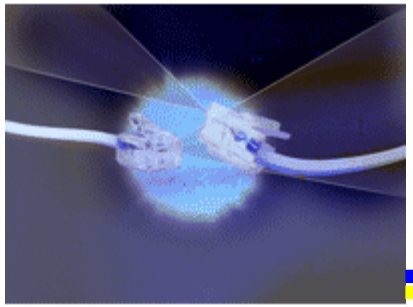
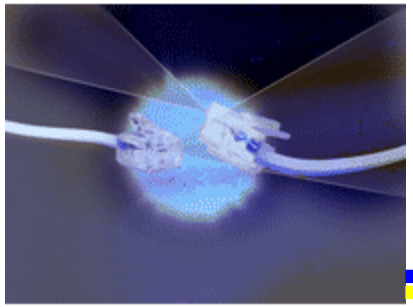


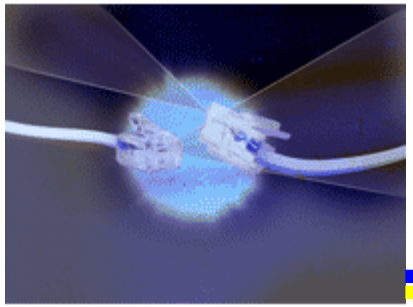
Subnetting

- Used to subdivide a single IP network, to more efficiently utilize the address space (create *subnets*)
- Also allows introduction of additional hierarchy of address space, so routers throughout internet don't need to know about all physical networks
  - Subnets should all be connected so they look like a single network to the internet



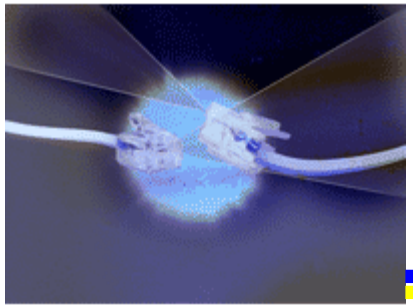
Subnetting (cont.)

- Create subnets using a *subnet mask*
  - The first *n* bits of the host number are used as the subnet number
  - All hosts on a physical network must have the same subnet number, and therefore the same subnet mask
- Example – use a subnet mask of 255.255.255.192 for a class C network – adds two highest bits of host # to subnet #



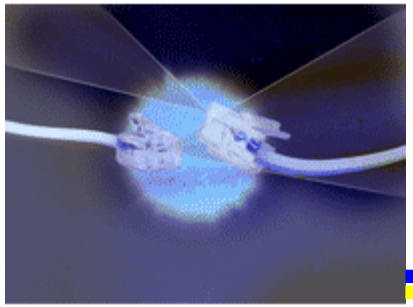
Subnetting (cont.)

- Routers outside network can be ignorant of subnets
- Routers inside network need to use subnet number and mask to do router, rather than just IP network number
- Not necessary for subnet bits to be contiguous in mask, but this should be avoided



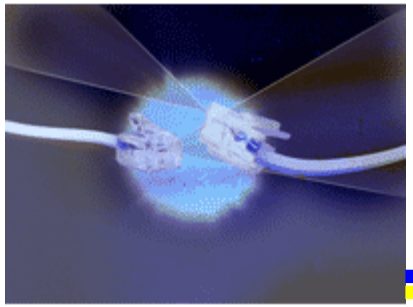
Subnetting (cont.)

- Can also put multiple subnets on a single physical network
  - Will force hosts on network to talk through a router



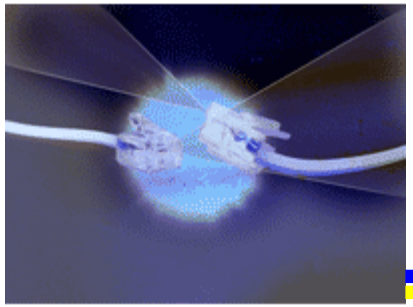
Forwarding Messages

- Home agent impersonates mobile node using *proxy ARP*
  - Sends out ARP messages with its own MAC address and mobile nodes home address, so other nodes on network think home agent is mobile node
- Nodes send message to mobile node using permanent home address; home agent receives messages



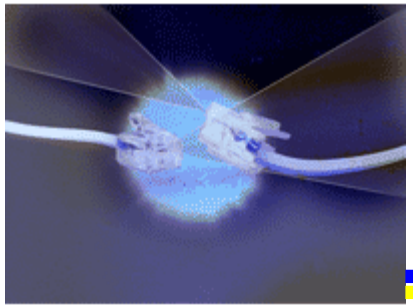
Forwarding Messages (cont.)

- Home agent forwards message to foreign agent using IP tunneling
- Foreign agent unwraps IP message, delivers to the MAC address of mobile node (recorded when mobile node registered on foreign network)



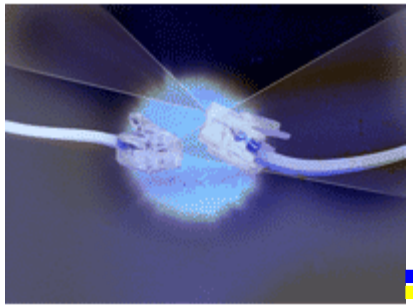
Eliminating Foreign Agent

- Mobile node can function as its own foreign agent, provided it can obtain an IP address on foreign network
  - Maybe use DHCP
  - Assigned IP address is used as care-of address
- When mobile node sends, it puts its home address in source address; any replies are routed as described



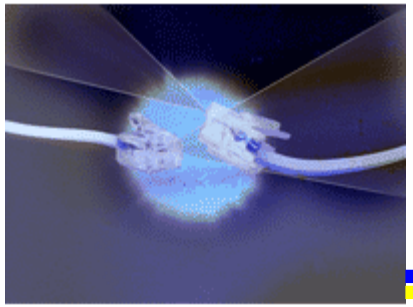
Route Optimization

- Forwarding through home agent can be significant overhead
  - Suppose mobile node is talking to another node on the same foreign network; every packet to mobile node must go clear to home node and be sent back through IP tunnel to foreign agent
  - Referred to as “triangle routing problem”



Route Optimization (cont.)

- To resolve, let sending node know care-of address for mobile node
  - Sending node creates tunnel directly to foreign agent
- Home agent sends *binding update* back to sending node when it forwards a packet
  - Requires special software in source node
  - If source understands, it can create entry in *binding cache*, use this to tunnel message next time it sends to mobile node



Route Optimization (cont.)

- Problem if binding caches become out of date when mobile node moves
  - Foreign agent can send *binding warning* if mobile node no longer on network
  - Sender then removes cache entry, goes back to sending through home agent
  - Only works if foreign agent is not mobile node
- Related area – ad hoc networks