

Mobility



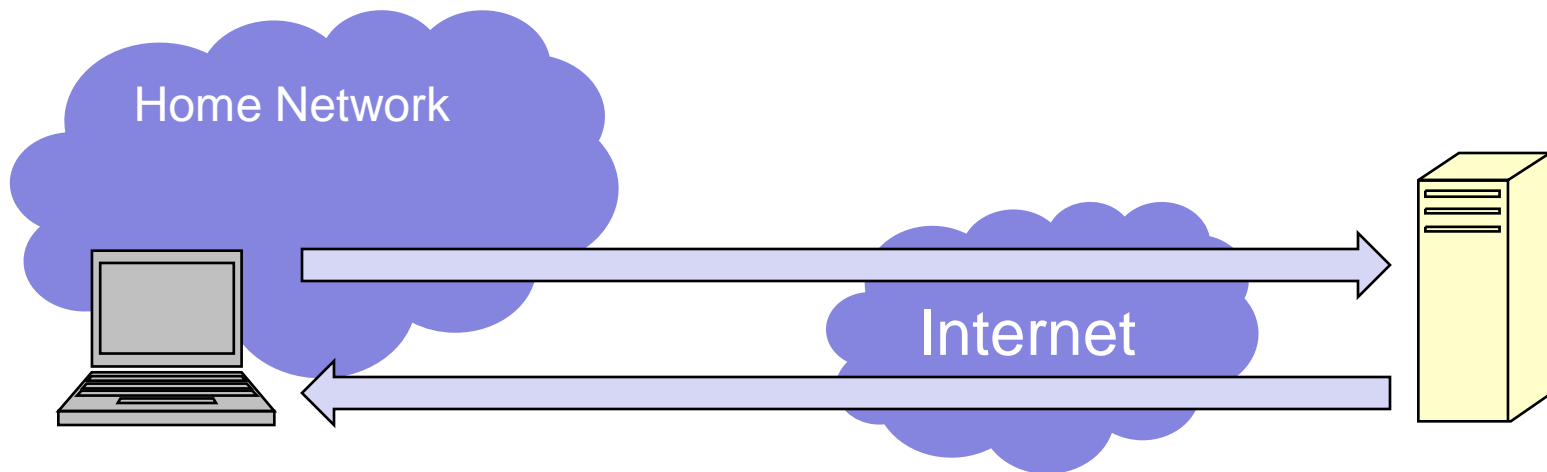
Mobile Users

- Seamless connectivity as users move around the network
 - Wired
 - Wireless
- Properties
 - Applications unaware user is moving between L2/L3 networks
 - L4 sessions remain active as user moves



