CS2105 Lecture 6
Network Layer

18 February, 2013

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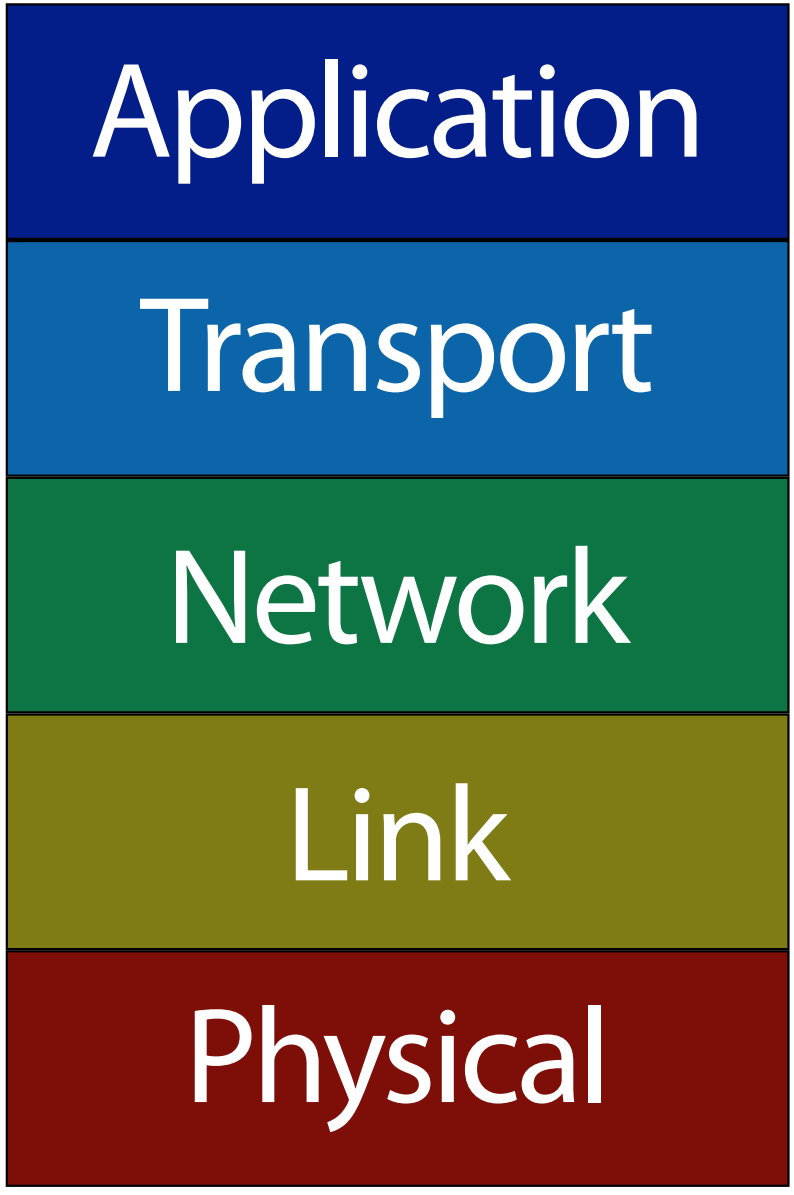
