Assignment 2

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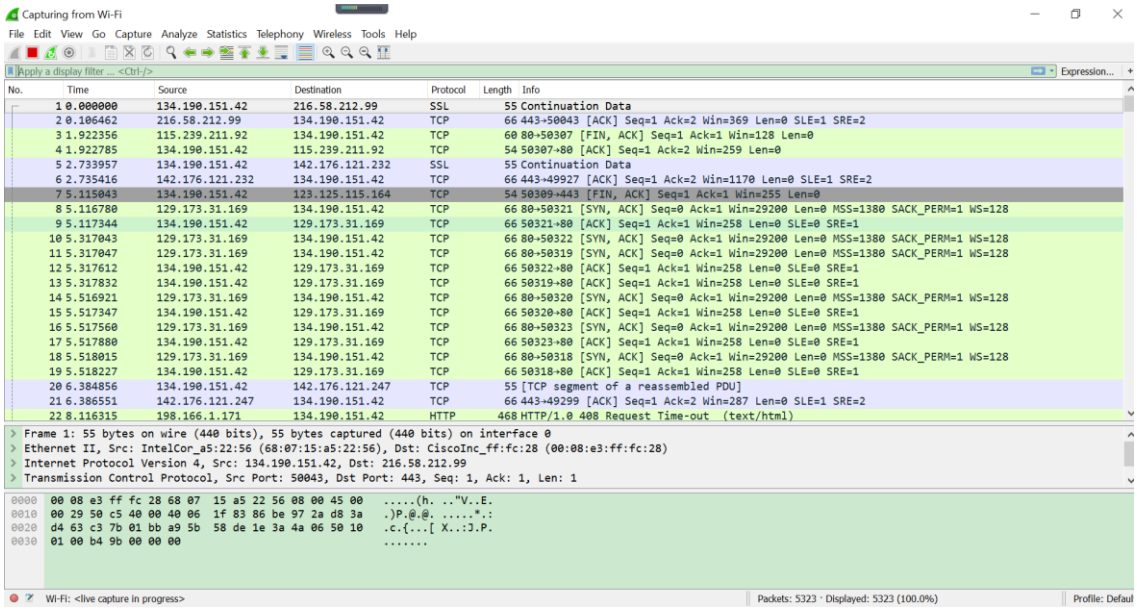
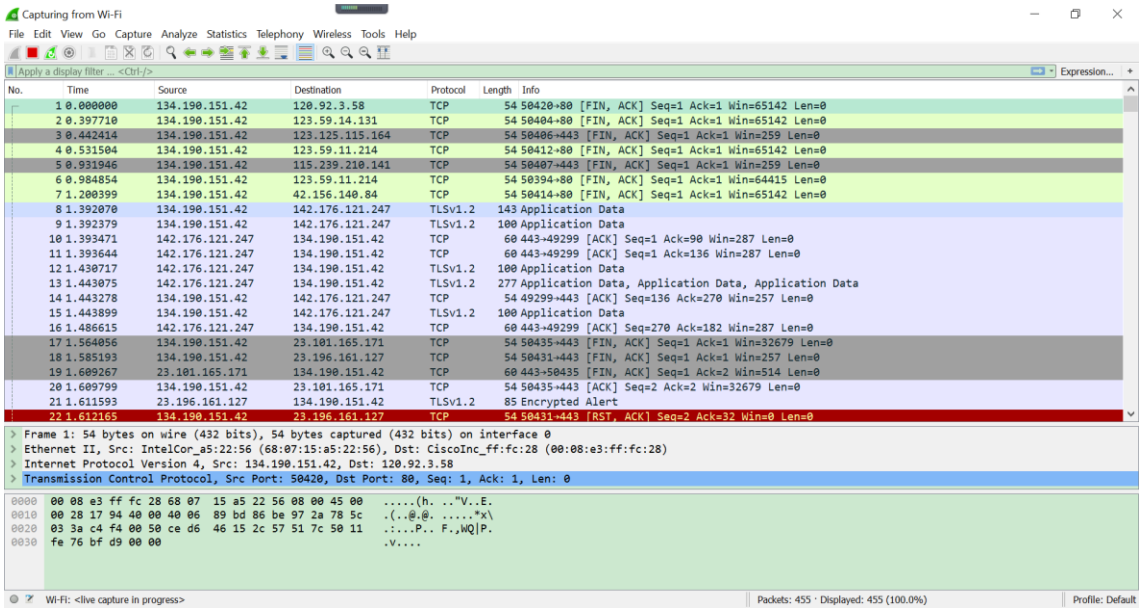
1. Experimental study with Wireshark