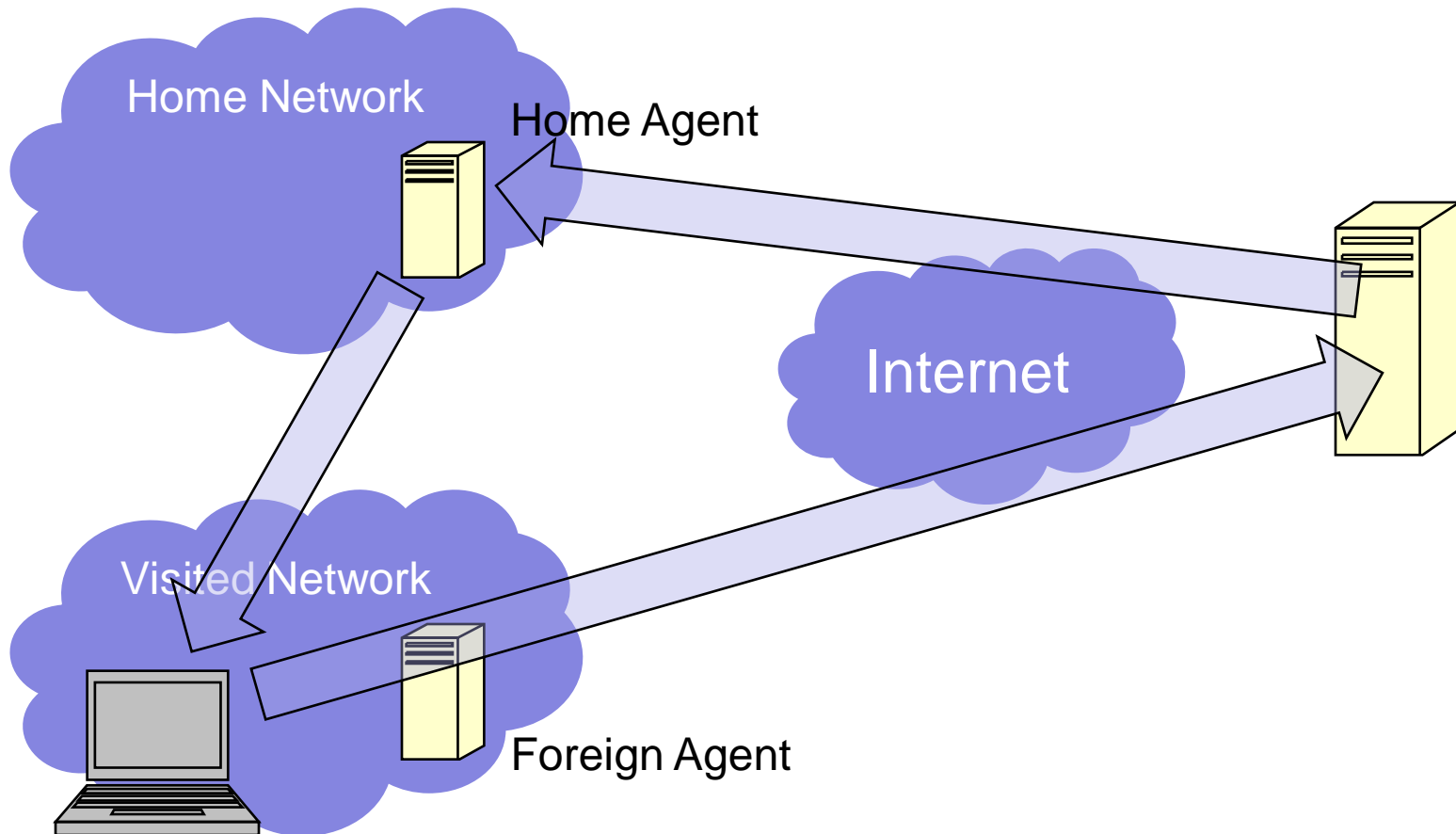
Mobile IP

- Allows user to maintain the same IP address no matter where they connect to the Internet
- In home network



