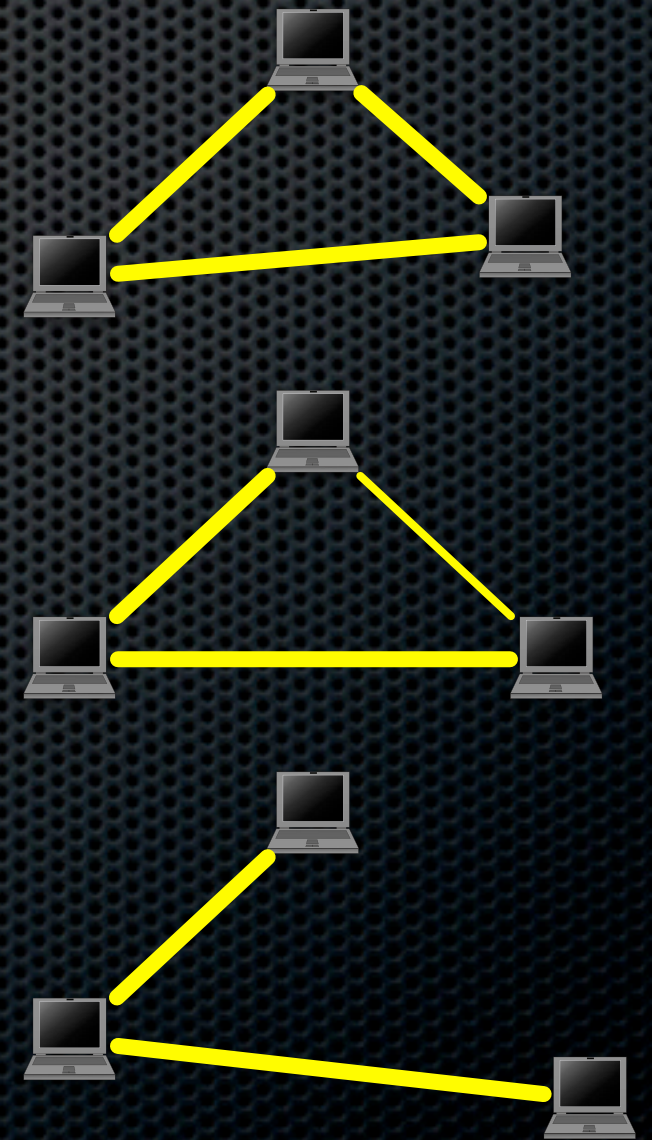
supported by 

Motivation

- ✦ We would like to deal with rapidly changing networks in a universal way

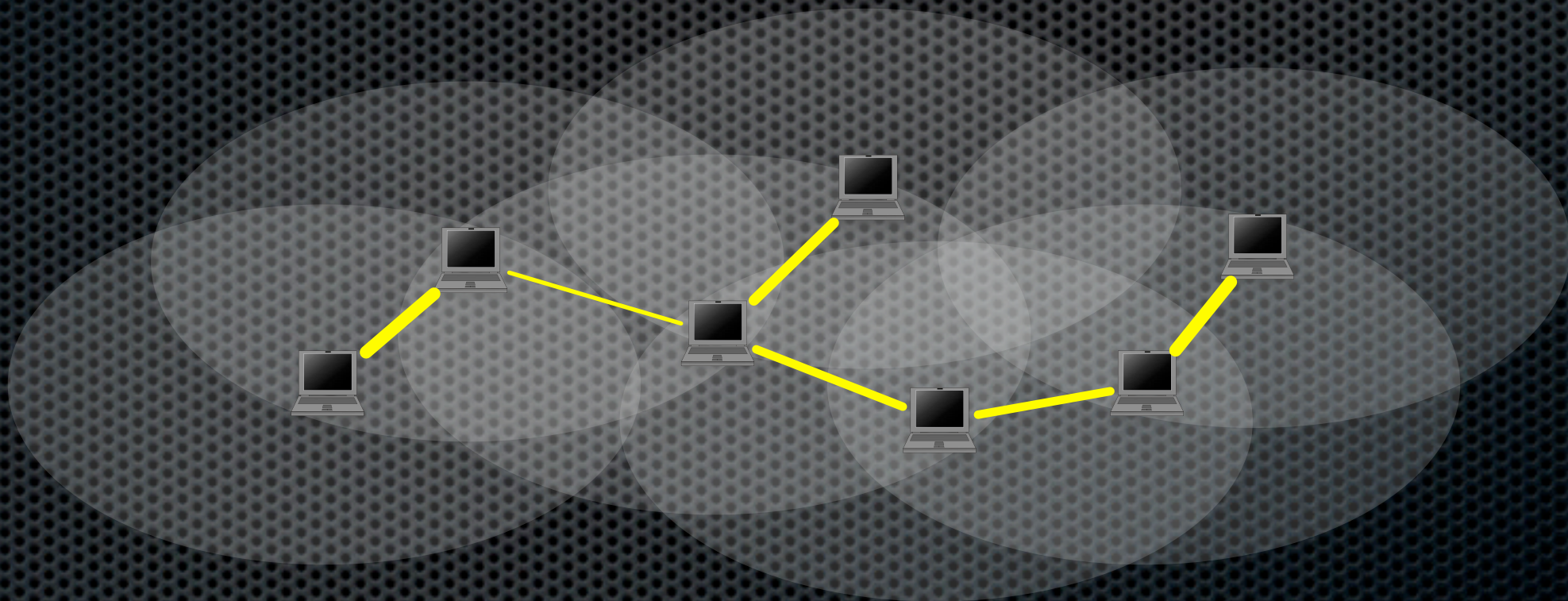
Changing Networks?

- ✧ Links change
 - ✧ in quality
 - ✧ in existence
- ✧ Examples of such networks
 - ✧ Mobile Ad-Hoc Networks
 - ✧ Mobile Infrastructure Networks