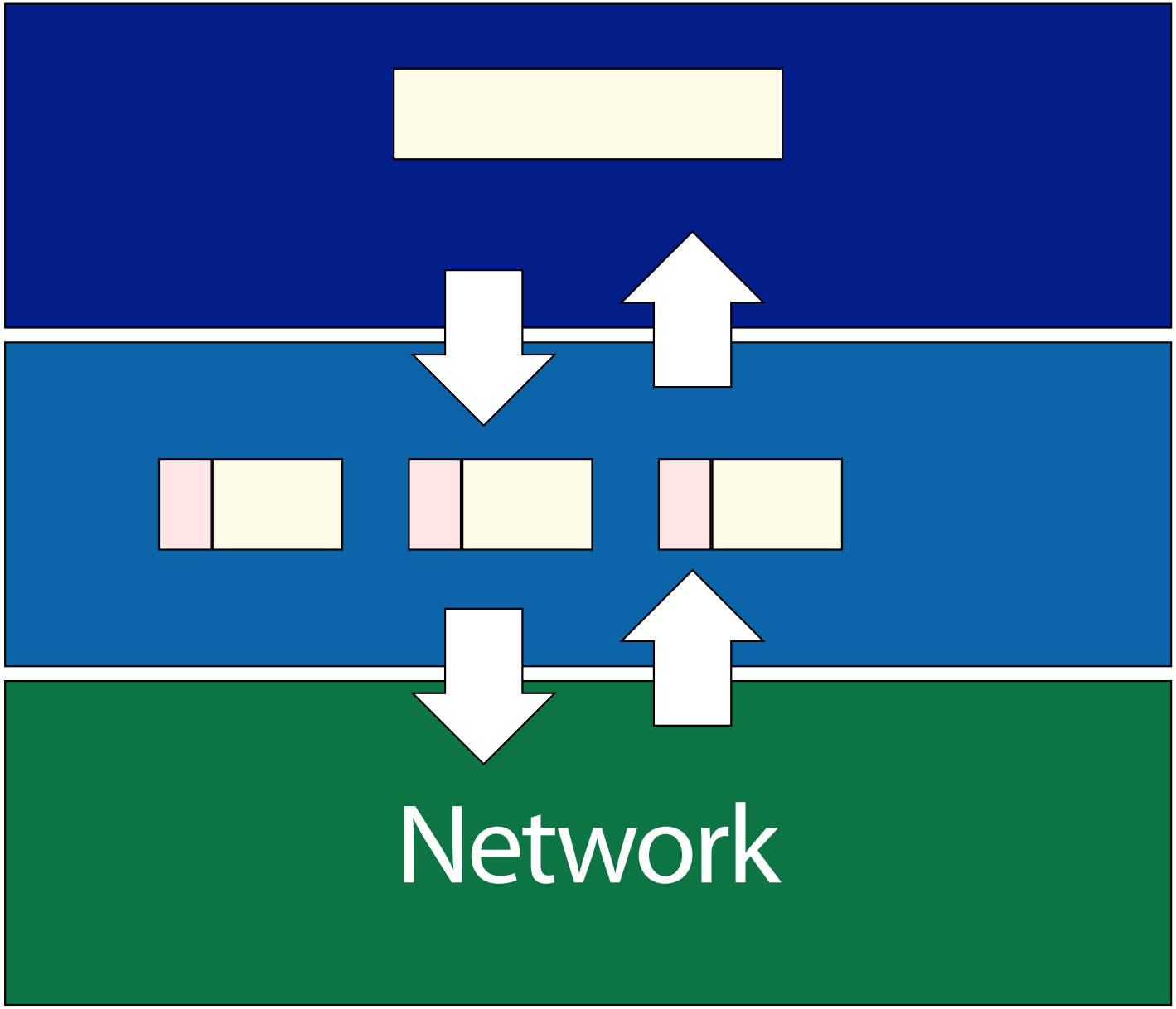
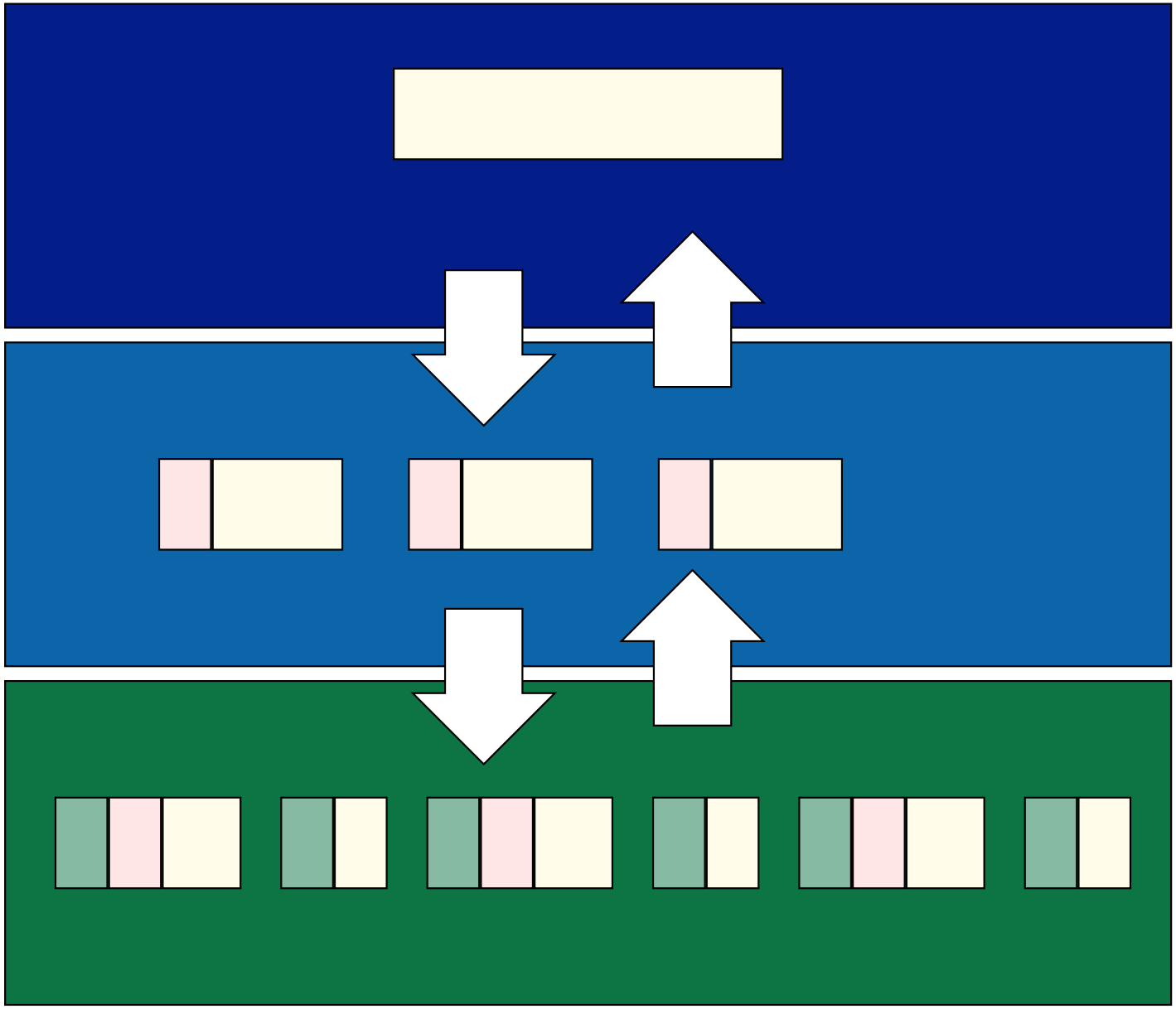
After this class, you are expected to be able to