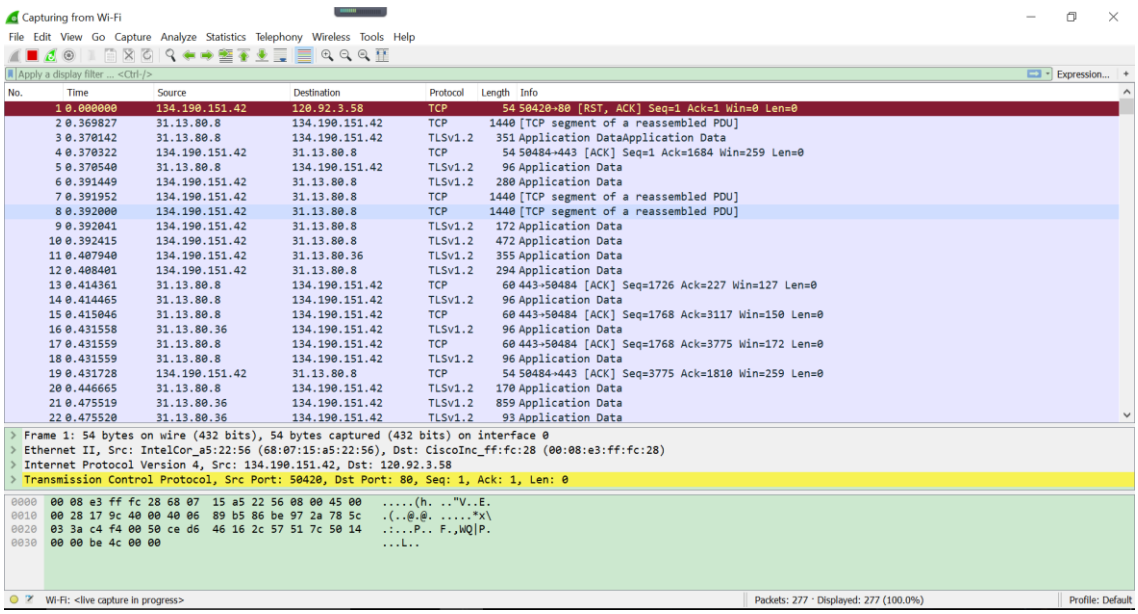
   b) www.cisco.com



www.google.ca



www.facebook.com



c) www.cisco.com-TCP segment

```
Transmission Control Protocol, Src Port: 52936, Dst Port: 80, Seq: 1, Ack: 1, Len: 1460
    Source Port: 52936
    Destination Port: 80
    [Stream index: 0]
    [TCP Segment Len: 1460]
    Sequence number: 1    (relative sequence number)
    [Next sequence number: 1461    (relative sequence number)]
    Acknowledgment number: 1    (relative ack number)
    Header Length: 20 bytes
  > Flags: 0x018 (PSH, ACK)
    Window size value: 958
    [Calculated window size: 958]
    [Window size scaling factor: -1 (unknown)]
    Checksum: 0xb059 [unverified]
    [Checksum Status: Unverified]
    Urgent pointer: 0
  > [SEQ/ACK analysis]
```

0 15 16 31

Source port number:52936			Destination port number:80
Sequence number:1			
Acknowledgement Number:1			
Header length : 20	Reserved: Not set	Flags: 0x018 (PSH, ACK)	Window size: 958
TCP checksum = 0xb059			Urgent pointer: 0
TCP Segment data = 1386 bytes			

www.cisco.com-IP datagram

```
Internet Protocol Version 4, Src: 96.16.43.95, Dst: 134.190.151.42
    0100 .... = Version: 4
    .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
    Total Length: 52
    Identification: 0xc47d (50301)
  > Flags: 0x02 (Don't Fragment)
    Fragment offset: 0
    Time to live: 58
    Protocol: TCP (6)
    Header checksum: 0xd2ee [validation disabled]
    [Header checksum status: Unverified]
    Source: 96.16.43.95
    Destination: 134.190.151.42
    [Source GeoIP: Unknown]
    [Destination GeoIP: Unknown]
```

0 16 31

IP version:4	Header Length: 20 bytes	Differentiated Services Field: 0x00 (DSCP CS0: ECN: NOT-ECT)	Total length: 52	
Identification: 0Xc47d (50301)			Flags: 0x02 (Don't Fragment)	Fragment Offset: 0
Time-to-live:58		Protocol: TCP(6)	Header Checksum: 0xd2ee	
Source IP Address: 96.16.43.95				
Destination IP Address: 134.190.151.42				

www.cisco.com-data link layer frame

```
Ethernet II, Src: ArrisGro_63:44:bd (dc:45:17:63:44:bd), Dst: IntelCor_a5:22:56 (68:07:15:a5:22:56)
  Destination: IntelCor_a5:22:56 (68:07:15:a5:22:56)
      Address: IntelCor_a5:22:56 (68:07:15:a5:22:56)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Source: ArrisGro_63:44:bd (dc:45:17:63:44:bd)
      Address: ArrisGro_63:44:bd (dc:45:17:63:44:bd)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
```