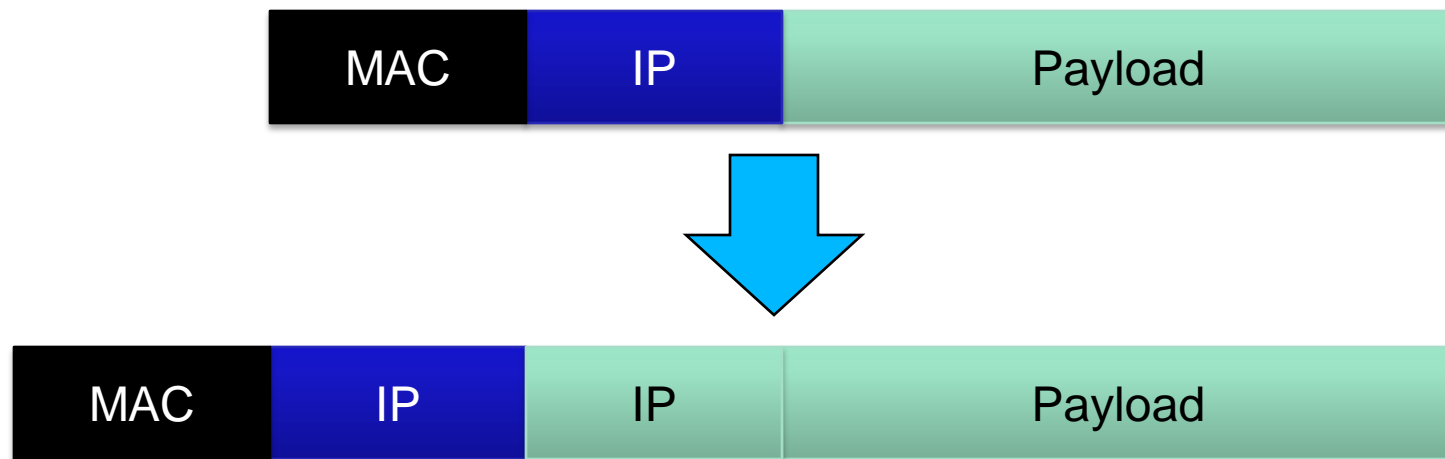
Mobile IP

- In visited network, actual IP address changes
- Need “agent” in each network to broker connection



Triangular Routing

- Mobile has two IP addresses
 - *Care-of* address on visited network
 - *Permanent* address on home network
- Home agent
 - Maintains mappings of care-of to permanent address
 - Encapsulates inbound traffic with an additional IP header