- describe the basic services the network layer and IP provides
- understand how datagram fragmentation works
- understand IP address, subnet, subnet mask, and address allocation.
- understand the purposes of NAT and DHCP and how they works.
- understand how ping and traceroute are implemented with ICMP
- understand how forwarding is done in a router with longest prefix matching


Application
Transport
Network
Link
Physical


Network



The network layer resides on both end hosts and routers.

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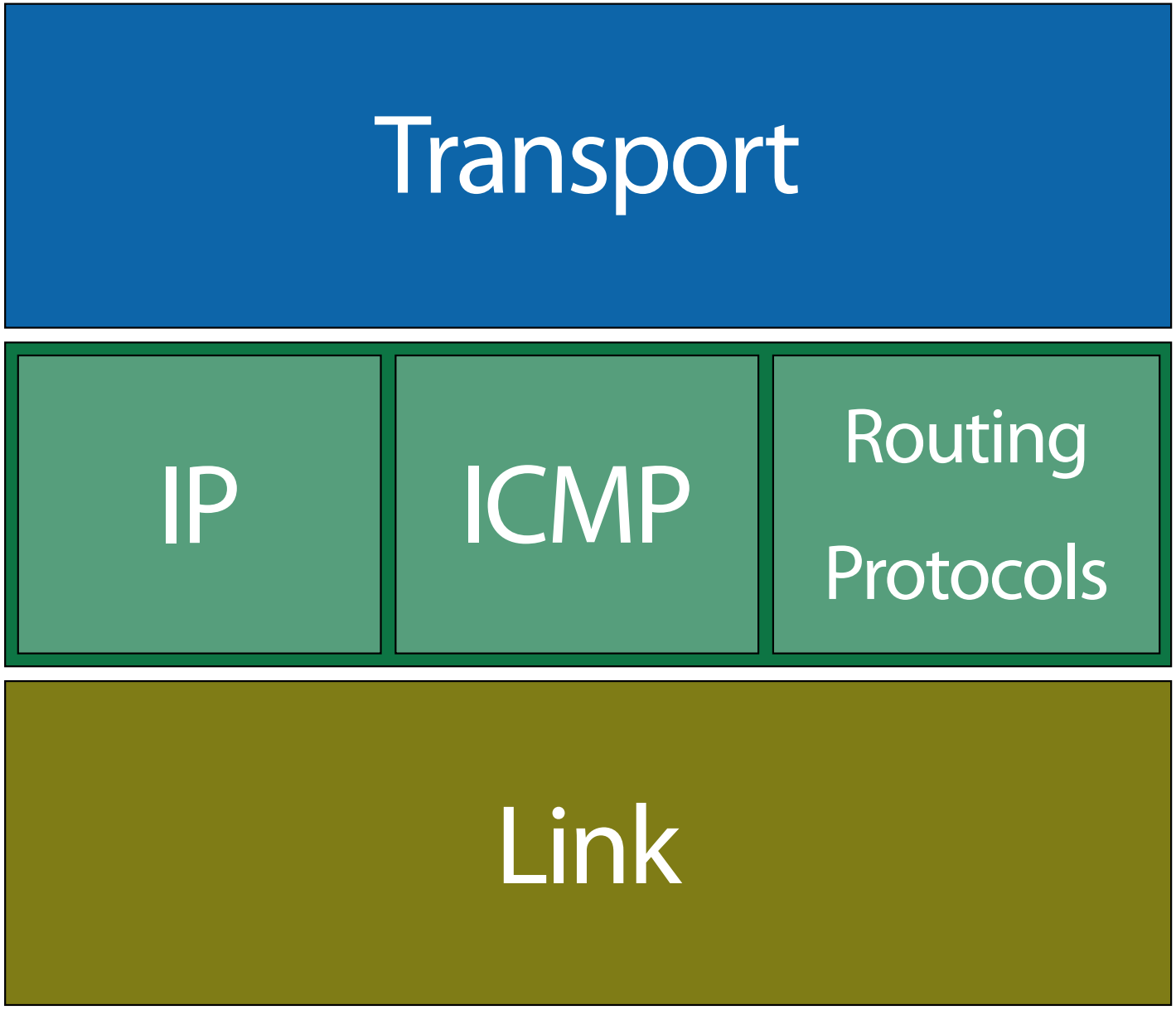
We focus on datagram networks in CS2105. You can read about the other alternative, virtual circuit, if you are interested, in Section 4.2.1.