Ethernet Header:

Destination Address: 68:07:15:a5:22:56	Source Address: 45:17:63:44:bd	Type: IP v4(0x0800)

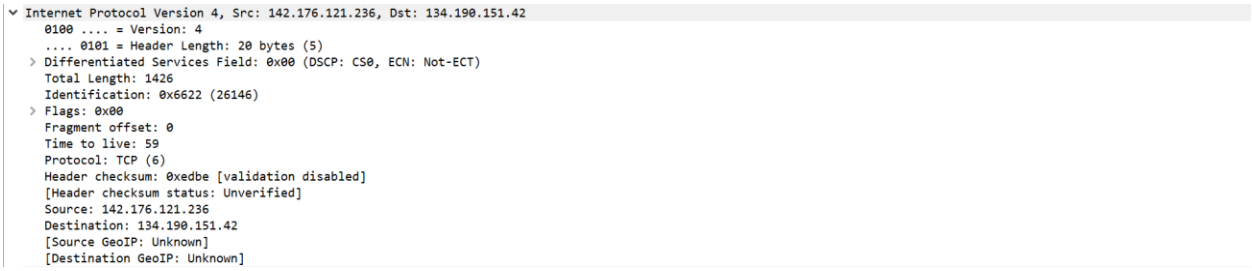
---

www.google.com-TCP segment

0 15 16 31

Source port number:443			Destination port number:64940
Sequence number:1			
Acknowledgement Number:1			
Header length : 20	Reserved: Not set	Flags: 0x010 (ACK)	Window size: 1672
TCP checksum = 0xb509			Urgent pointer: 0
TCP Segment data = 1290 bytes			

www.google.com-IP datagram



0 16 31

IP version:4	Header Length: 20 bytes	Differentiated Services Field: 0x00 (DSCP CS0: ECN: NOT-ECT)	Total length: 1426	
Identification: 0x6622 (26146)			Flags: 0x00 (Don't Fragment)	Fragment Offset: 0
Time-to-live:59		Protocol: TCP(6)	Header Checksum: 0xedbe	
Source IP Address: 142.176.121.236				
Destination IP Address: 134.190.151.42				

www.google.com-data link layer frame

```
Ethernet II, Src: ArrisGro_63:44:bd (dc:45:17:63:44:bd), Dst: IntelCor_a5:22:56 (68:07:15:a5:22:56)
  Destination: IntelCor_a5:22:56 (68:07:15:a5:22:56)
      Address: IntelCor_a5:22:56 (68:07:15:a5:22:56)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Source: ArrisGro_63:44:bd (dc:45:17:63:44:bd)
      Address: ArrisGro_63:44:bd (dc:45:17:63:44:bd)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
    Type: IPv4 (0x0800)
```

Destination Address: 68:07:15:a5:22:56	Source Address: 45:17:63:44:bd	Type: IP v4(0x0800)

---

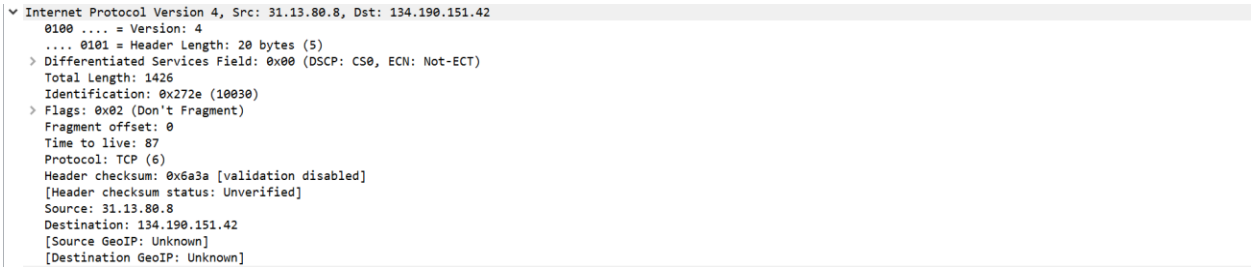
www.facebook.com-TCP segment

```
Transmission Control Protocol, Src Port: 443, Dst Port: 49193, Seq: 1, Ack: 1, Len: 1386
    Source Port: 443
    Destination Port: 49193
    [Stream index: 0]
    [TCP Segment Len: 1386]
    Sequence number: 1    (relative sequence number)
    [Next sequence number: 1387    (relative sequence number)]
    Acknowledgment number: 1    (relative ack number)
    Header Length: 20 bytes
  > Flags: 0x010 (ACK)
    Window size value: 121
    [Calculated window size: 121]
    [Window size scaling factor: -1 (unknown)]
    Checksum: 0x5c52 [unverified]
    [Checksum Status: Unverified]
    Urgent pointer: 0
  > [SEQ/ACK analysis]
    TCP segment data (1386 bytes)
```

