Today

Checksum practice

Hidden/Exposed Terminals, RTS/CTS

Switch

Q&A
Checksum  3254 55f0 663a 4010

**Encoding:** (16 bit)

input: data[0..L-1]

s=sum(data)

return ~(s & 0xffff) + ((s >> 16) & 0xffff))

**Decoding:**

input: data[0..L-1], checksum

s=sum(data)+checksum

return ~(s & 0xffff) + ((s >> 16) & 0xffff))
Checksum Practice

3254 55f0 663a 4010
Checksum Practice

3254 55f0 663a 4010

Encoding: 3254+55f0+663a+4010=12e8e; ~(2e8e+1)=d170

Decoding: 3254+55f0+663a+4010+d170=1ffe; ~(1+ffe)=0000
CRC

Encoding:

Input: data[0..L-1], C (generator), k (check bits #)

data=[data, 0,0,...,0 (k zeros)]

return data % C

Decoding:

redo encoding, check result
CRC Practice

data: AC35 (1010 1100 0011 0101)

C: 10011

k: 4
CRC Practice

data: AC35 (1010 1100 0011 0101)

C: 10011

k: 4

CRC: 1111
Hidden Terminal Problem

- Terminal A is currently transmitting.
- Terminal B is in the range of Terminal A.
- Terminal C wants to transmit to B but will collide with Transmission from A.

Exposed Terminal Problem

- Terminal A is currently transmitting.
- Terminal B is in the range of Terminal A.
- Terminal C wants to transmit to D but cannot due to carrier sense.
- Terminal C is in the range of Terminal B.
MACA

Transmitter sends RTS (Request To Send) with destination id
Receiver responds CTS (Clear To Send) with transmitter id
Failed contenders use a random back-off
Acknowledgement to notify failed contenders
802.11 (eg, WiFi) vs 802.3 (eg, Ethernet) link layer protocols

<table>
<thead>
<tr>
<th>Protocol</th>
<th>802.11</th>
<th>802.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSMA/CA</td>
<td>-</td>
<td>CSMA/CD</td>
</tr>
<tr>
<td>MACA</td>
<td>-</td>
<td>None</td>
</tr>
</tbody>
</table>
Switch

Packet switching vs. circuit switching

Switch

Input: N ports

Output: M ports
MAC Address

Identify devices in link layer

48 bits

XX-XX-XX-XX-XX-XX
Port <=> MAC mapping

Backward learning