Transport
IP
ICMP
Routing
Protocols
Link

IP
The Internet Protocol
version 4

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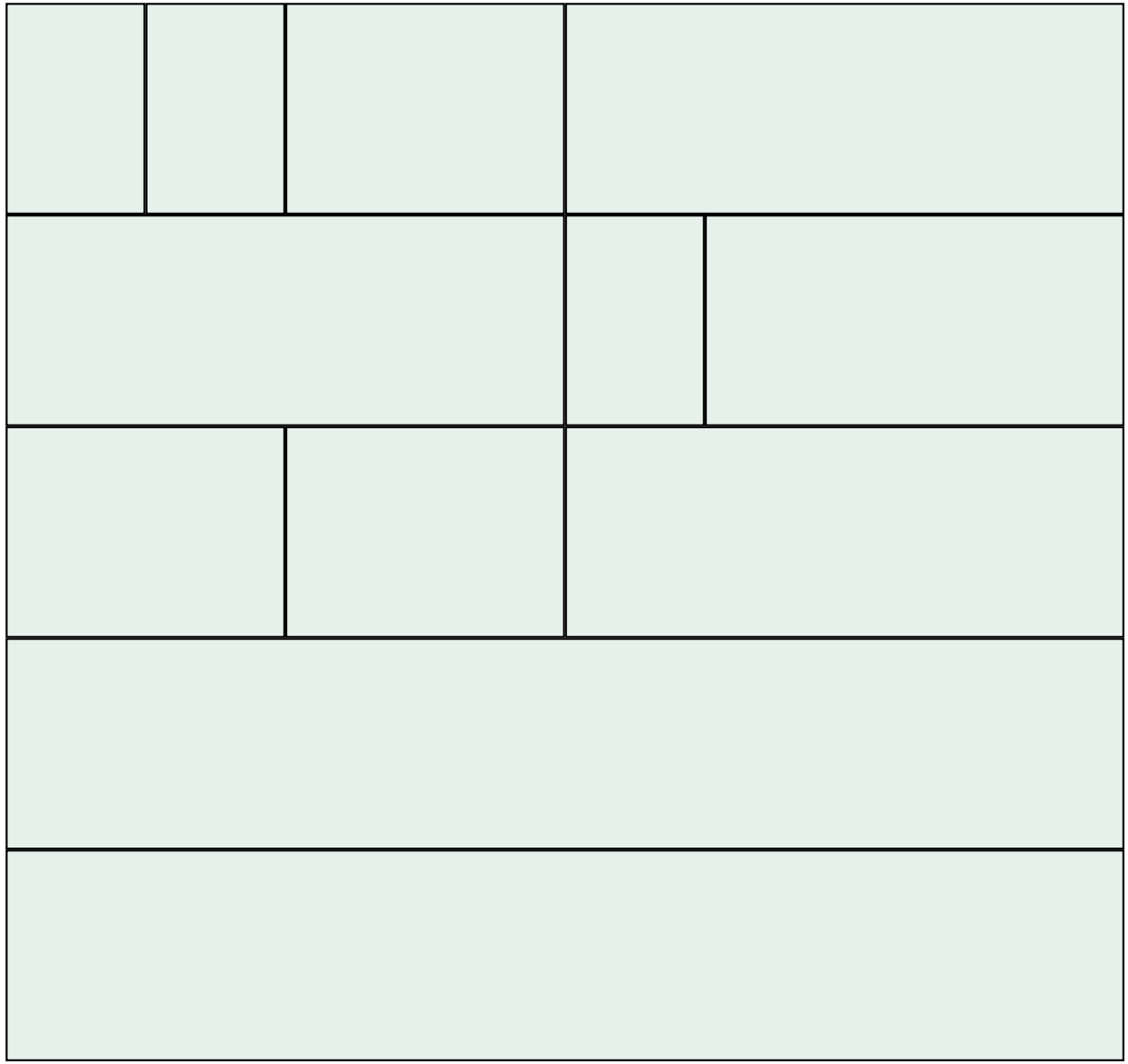