0 15 16 31

Source port number:443			Destination port number:49193
Sequence number:1			
Acknowledgement Number:1			
Header length : 20 bytes	Reserved: Not set	Flags: 0x010 (ACK)	Window size: 121
TCP checksum = 0x5c52			Urgent pointer: 0
TCP Segment data = 1386 bytes			

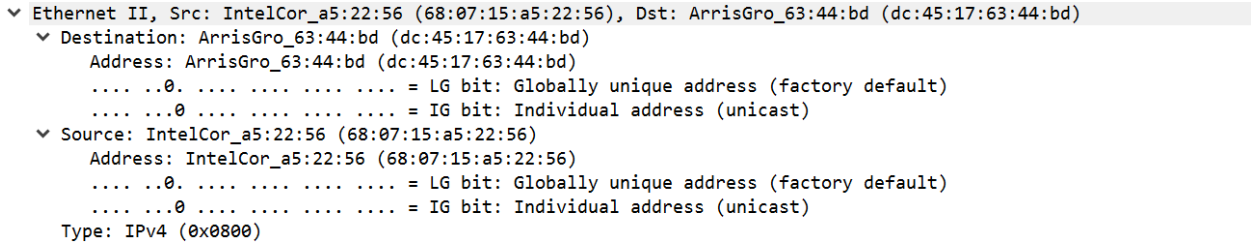
www.facebook.com-IP datagram



0 16 31

IP version:4	Header Length: 20 bytes	Differentiated Services Field: 0x00 (DSCP CS0: ECN: NOT-ECT)	Total length: 1426	
Identification: 0x272e (10030)			Flags: 0x02 (Don't Fragment)	Fragment Offset: 0
Time-to-live:87		Protocol: TCP(6)	Header Checksum: 0x6a3a	
Source IP Address: 31.13.80.8				
Destination IP Address: 134.190.151.42				

www.facebook.com-data link layer frame



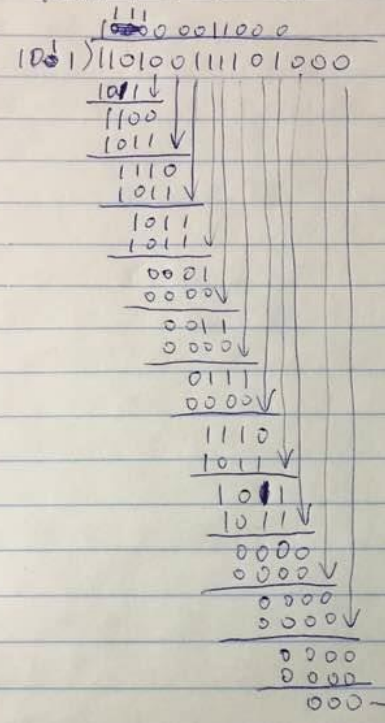
Destination Address: 45:17:63:44:bd	Source Address: 68:07:15:a5:22:56	Type: IP v4(0x0800)

d) According to the screen snapshot of the three websites, I found we can use Wireshark to know the packet, MAC/IP address, TCP/UDP port, protocol or the content of packet during the transmission and we can find the transmission process. The wireshark helps us to understand how the packet transmit in the different layer and what is the specific information of the transmission.

3.

a) $M(x) = 1101001111101$ $G(x) = 1011$

$M'(x) = 1101001111101000$



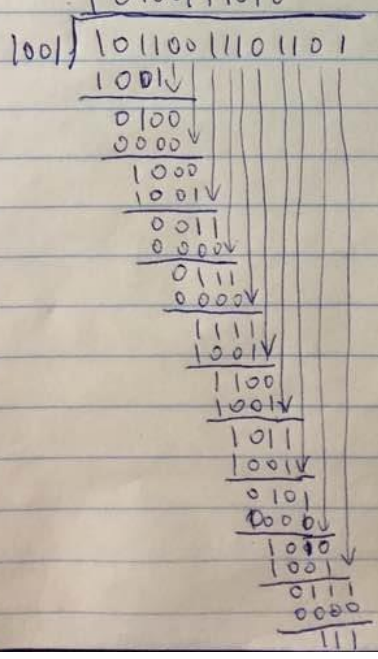
Remainder is 000

∴ There's no error

$P(x) = M(x) + R(x)$

$= 1101001111101000$

b) $P(x) = M(x) + R(x) = 1011001110101$



Remainder is 111 but not 000

∴ There is an error in the data unit