Mobile Ad-Hoc Network

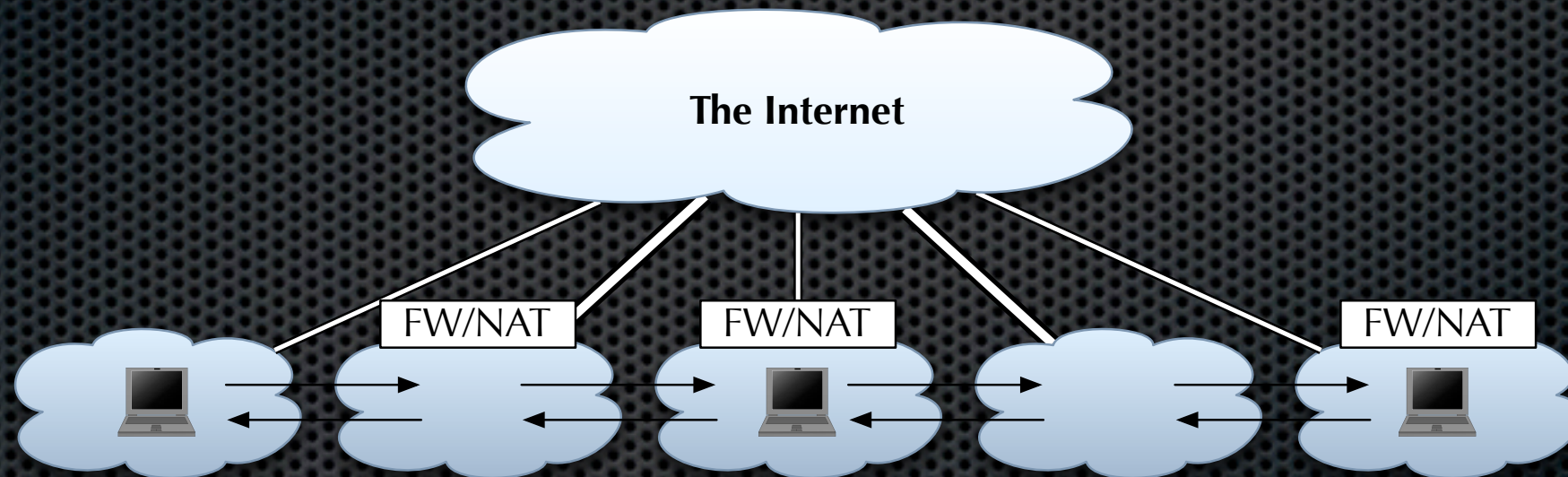
- Nodes with wireless network interfaces move around



- Wireless links are dependent on the distance between communicating nodes

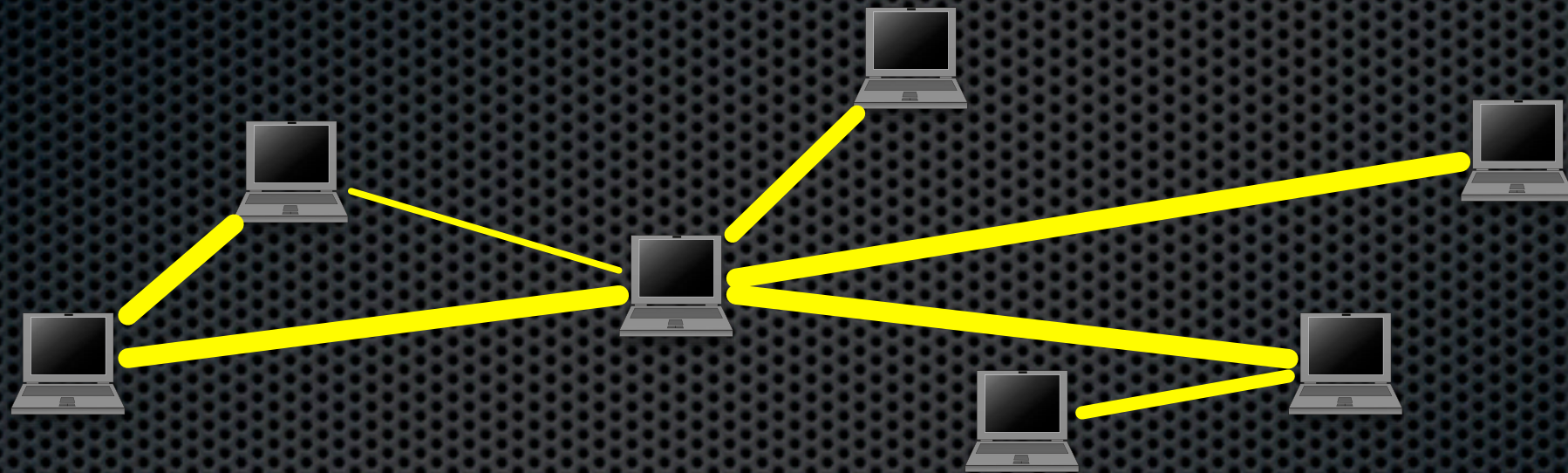
Mobile Infrastructure Network(1)

- ✦ Nodes move among subnetworks which are connected to the Internet



- ✦ Subnetworks have different characteristics
 - ✦ FWs/NATs might be installed in the entrance
 - ✦ the uplink might be broadband or narrowband

Mobile Infrastructure Network(2)



- ✦ If a node moves to another subnetwork, it changes its IP address
 - ✦ therefore, the existing links are broken if the node cannot advertise the new address to the other node

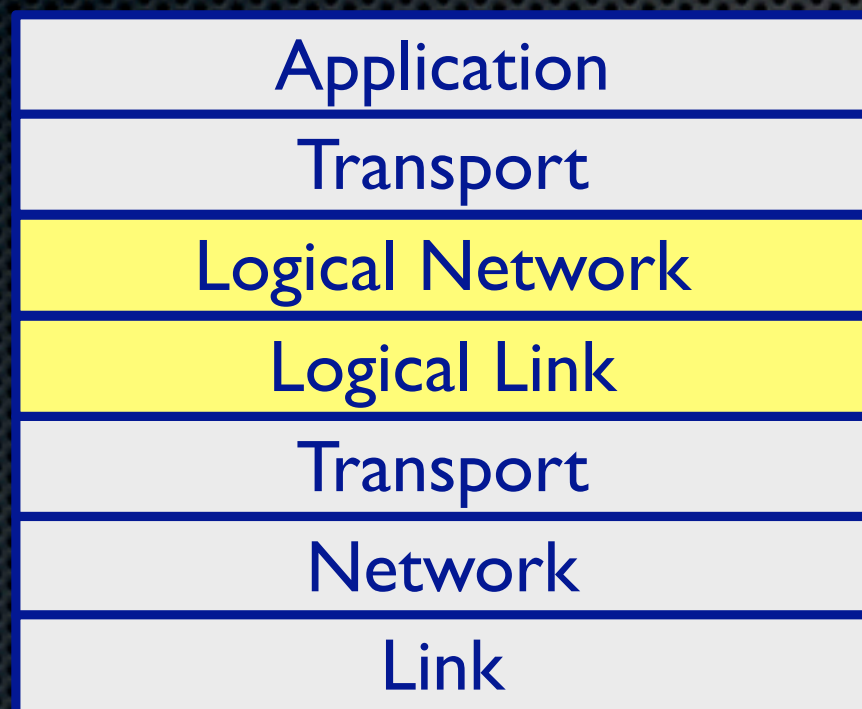
Problem Statement

- ✦ Although these networks have similar characteristics,
 - ✦ we have to deal with them separately
 - ✦ we have to modify applications for each of them