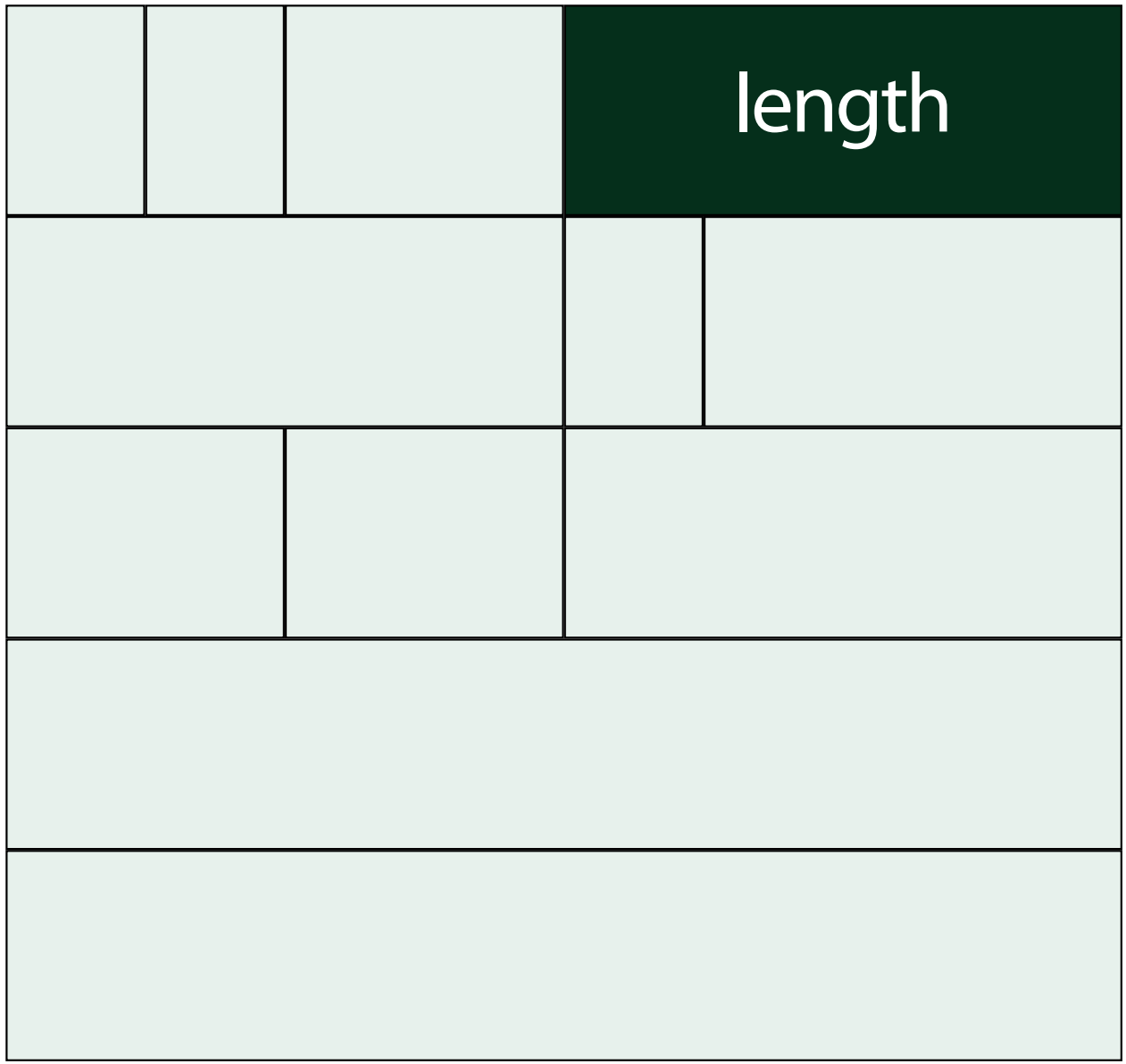
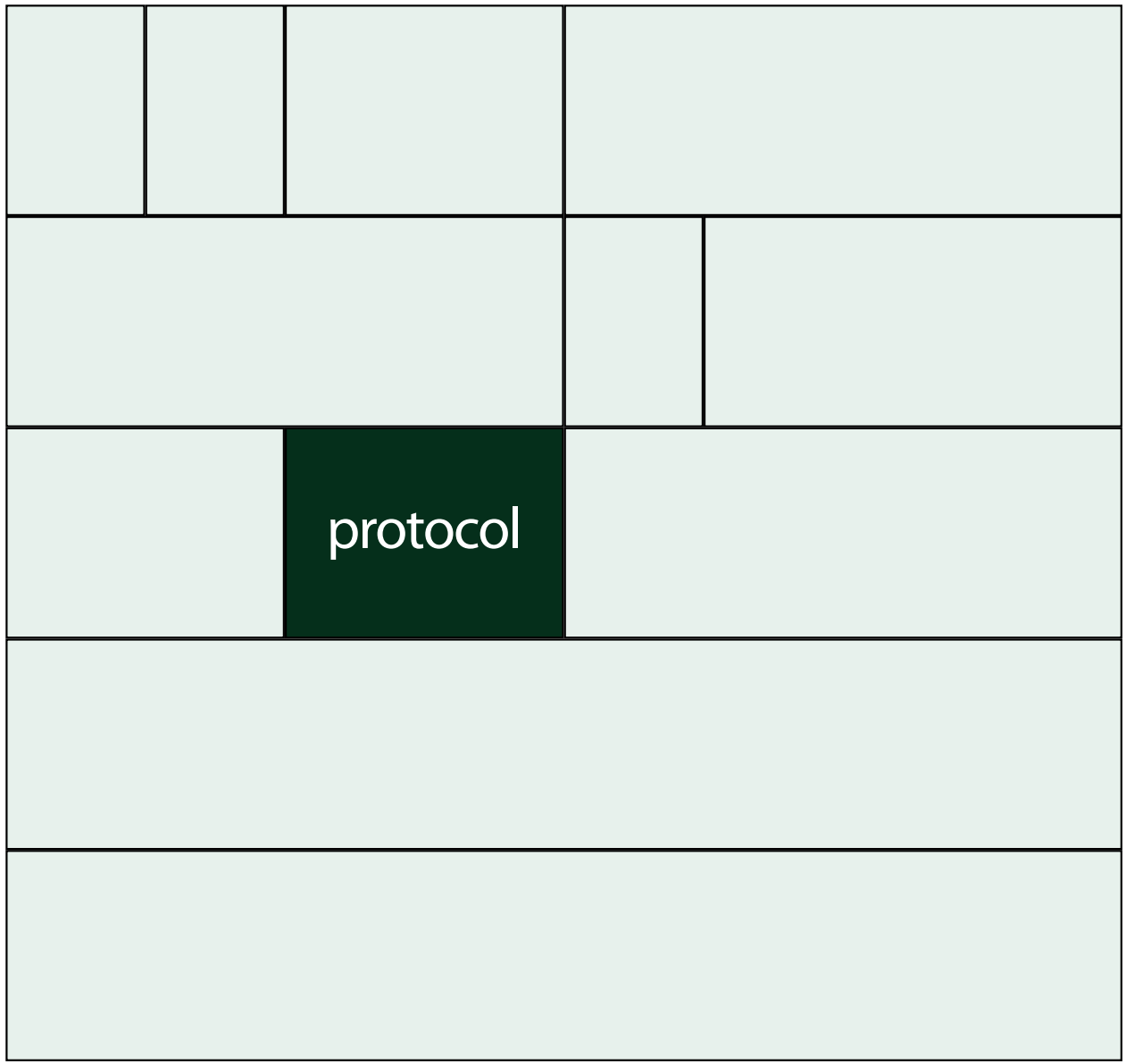
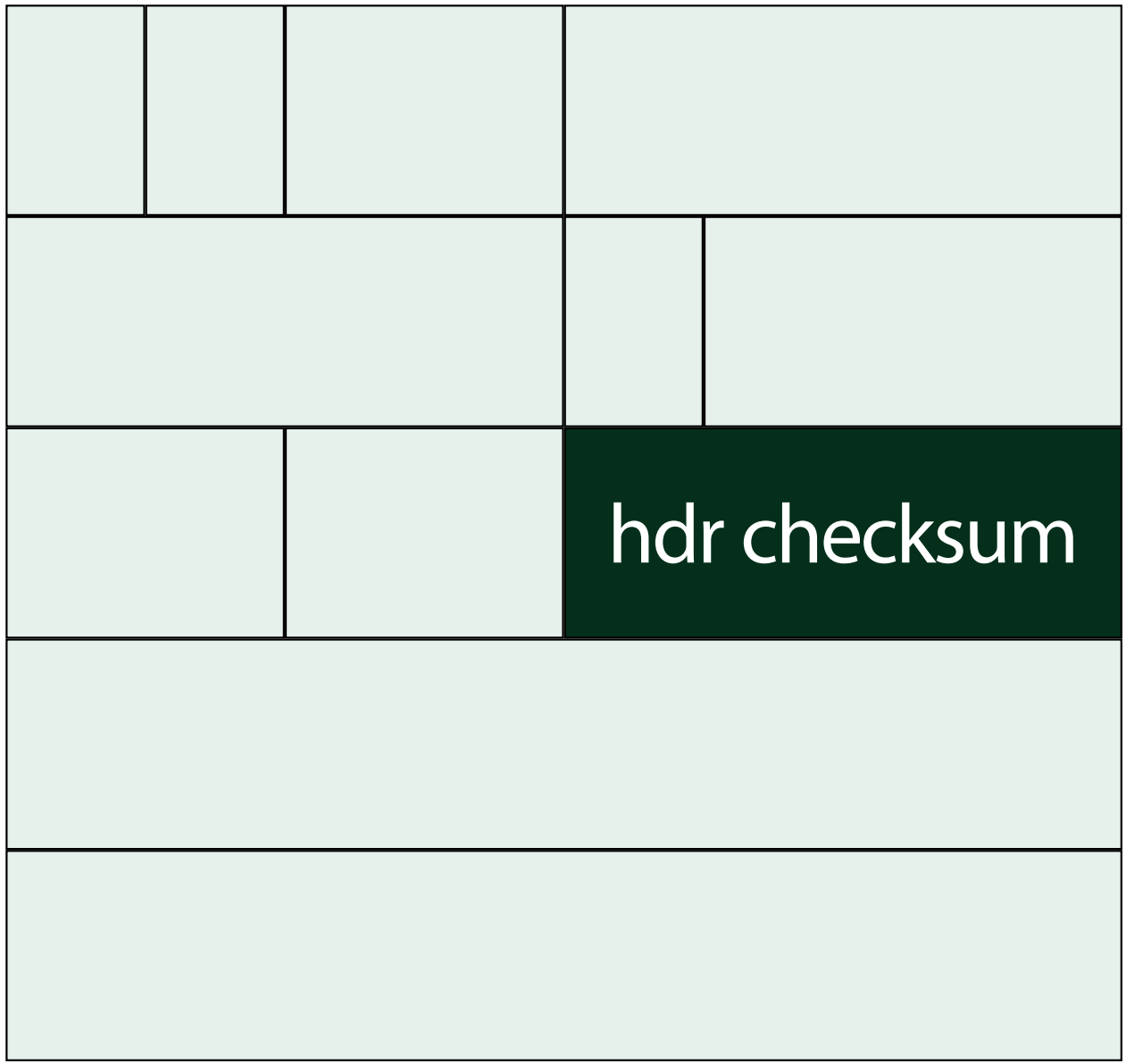
The Internet Protocol
version 4

