CS2105 Lecture 5
UDP and TCP
10 February, 2014
After this class, you are expected to:

- appreciate the simplicity of UDP and the service it provides
- know how to calculate the checksum of a packet
- understand the operation of TCP, particularly, the sequence number, the acknowledgement number, retransmission, the receiver window, and connection setup/termination.
``You Won't Believe How Simple the UDP Protocol is. But The Complexity of TCP Will Make You Cry.
Application
Transport
Network
Link
Physical
Network
UDP
User Datagram Protocol
Details of Internet protocols are described in documents known as Request for Comments (RFC). UDP is such a simple protocol that its RFC http://www.ietf.org/rfc/rfc768.txt is only 3 pages. Interested students should check out the RFC for further details of UDP.
<table>
<thead>
<tr>
<th>1</th>
<th>16</th>
<th>32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Src Port</td>
<td>Dest Port</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>Checksum</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Payload</td>
</tr>
</tbody>
</table>
sender computes $f(P) = c$
sends $P$ and $c$
receiver receives $P'$ and $c'$
checks if $f(P') = c'$
1011  1011  1011  0101
1000  1111  0000  1100
Quick recap on binary addition:

- $0+0 = 0$
- $1+0 = 0+1 = 1$
- $1+1 = 10$
- $1+1+1 = 11$
0110 0110 0110 0000
0101 0101 0101 0101
1000 1111 0000 1100
1011 0101 0011 1101
1011 0101 0011 1101
TCP
Transport Control Protocol
In contrast to UDP, TCP is complex and is described in tens of RFCs, with new mechanisms or tweaks introduced throughout the years, resulting in many variants of TCP. We will only be scratching the surface of TCP in CS2105.
<table>
<thead>
<tr>
<th></th>
<th>GBN</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACK</td>
<td>cumulative</td>
<td>selective</td>
</tr>
<tr>
<td>out-of-order</td>
<td>ignore</td>
<td>keep</td>
</tr>
<tr>
<td>retransmit</td>
<td>all unack</td>
<td>one unack</td>
</tr>
<tr>
<td>timer</td>
<td>earliest unack</td>
<td>one per unack</td>
</tr>
</tbody>
</table>
sequence number

acknowledgement number
Sender's buffer
Receiver's buffer
Setting RTO
Setting rwnd