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2.1 Link Layer

Week 1 Quiz due Jan 25, 2016 at 15:30 UTC

2.2 Multiple Access Protocols

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2.4 QUIZ QUESTION 1 (3/4 points)

Consider a slotted Aloha multiple access protocol where there are five nodes that send frames across a shared channel for 20 slots as shown below. Assume that each frame occupies one slot only.

Node 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Node 2																				
Node 3																				
Node 4																				
Node 5																				
Slot No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

How many slots contain a successful transmission?



Answer: 13

How many slots are empty?



Answer: 1

How many slots contain a collision?



Answer: 6

Calculate the efficiency for this example?



Answer: 13/20

0.0204

EXPLANATION

Total number of successful transmitted frame = 13.

Total slot = 20.

Efficiency = 13/20.

You have used 3 of 3 submissions

2.4 QUIZ QUESTION 2 (1/1 point)

Consider a communication link that implements a slotted Aloha multiple access protocol. If there are 6 backlogged nodes, each transmitting with probability 0.3 in each time slot, what is the numerical value of the efficiency of this link to two decimal places (e.g. 0.11)?

0.30

✓ Answer: 0.30

0.30

EXPLANATION

$p=0.3$ and $N=6$

Probability that a node is successful in a slot = $p((1-p)^{N-1})$

Probability that any node is successful in a slot = $Np((1-p)^{N-1})$

Efficiency = $1.8*(0.3^5) = 0.30$

You have used 1 of 3 submissions

2.4 QUIZ QUESTION 3 (1/1 point)

What is the numerical value of the maximum efficiency in the link described above to two decimal places? Assume each node transmits with the optimal probability to maximize efficiency.

✓ Answer: 0.40

0.40

EXPLANATION

Maximum is obtained when the derivative of $Np((1-p)^{N-1})$ with respect to p is set to zero.

$$p^{N-1}((1-p)^{N-2})(-1) + (1-p)^{N-1} = 0$$

Derivative is zero when $p = 1/6$, so when each node transmits with the optimal probability, the maximum efficiency is $(5/6)^5 = 0.40$

You have used 1 of 3 submissions

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