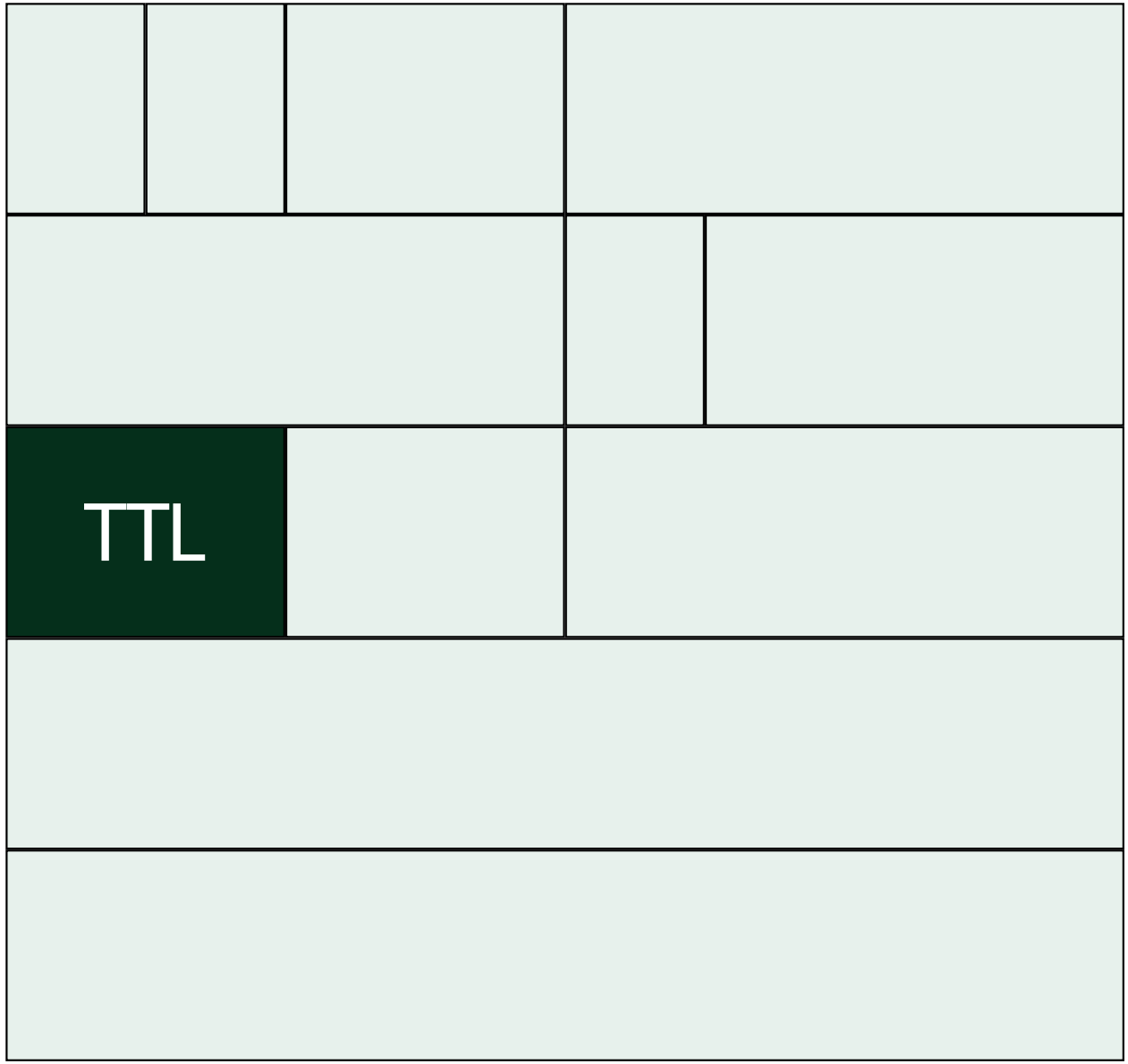
We focus on IPv4, which is still the dominant version of IP running today. IPv6, however, is increasingly being deployed and will replace IPv4 eventually. Interested students are encourage to read up Section 4.4.4 of the textbook to learn about IPv6.