Proposal

- ✦ Build a Virtual Private Network over Changing Networks

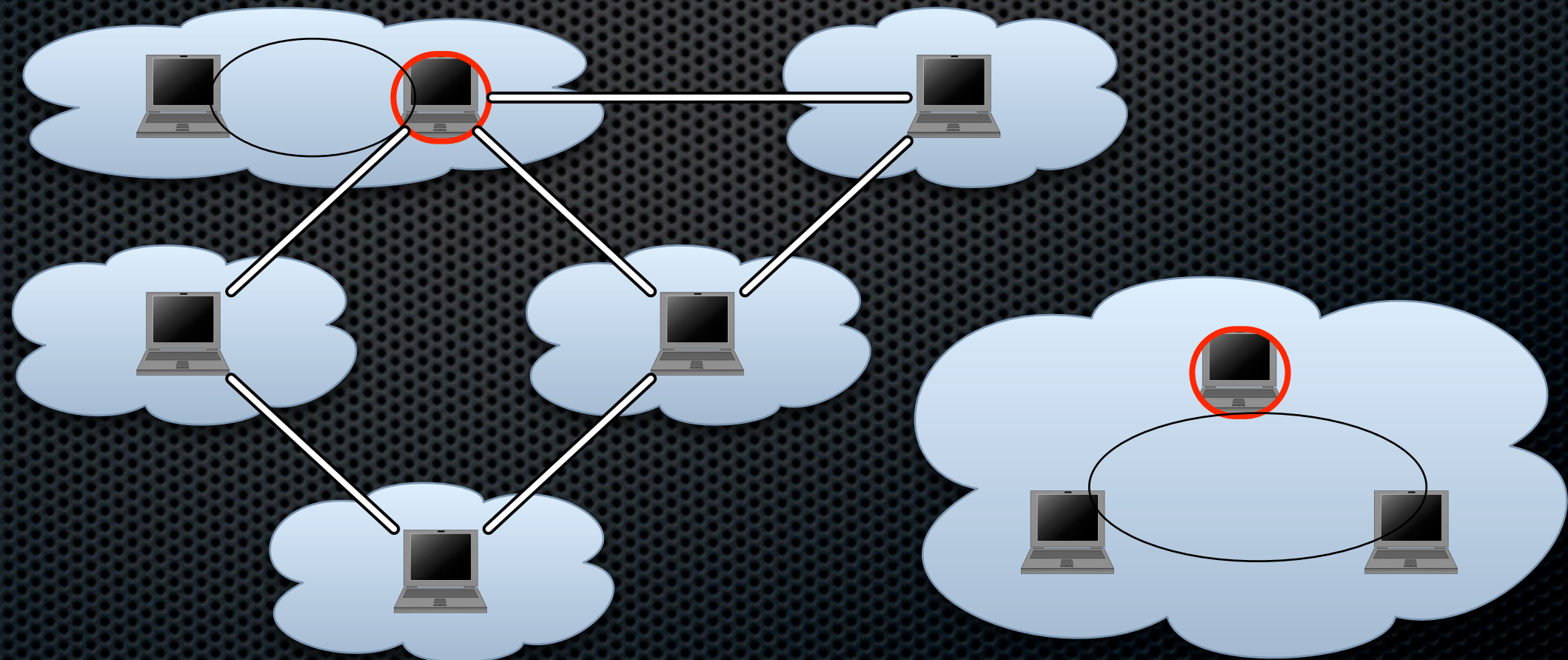
OMNI Architecture



- ✦ Extend the hierarchical structure of the Internet by adding
 - ✦ Logical Link Layer
 - ✦ Logical Network Layer

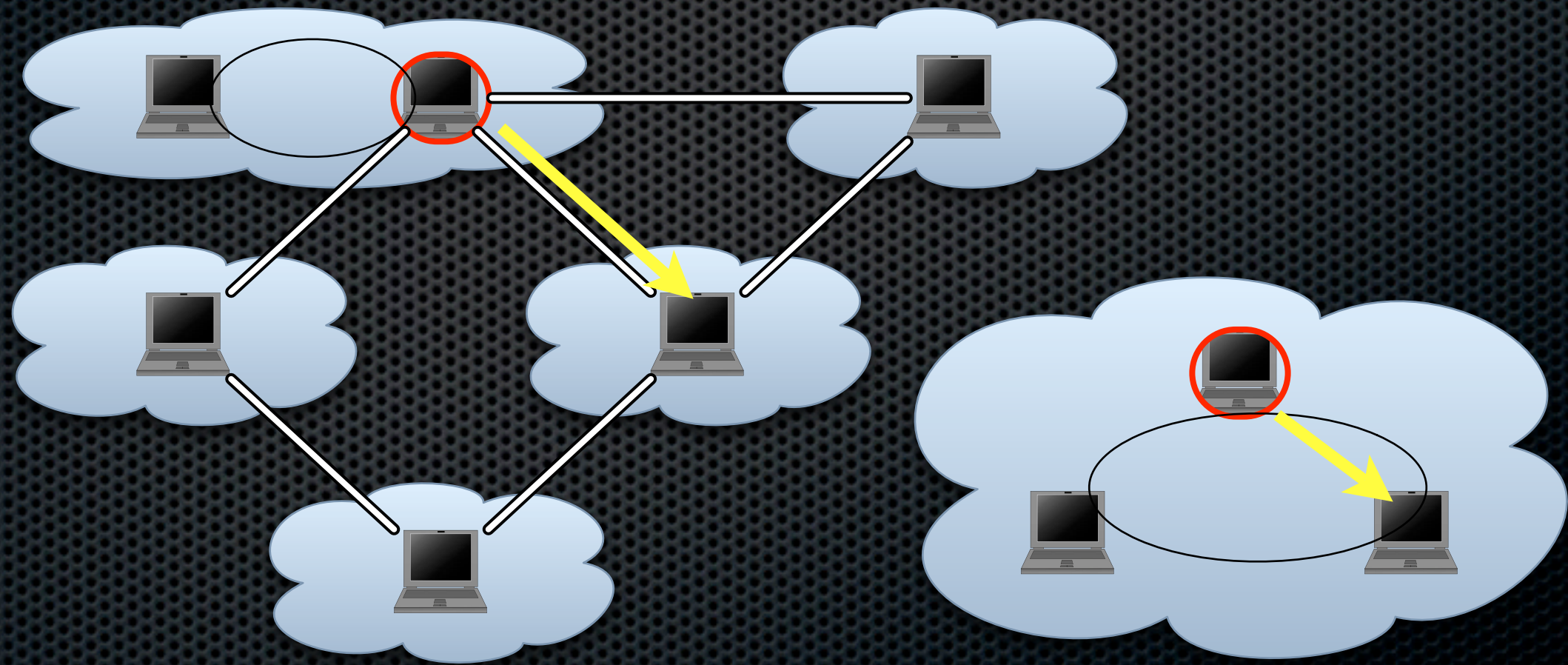
Logical Link(1)