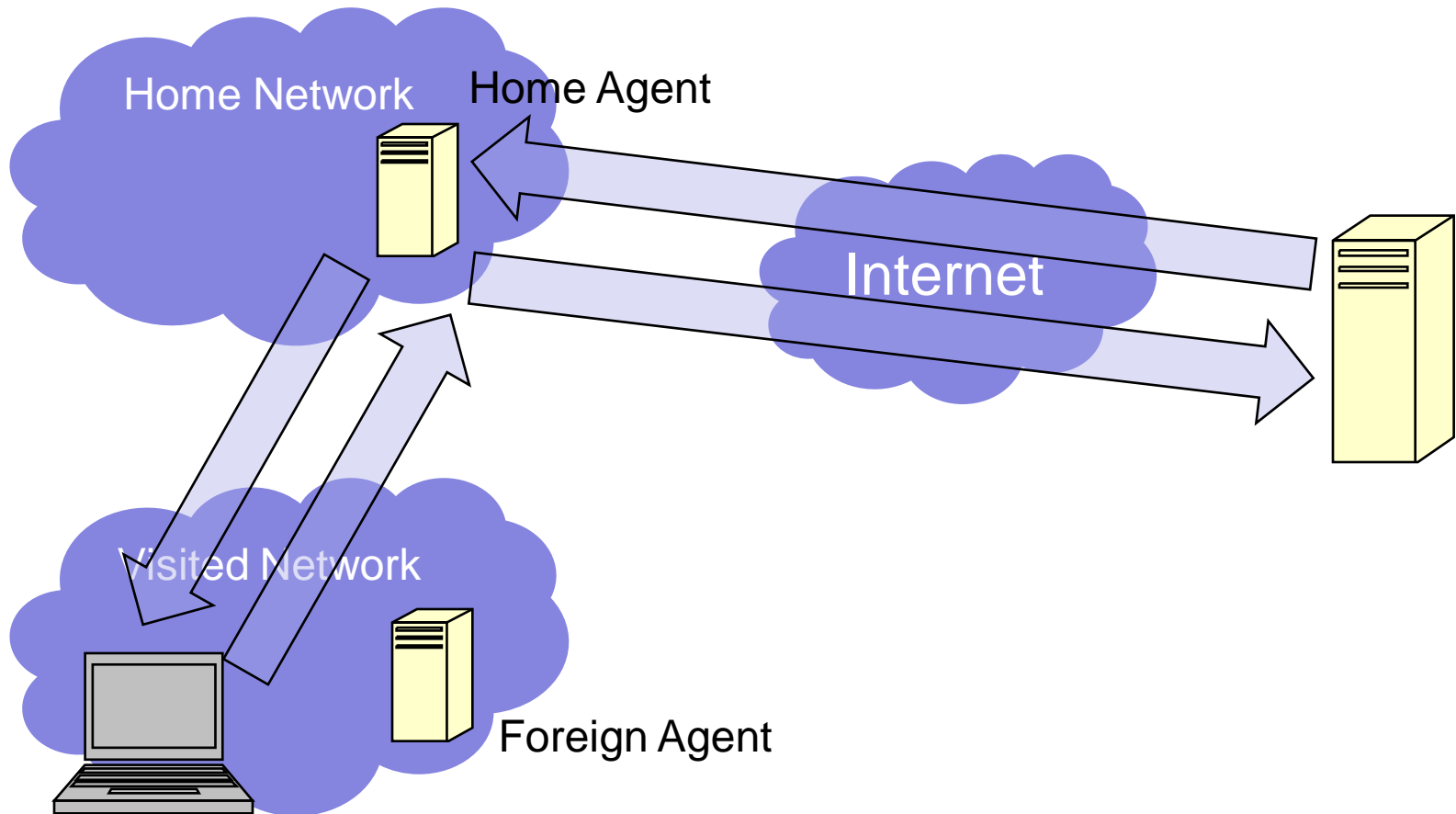
Triangular Routing

- Mobile node decapsulates tunneled data
- To transmit, mobile node can simply send data to the server with home network IP address as source
- Can cause security problems if routers check source addresses



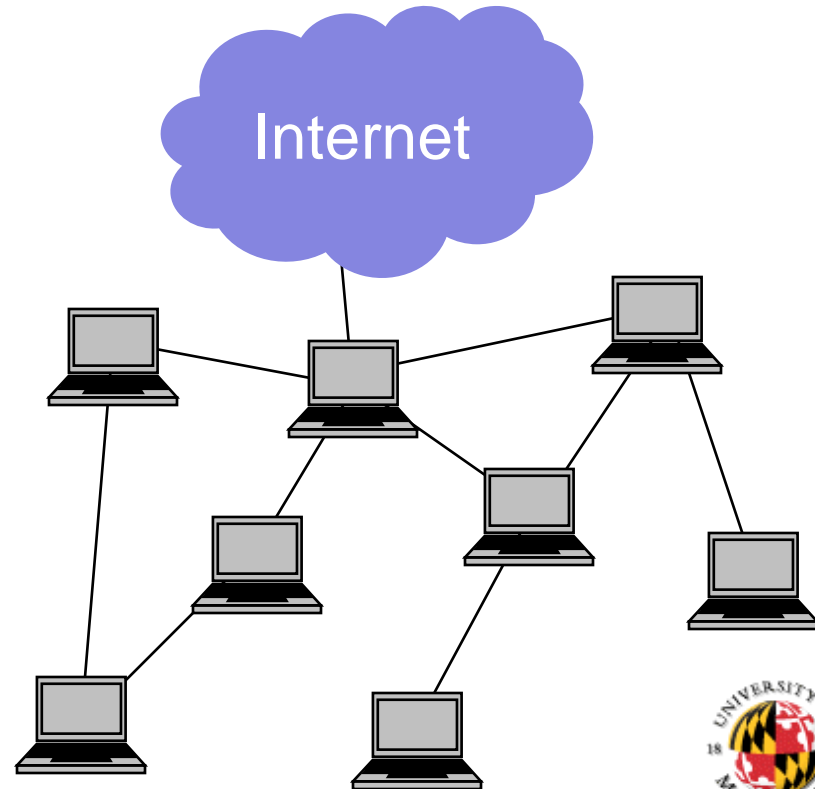
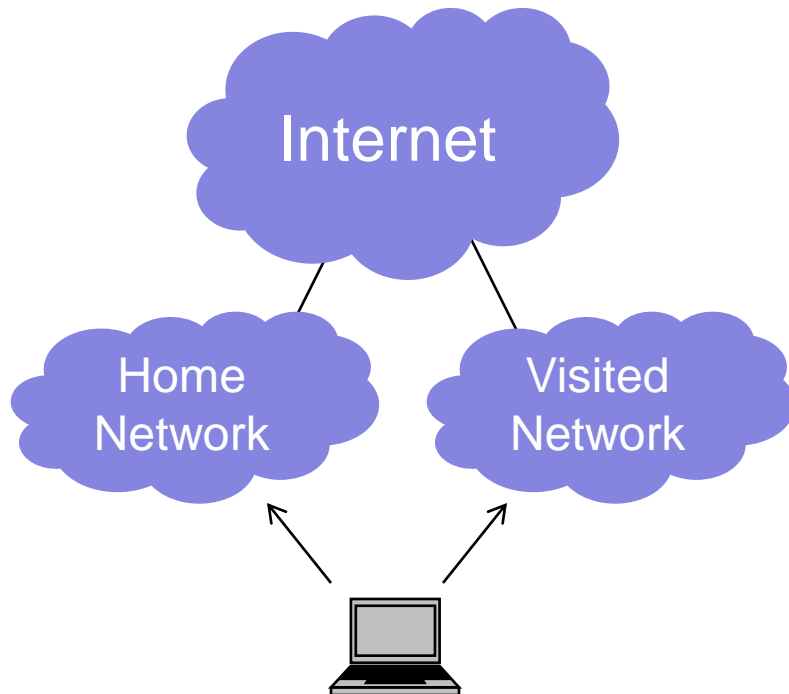
Reverse Tunneling

