

CSC411: Advanced Networks

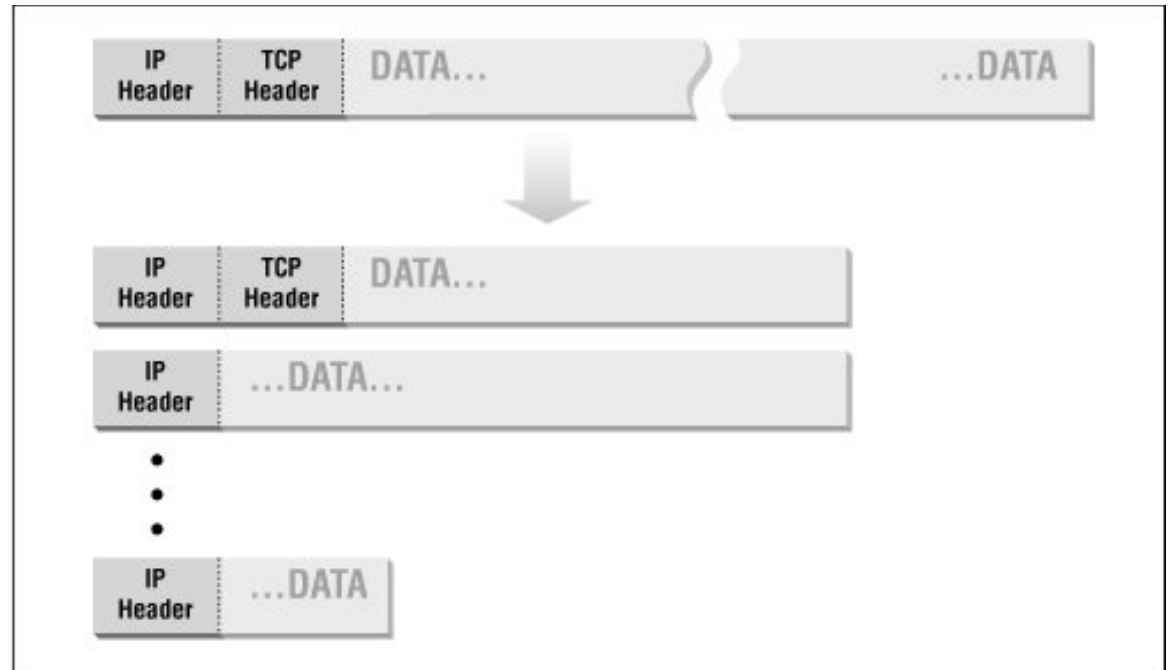
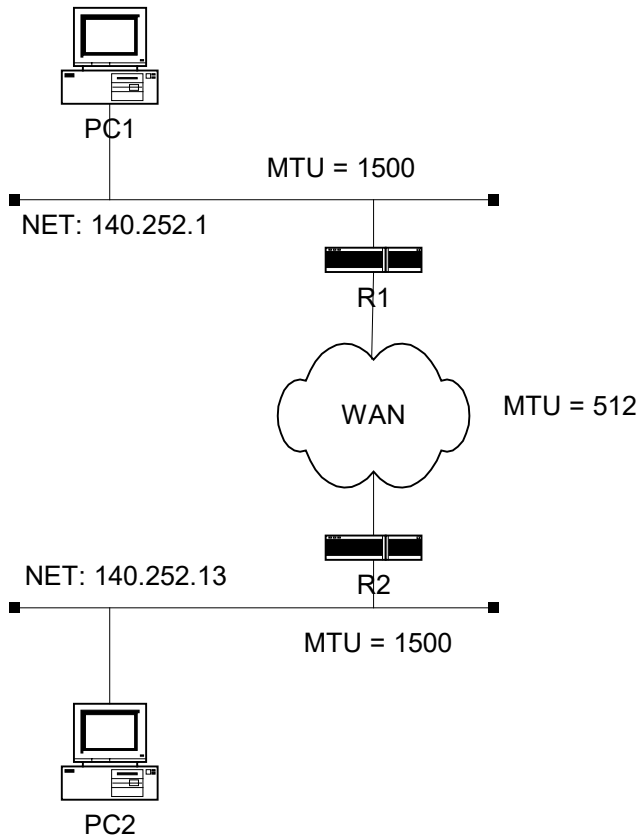
IP Fragmentation

Note: This class lecture will be recorded!

If you do not consent to this recording, please do not ask questions via your video, audio or public chat; send your question to the instructor using the private chat.

