Announcements

- Homework 7 online (soon?)
- Lab 9 -
  - One lab report per group
An IMP provided interface between the ARPANET (the predecessor to the Internet) and a computer connected to the network. It served the same role as the modern Ethernet card (which can be purchased at Walmart for less than $25). This $82,200 IMP was one of the first made. The Honeywell 516 minicomputer inside had only 12,000 words of memory.
Summary of Ethernet

- Carrier Sense = Wait if network idle
- 1-persistence = If waiting, start when idle
- Collision Detection = Stop and Backoff
- Minimum packet transmission time = 
  \[2 \times \text{max propagation time} = \text{waiting slot time}\]
- Backoff = Delay random \# between 0 and \[2^{\text{failures}} - 1\] slots after collision
ETHERNET TRANSMISSION ALGORITHM

Packet becomes ready

Eager to send a packet

Transmitting packet preamble

Transmitting packet contents

Waiting for backoff slots

Transmitting jamming signal

Receiver becomes idle

Preamble complete

Receiver becomes busy

Jamming complete

Reset range of delay slots to 1

DONE

Double delay slot range = $2^3$ failures

$= 2^0$
Efficiency = $\frac{P/R}{W \times T + P/R}$

$W = \frac{1 - A}{A}$

$A = \left( 1 - \frac{1}{Q} \right)(Q - 1)$

$P = \text{expected/average packet size}$

$R = \text{transmission rate (M \& B call it C)}$

$W = \text{expected \# of slots between transmissions}$

$T = \text{expected length of a contention slot}$

$A = \text{Probability exactly one computer sends in a slot}$

$Q = \text{number of computers trying to sent}$
Efficiency = \frac{P}{R} \left( \frac{W \times T + P}{W \times T + P/R} \right)

\begin{align*}
P & = \text{expected/average packet size} \\
R & = \text{transmission rate (M & B call it C)} \\
W & = \text{expected # of slots between transmissions} \\
T & = \text{expected length of a contention slot}
\end{align*}
Efficiency = \frac{\text{Time spent doing useful work}}{\text{Time spent}}
Efficiency = \frac{\text{Time spent sending a packet}}{\text{Time spent colliding and then sending}}
Efficiency = \frac{P}{R} \cdot \frac{W \times T + P/R}{W \times T + P/R}

P = expected/average packet size
R = transmission rate (M & B call it C)
W = expected # of slots between transmissions
T = expected length of a contention slot
Let $P$ be the number of bits in an Ethernet packet. Let $C$ be the peak capacity in bits per second, carried on the Ether. Let $T$ be the time in seconds of a slot, the number of seconds it takes to detect a collision after starting a transmission. Let us assume that there are $Q$ stations continuously queued to transmit a packet; the slot duration $T$ must be long enough to allow a collision to be detected or at least twice the Ether's round trip time.
Assume a spherical cow of uniform density.

MOO.
...while ignoring the effects of gravity.
...in a vacuum.

CAN'T. BREATHE.

bastard theoretical physicists
How do you sleep at night?
Efficiency = \frac{P}{W \times T + \frac{P}{R}}

= \frac{1}{\frac{W \times T + 1}{P/R}}

P = expected/average packet size
R = transmission rate (M & B call it C)
W = expected # of slots between transmissions
T = expected length of a contention slot
Efficiency = \frac{P/R}{W \times T + P/R}

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R = transmission rate (M & B call it C)
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