- All data travels through the home agent
- Added latency over traditional Mobile IP



Mobile Infrastructure

- Mobile IP good for Infrastructure networks
- What about when your entire infrastructure is mobile?



Many types of Mesh Routing

- Pro-active
 - Pre-establish routing information
- Re-active
 - On-demand routes
- Pro/Re hybrid
- Adaptive routing
 - Tables updated based on node mobility
- Hierarchical
 - Super-nodes organize flows
- Geographical
 - GPS-aware
- Power-Aware



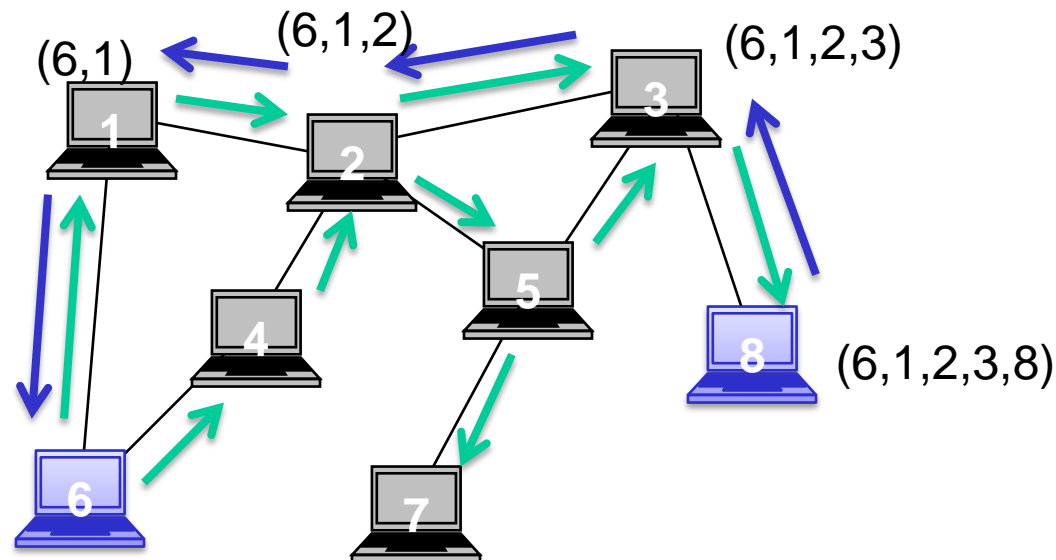
On-Demand Routing

- If the mesh network is stationary, you can run standard algorithms like RIP or OSPF
- If network is dynamically changing, RIP/OSPF not appropriate
- On-Demand Routing
 - End-hosts requests routing information on a per-transaction basis
 - Determine routing information in real time



Dynamic Source Routing (DSR)

- Flood network with route request
- Each hop maintains route information
- When destination receives message, reverses route and sends it back to the source
- Source then has full routing information