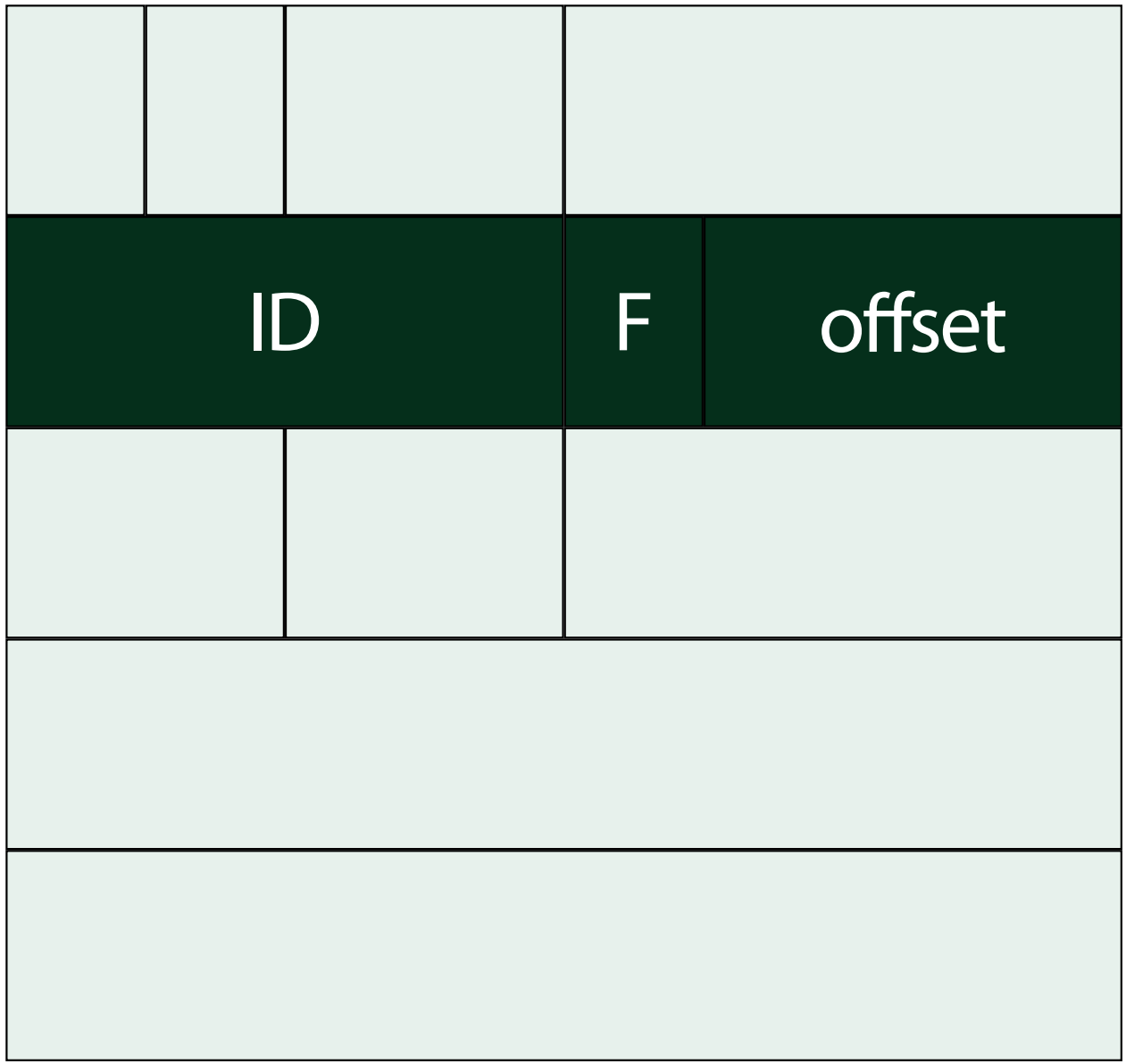


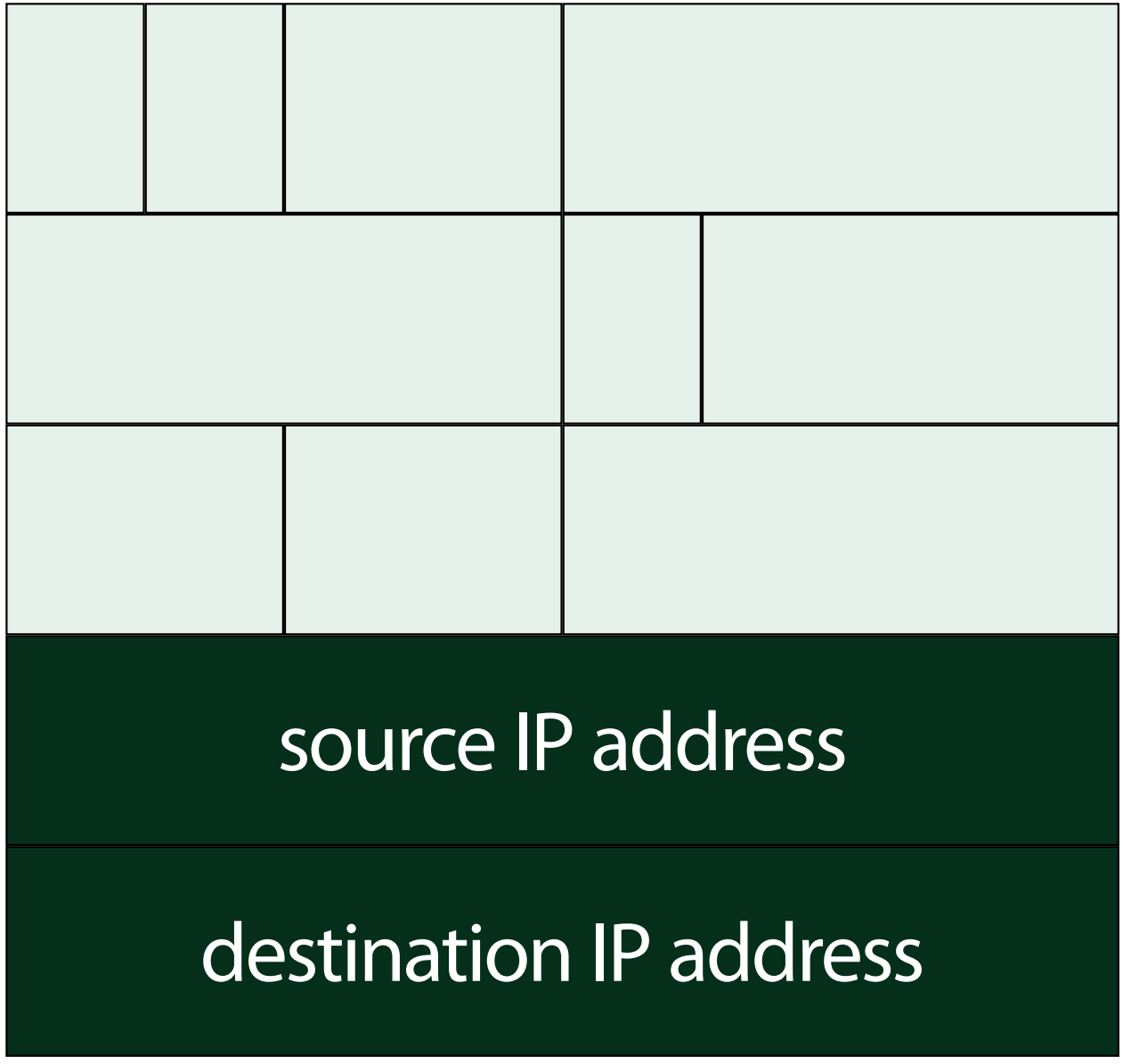

length


protocol


hdr checksum


TTL


ID
F
offset


source IP address
destination IP address

An IP address is
associated with **an interface**.