- ✦ The logical link layer hides the implementation of different types of links and shows the same interfaces (unicast, multicast, receive)



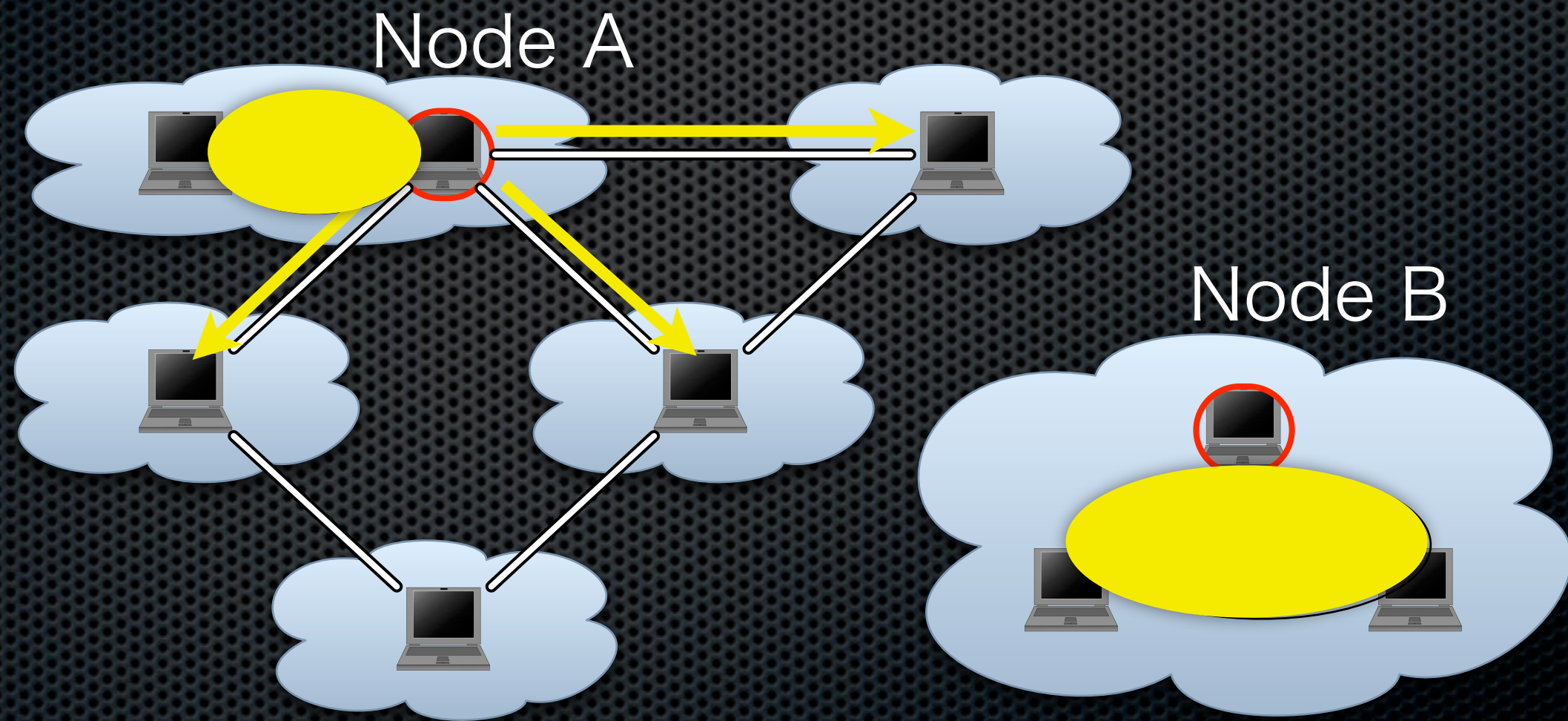
Logical Link(2)

- Unicast transmission



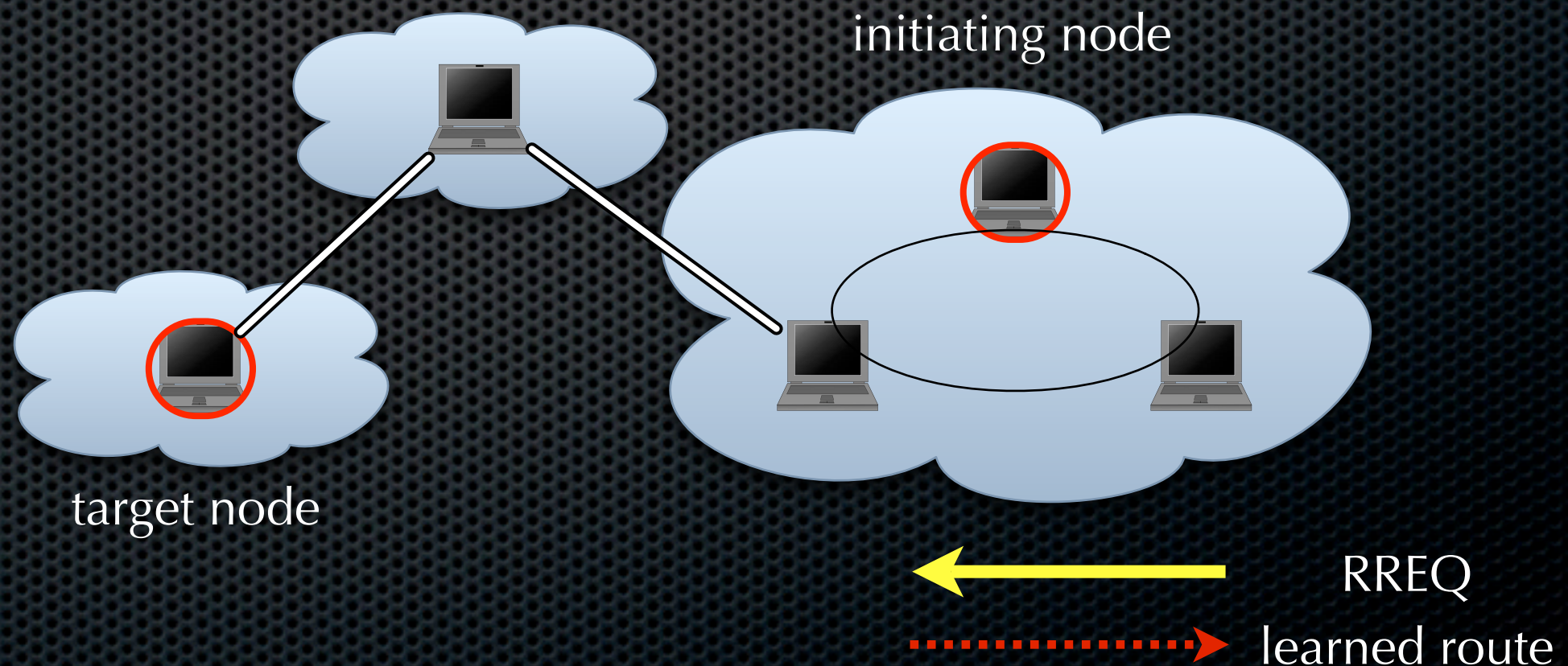
Logical Link(3)