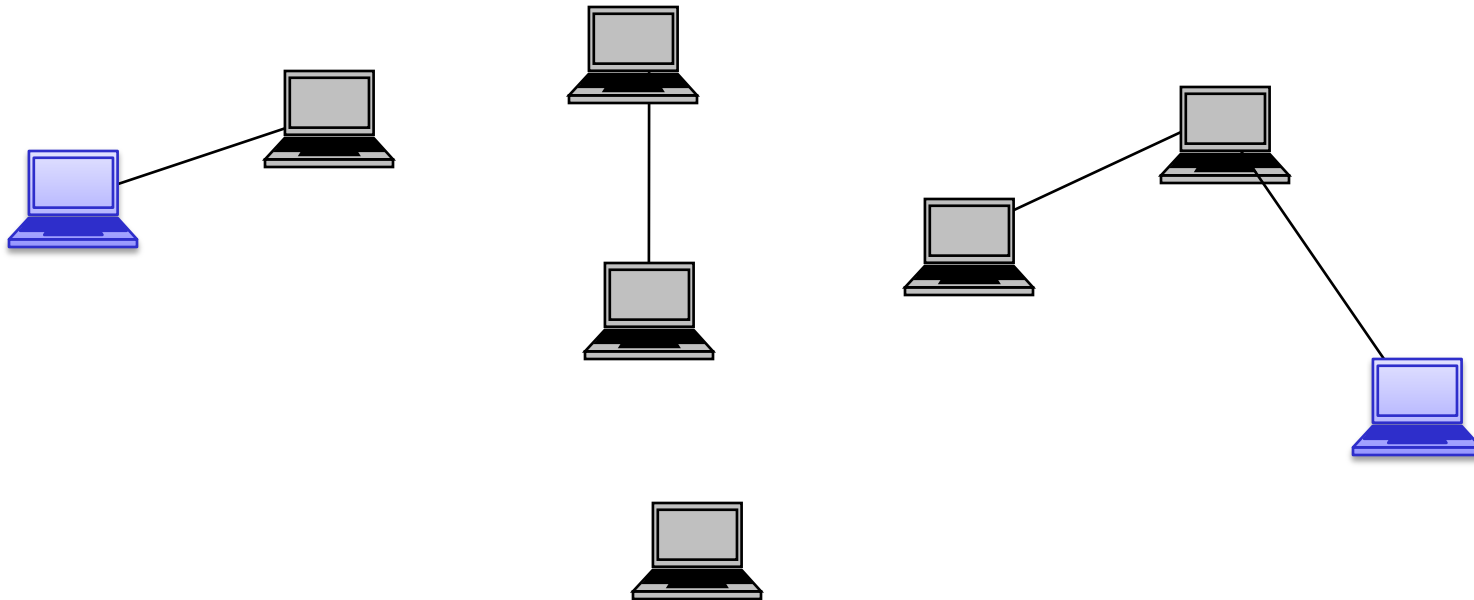
Adhoc On-Demand Distance Vector Routing (AODV)

- Improvement to DSR
- On-path nodes remember routing information as it propagates, build transient routing tables
- Source node does not need to include all the addressing information



Disconnected Networks

- Delay-Tolerant Networks
- Disruption-Tolerant Networks



Delay-Tolerant Networks (DTNs)

- Rely on node mobility to deliver messages
- Store and forward networks
- If node is completely disconnected, how does it know to whom it should give a message?



Epidemic Routing

- Easy solution: give the message to everyone you see
 - Message spreads like a disease
- Inefficient, wastes storage space on devices who are not on the path between the source and destination
- Improvement:
 - When the destination receives the message, it sends out an ACK, so devices can delete the buffered message
 - Spreads like a vaccine



Gradient Decent

- Each node broadcasts distance, incremented each hop
 - Much like distance-vector routing
- Only pass messages to nodes with smaller value than you
- Topology changes
 - Distance number inaccurate
 - Solution
 - Each node gradually increments values
 - If you receive a message with lower value, update



Analyzing DTNs

- Analysis depends on mobility model
 - Random appearance
 - Random walk
 - Random way-point
 - Localized random walk