4,294,967,296

ran out in 2011
(but only 14% utilized)

subnet

subnet mask

classful network address allocation

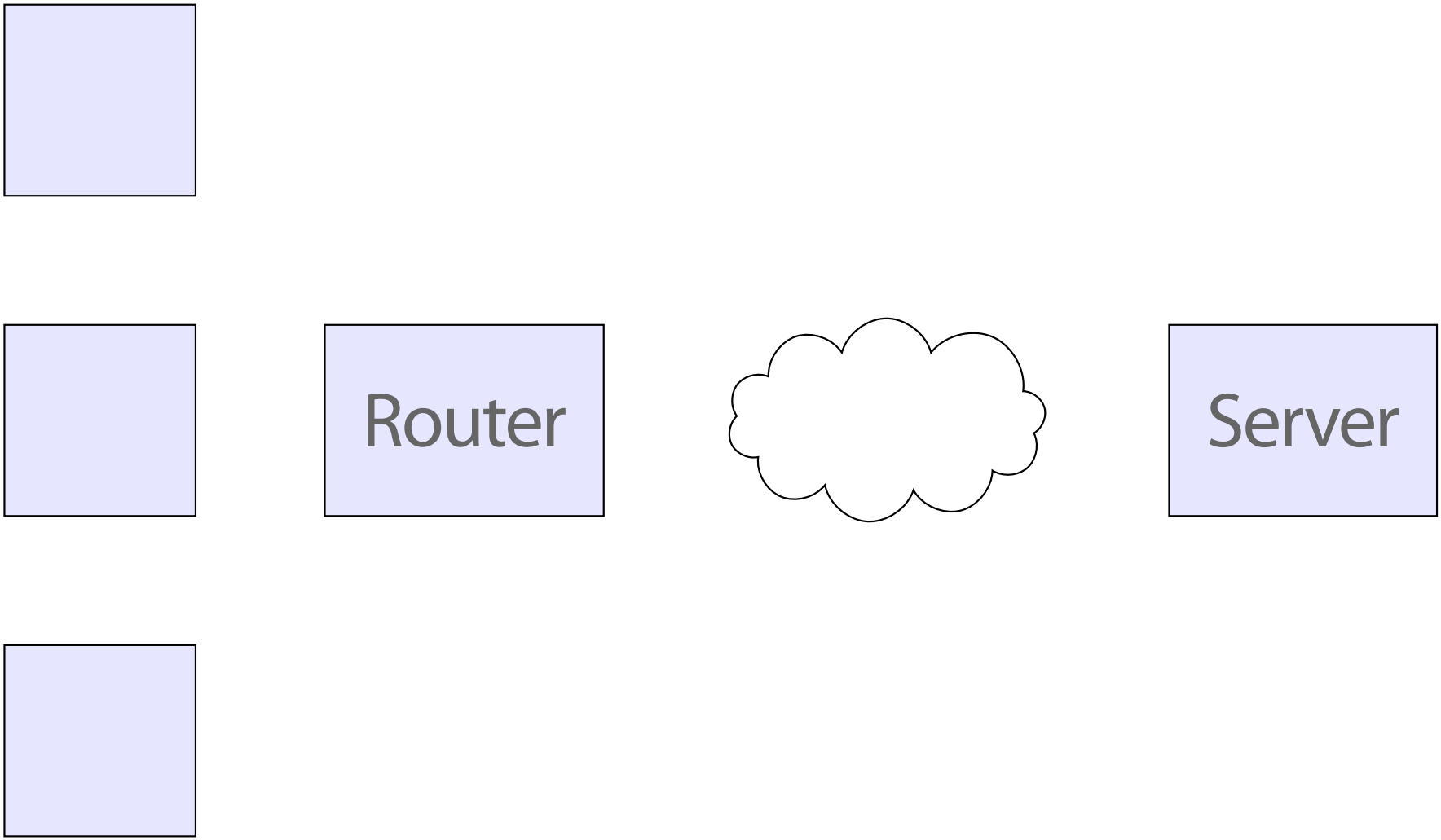
classless network address allocation

``special" IP addresses

The list of special IP addresses can be found in RFC5735. `http://tools.ietf.org/rfc/rfc5735.txt`

DHCP
Dynamic Host Configuration Protocol

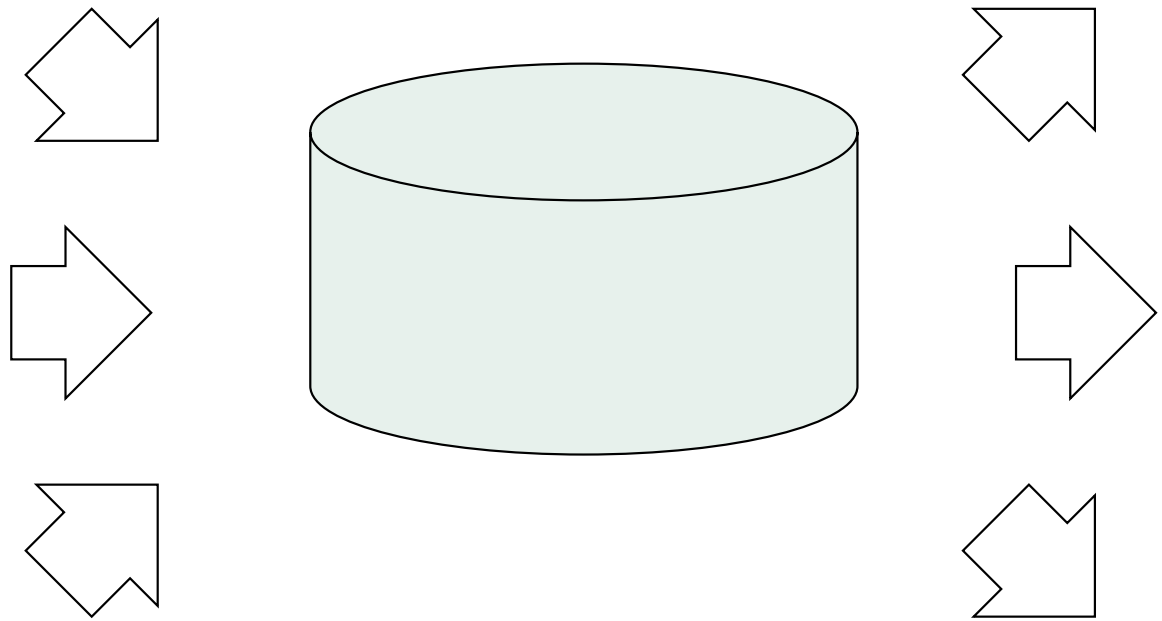
NAT
Network Address Translation


Router
Server

ICMP
Internet Control Message Protocol

ping

traceroute



forwarding table

longest prefix matching