- Multicast



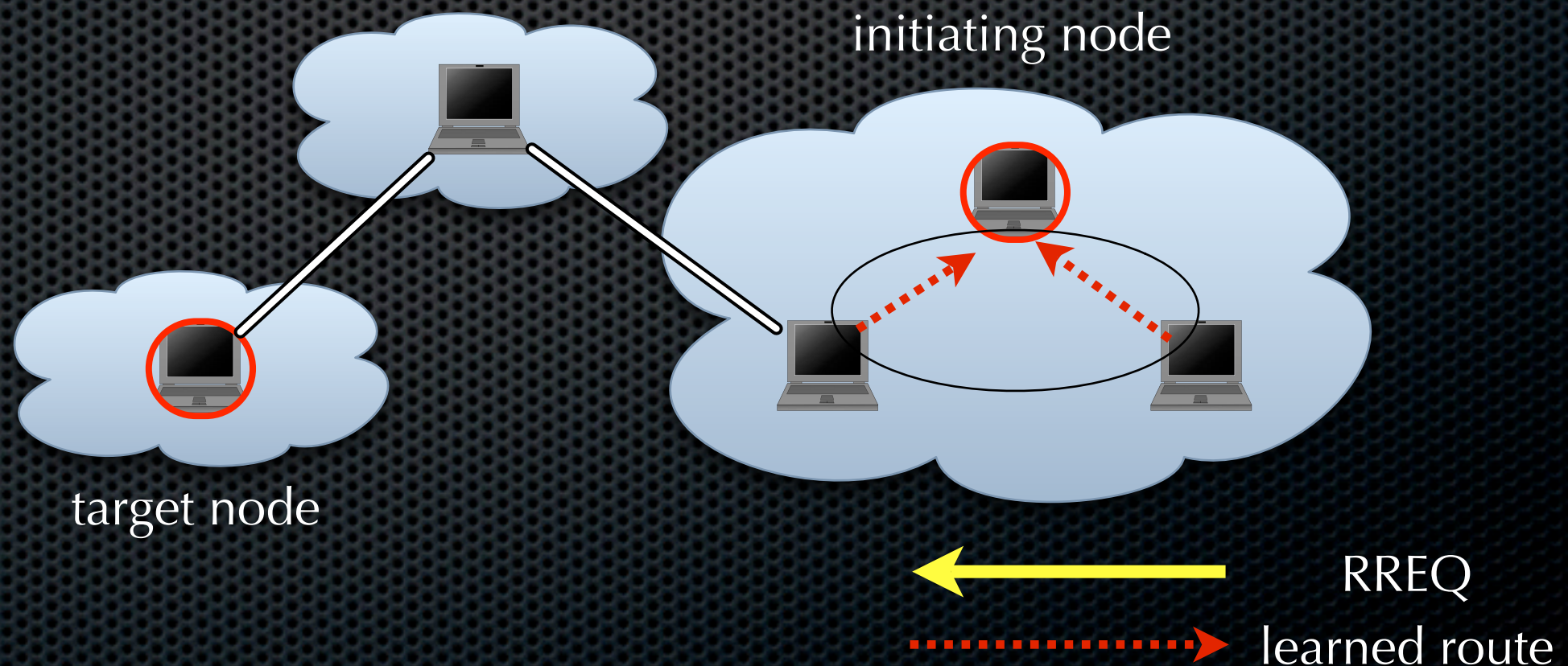
Logical Network(1)