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IP Fragmentation



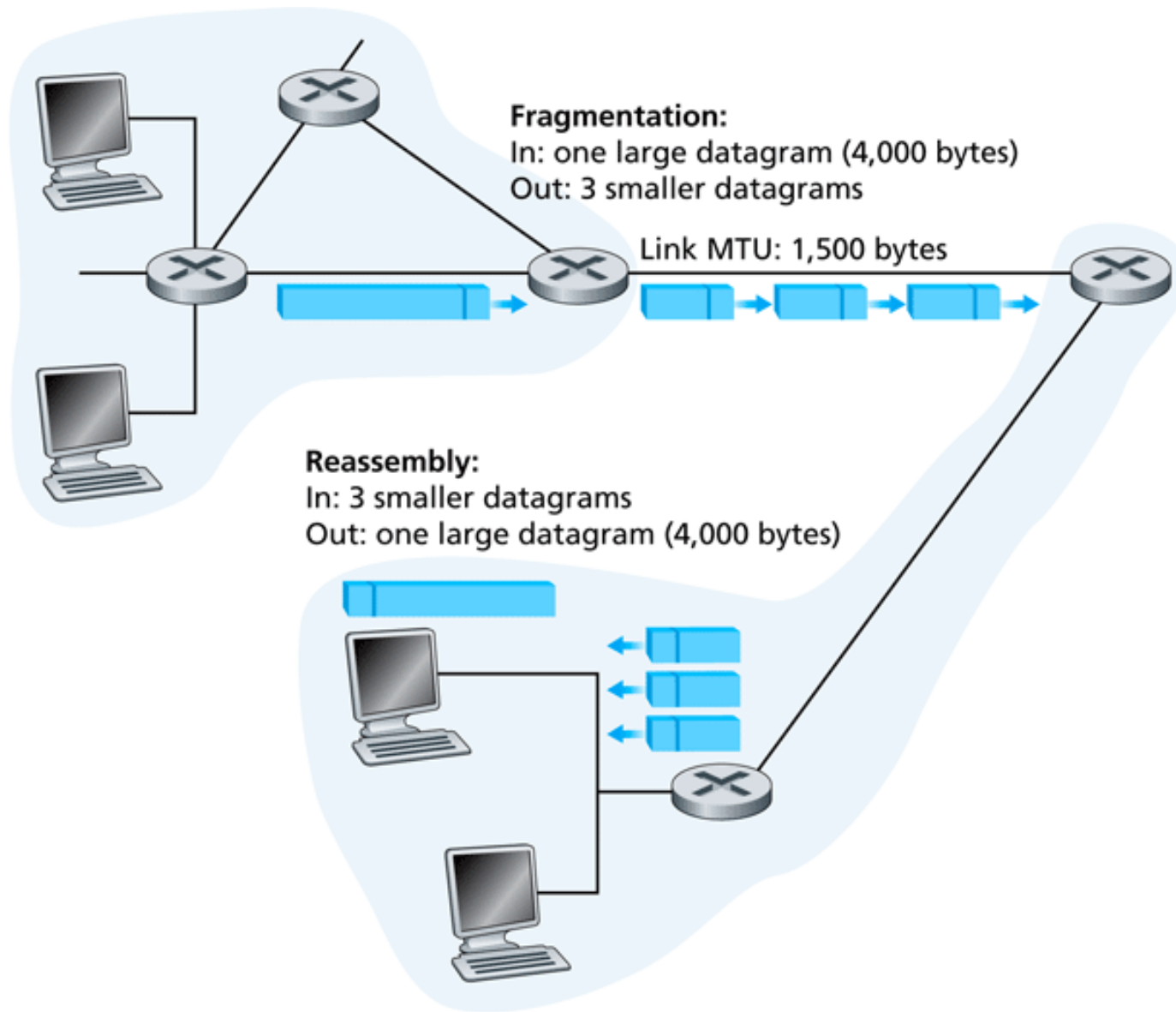


Figure 4.14 ♦ IP fragmentation and reassembly

Fragmentation Algorithm

Given: an IP datagram, D , and a network MTU.

Produce: a set of fragments for D .

If the *DO NOT FRAGMENT* bit is set {

 Stop and report an error;

}

Compute the size of the datagram header, H ;

Choose N to be the largest multiple of 8 such that $H+N \leq \text{MTU}$;

Initialize an offset counter, O , to zero;

Repeat until datagram empty {

 Create a new fragment that has a copy of D 's header;

 Extract up to the next N octets of data from D and place the data in the fragment;

 Set the *MORE FRAGMENTS* bit in fragment header;

 Set *TOTAL LENGTH* field in fragment header to be $H+N$;

 Set *FRAGMENT OFFSET* field in fragment header to O ;

 Compute and set the *CHECKSUM* field in fragment header;

 Increment O by $N/8$;

}

IP Fragmentation & Reassembly

length	ID	fragflag	offset
=3980	=71	=0	=0

One large datagram becomes
several smaller datagrams

length	ID	fragflag	offset
=1500	=71	=1	=0

length	ID	fragflag	offset
=1500	=71	=1	=1480

length	ID	fragflag	offset
=1040	=71	=0	=2960

Reassembly Algorithm

Given: a fragment, F , add to a partial reassembly.

Method: maintain a set of fragments for each datagram.

Extract the source IP address, S , and ID fields from F ;

Combine S and ID to produce a lookup key, K ;

Find the fragment set with key K or create a new set;

Insert F into the set;

If the set contains all the data for the datagram {

Form a completely reassembled datagram and process it;

}

Question #1

- ▶ Consider sending a 2,000-byte datagram into a link with a MTU of 980 bytes. Suppose the original datagram has the identification number 227. How many fragments are generated?



Question #2

- ▶ For each fragment, what is its size, what is the value of its identification, fragment offset, and fragment flag?

Question #3

- ▶ Consider sending a 2,500-byte datagram into a link that has an MTU of 600 bytes. Suppose the original datagram is stamped with the identification number 41. How many fragments are generated?



Question #4

- ▶ For each fragment, what is its size, what is the value of its identification, fragment offset, and fragment flag?

Question #5

- ▶ 2500 byte datagram
- ▶ MTU = 600 bytes
- ▶ ID = 41

Frag #	ID	Flag	Payload size	Total size	Offset

Simulation – Try This!

- ▶ <http://www.cs.stir.ac.uk/~kjt/software/comms/jasper/IP.html>