CS 134
Intro to Computer Science

Feb 29, 2016
Lecture 10:
Framing and Transmission Delays

Homework #3 due now
Lab #4:
- Set up Gmail accounts for chat
- Try to complete constructor before lab
- Debugging tutorial at start of lab
- Recommended strategy

Review
- while loops
  - initialize loop variable
  - termination condition
  - body:
    - perform 1 step
    - move to next step (loop var)
- String processing

Today's Plan
- Message framing
- Transmission and propagation delay
- More String loops?
On-off Keying

1 = __________  0 = __________

Manchester Encoding

1 = __________  0 = __________

D = 01000100 = ?

0 1 0 0 0 1 0 0

Manchester Encoding

1 = __________  0 = __________

D = 01000100 = ?

0 1 0 0 0 1 0 0

Getting Started

What is this?
Getting Started

Manchester Encoding or On-off Keying?

Suppose we know it’s on-off keying. What is this?

Getting Started

6 bits?

8 bits?
ASCII Codes

<table>
<thead>
<tr>
<th>Letter</th>
<th>ASCII Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>01100001</td>
</tr>
<tr>
<td>b</td>
<td>01100010</td>
</tr>
<tr>
<td>c</td>
<td>01100011</td>
</tr>
<tr>
<td>d</td>
<td>01100100</td>
</tr>
<tr>
<td>e</td>
<td>01100101</td>
</tr>
<tr>
<td>f</td>
<td>01100110</td>
</tr>
<tr>
<td>g</td>
<td>01100111</td>
</tr>
<tr>
<td>h</td>
<td>01101000</td>
</tr>
<tr>
<td>i</td>
<td>01101001</td>
</tr>
<tr>
<td>j</td>
<td>01101010</td>
</tr>
<tr>
<td>k</td>
<td>01101011</td>
</tr>
<tr>
<td>l</td>
<td>01101100</td>
</tr>
<tr>
<td>m</td>
<td>01101101</td>
</tr>
<tr>
<td>n</td>
<td>01101110</td>
</tr>
<tr>
<td>o</td>
<td>01101111</td>
</tr>
<tr>
<td>p</td>
<td>01110000</td>
</tr>
<tr>
<td>q</td>
<td>01110001</td>
</tr>
<tr>
<td>r</td>
<td>01110010</td>
</tr>
<tr>
<td>s</td>
<td>01110011</td>
</tr>
<tr>
<td>t</td>
<td>01110100</td>
</tr>
<tr>
<td>u</td>
<td>01110101</td>
</tr>
<tr>
<td>v</td>
<td>01110110</td>
</tr>
<tr>
<td>w</td>
<td>01110111</td>
</tr>
<tr>
<td>x</td>
<td>01111000</td>
</tr>
<tr>
<td>y</td>
<td>01111001</td>
</tr>
<tr>
<td>z</td>
<td>01111010</td>
</tr>
</tbody>
</table>

blank: 00110000
-

Getting Started

Also a problem for Manchester Encoding...
Getting Started

Also a problem for Manchester Encoding...

Soln: Framing

START BITS
Do not count as part of message!

LENGTH REPRESENTATIONS

01101010 vs. 00110101

00110101
Ethernet Frame Format

<table>
<thead>
<tr>
<th>PREAMBLE</th>
<th>TO</th>
<th>FROM</th>
<th>LENGTH/TYP</th>
<th>DATA</th>
<th>ERROR CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>48</td>
<td>48</td>
<td>16</td>
<td>variable</td>
<td>32</td>
</tr>
</tbody>
</table>

The key is that the sender and receiver must agree in advance.

GETTING PHYSICAL

\[
\frac{1}{R} = T
\]

- \( R \) is \textit{transmission} rate.
- \( c \) is \textit{propagation} rate (speed of light).

\[
1 \quad 0
\]

- \( 1 \) \( \frac{1}{R} \) \( 0 \)
- \( 1 \) \( T \) \( 0 \)
- \( W \) \( \text{width of bit on fiber} \)
- \( c \) \( \text{speed of signal propagation} \)
GETTING PHYSICAL

$R = \# \text{OF BIT / SECOND}$
$T = \text{TIME TO SEND 1 BIT}$
$W = \text{WIDTH OF BIT ON FIBER}$
$c = \text{SPEED OF SIGNAL PROPAGATION}$

$1/R = T$

$W = c/R$

$D = \# \text{OF DATA BITS IN MESSAGE}$
$L = \text{DISTANCE FROM SENDER TO RECEIVER}$
$R = \# \text{OF BIT / SECOND}$
$c = \text{SPEED OF SIGNAL PROPAGATION}$

$D/R$ is transmission delay.
$L/c$ is propagation delay.
Total time is $D/R + L/c$.

More Loops!

See ProgramEditor