- The logical network layer routes packets through the logical links



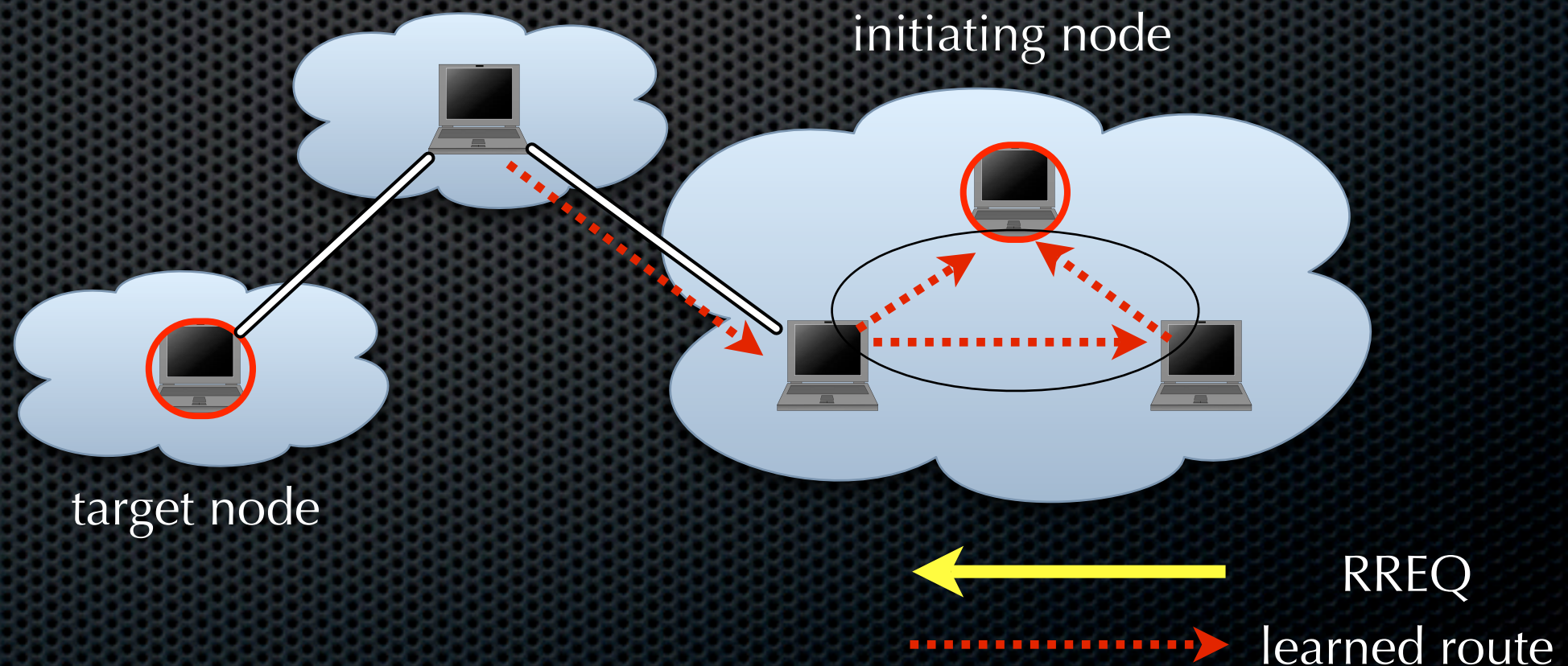
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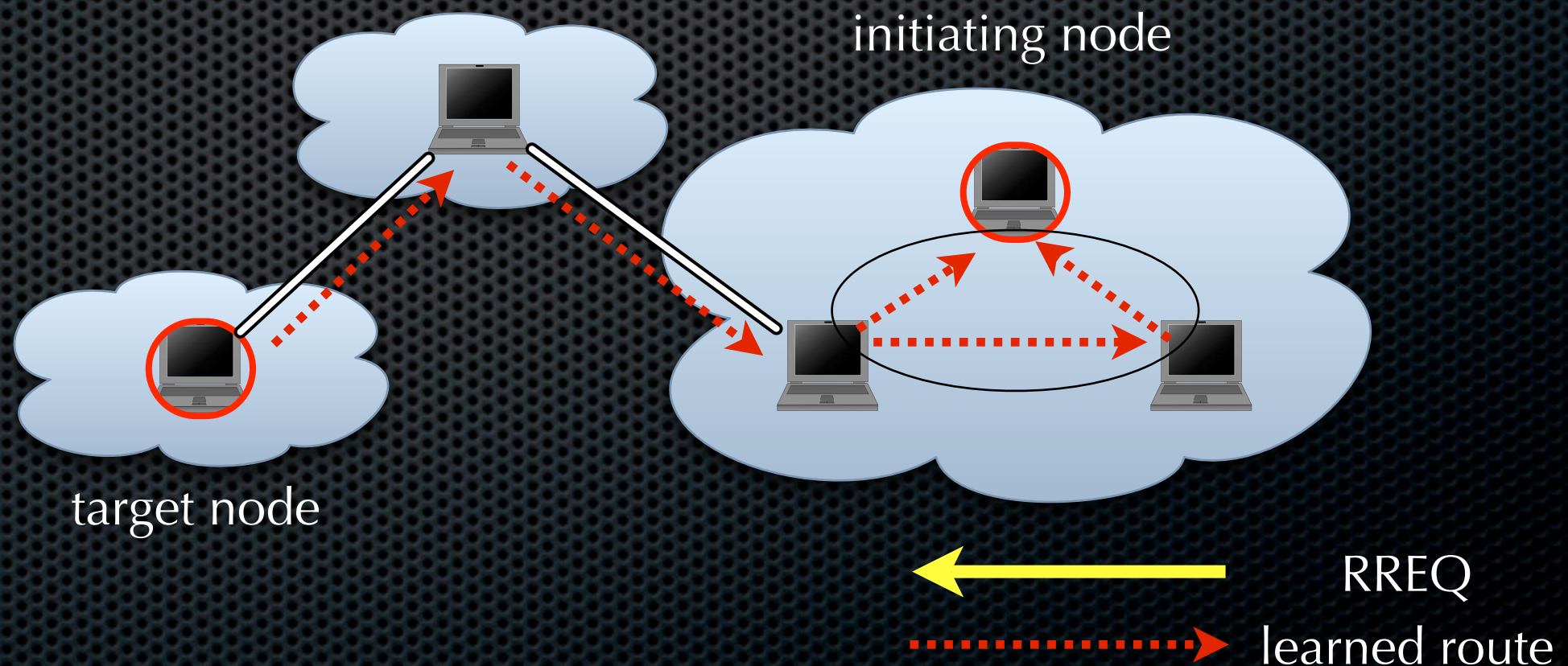
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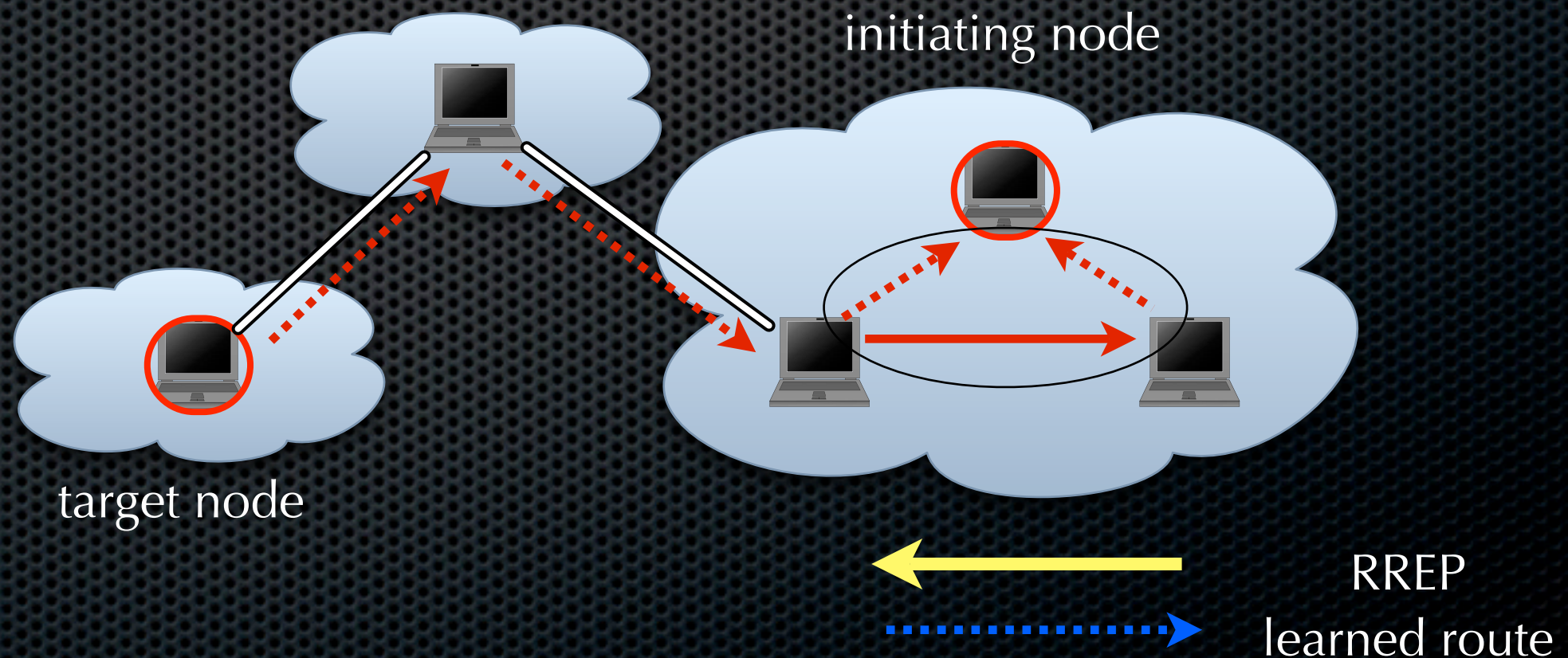
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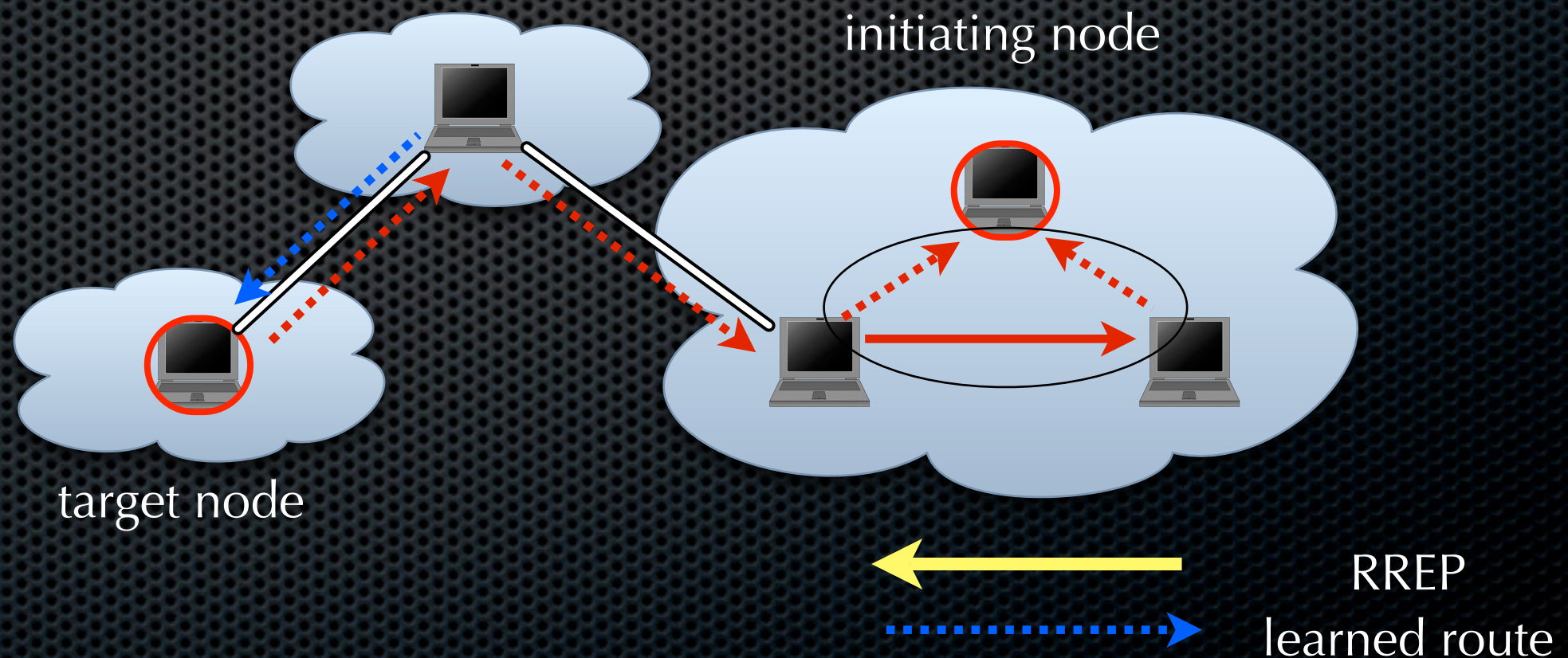
Logical Network(2)

- The logical network layer routes packets through the logical links



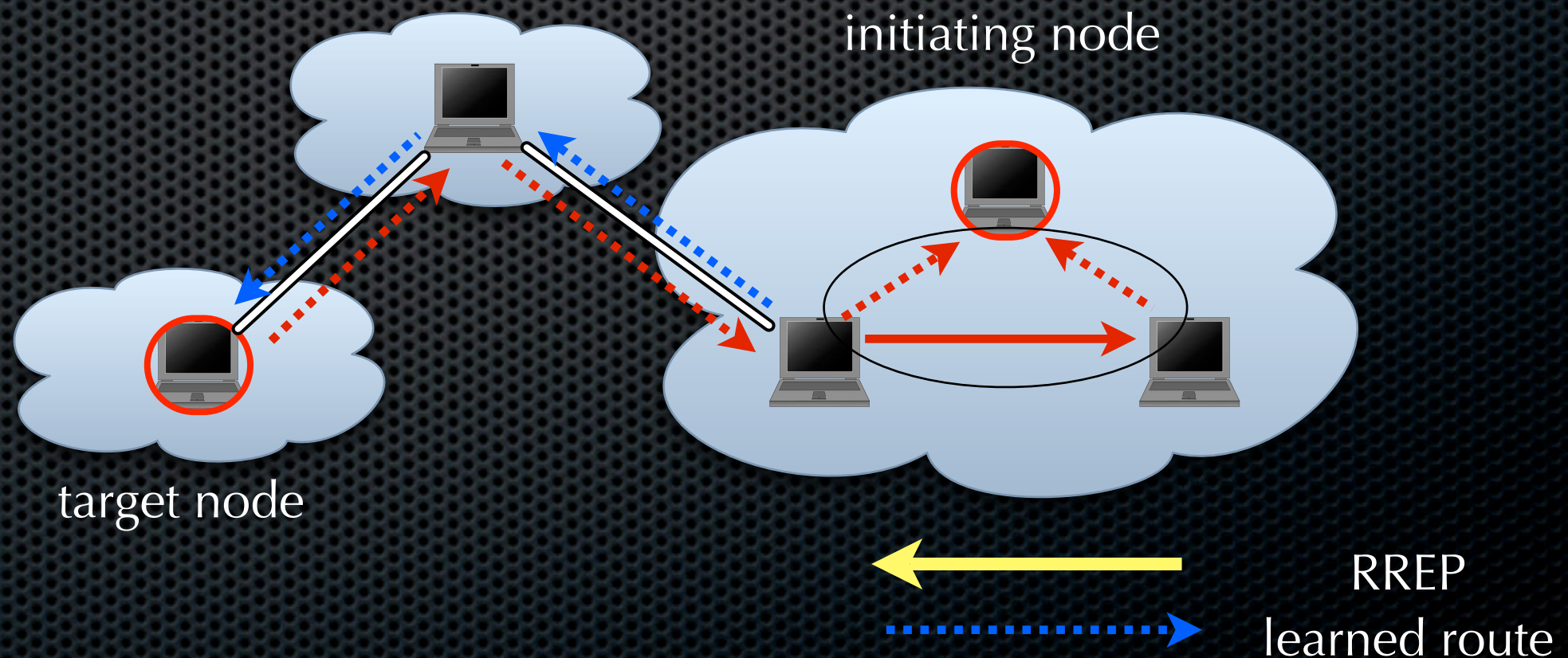
Logical Network(2)

- The logical network layer routes packets through the logical links



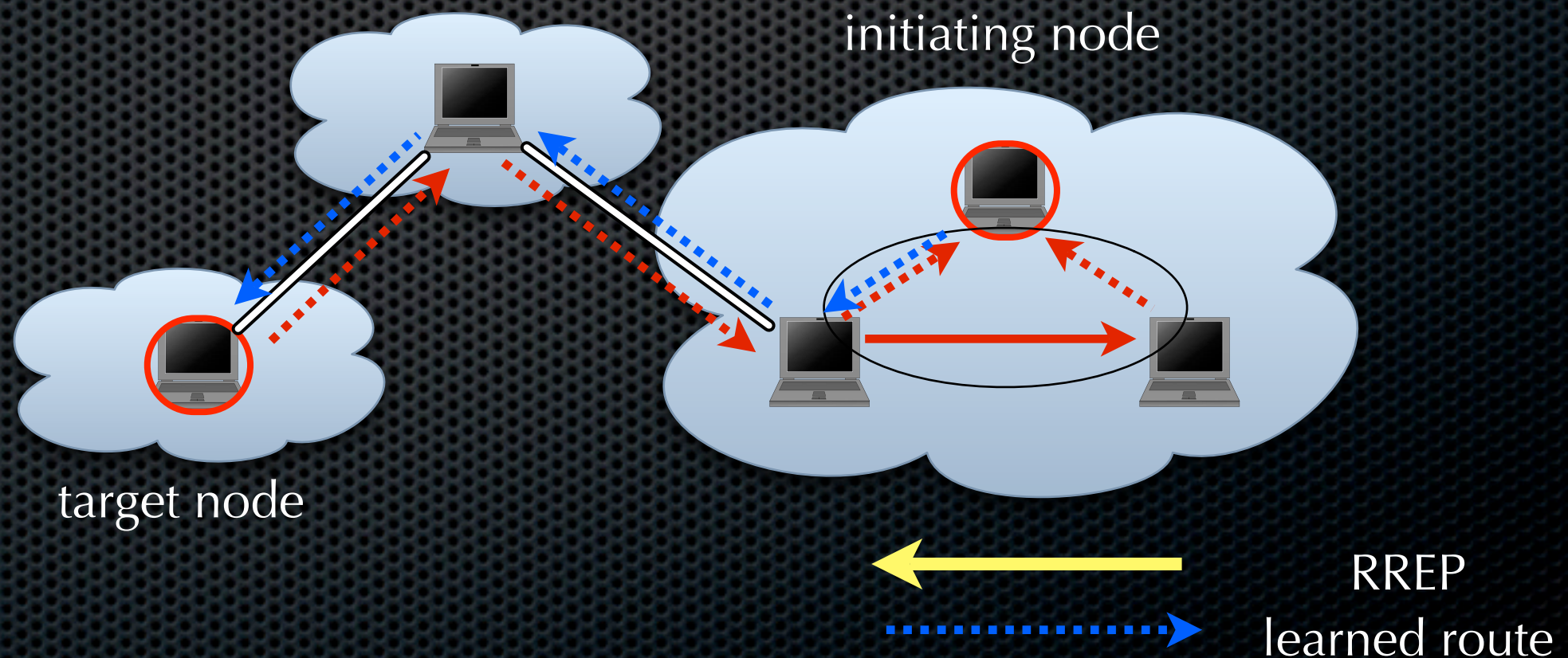
Logical Network(2)

- The logical network layer routes packets through the logical links

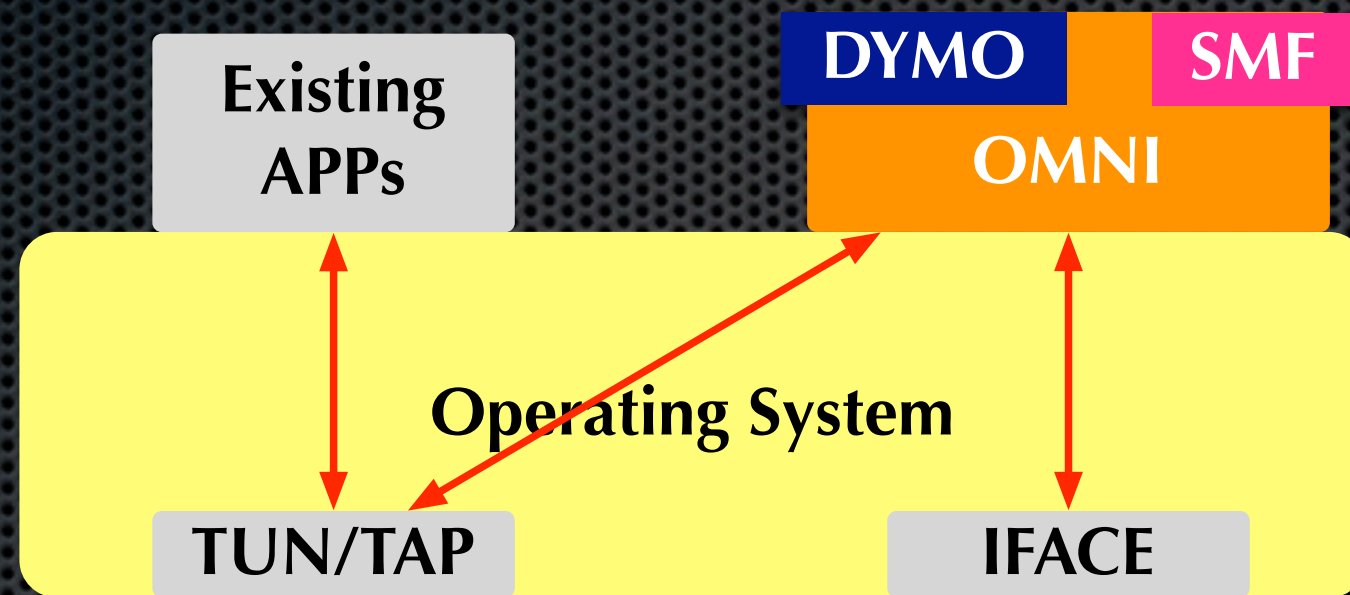


Logical Network(2)

- The logical network layer routes packets through the logical links



Implementation



- ✦ We have implemented
 - ✦ the logical layers in the user space through TUN/TAP devices
 - ✦ DYMO and SMF in the logical network layer

Conclusion

- ✦ OMNI is an architecture to handle different types of rapidly changing networks
- ✦ We will run experiments in practical scenarios and analyze the data

Thank you!

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