



NPTEL ONLINE CERTIFICATION COURSES

COMMUNICATIONS NETWORK

Dr. Goutam Das

G. S. Sanyal School of Telecommunications, IIT KHARAGPUR

Module 09:Media Access Control Protocol

Lecture 40: Stabilized Slotted Aloha- Bayesian Estimation

Concepts Covered

1-Stabilized Slotted Aloha

2-Bayesian Estimation

3-Binary Back- off Algorithm

References

Book:
Queuing Systems Vol. 1 – L. Kleinrock

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Module 09:Media Access Control Protocol

Lecture 41:Binary Back- off Algorithm

Concepts Covered

1-Stabilized Slotted Aloha

2-Bayesian Estimation

3-Binary Back- off Algorithm

References

Book:
Queuing Systems Vol. 1 – L. Kleinrock

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Module 09:Media Access Control Protocol

Lecture 43: PON and Ethernet MAC

Concepts Covered

- 1-Stabilized Slotted Aloha
- 2-Bayesian Estimation
- 3-Binary Back- off Algorithm
- 4-PON and Ethernet MAC

References

Book:
Queuing Systems Vol. 1 – L. Kleinrock

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Module 09:Media Access Control Protocol
Lecture 44:PON and Ethernet MAC Contd.

Concepts Covered

- 1-Stabilized Slotted Aloha
- 2-Bayesian Estimation
- 3-Binary Back- off Algorithm
- 4-PON and Ethernet MAC

References

Book:
Queuing Systems Vol. 1 – L. Kleinrock

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m
 $\Rightarrow \textcircled{n} \Rightarrow \text{BL}$
 $m-n \Rightarrow \text{FA}$
 $\Rightarrow$
 $m=2$
 $\Rightarrow$

Stability:

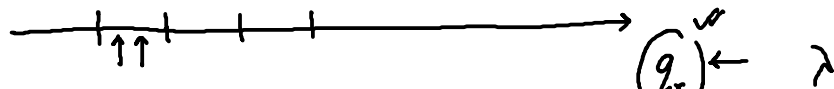
$\downarrow$
 $\frac{m-n}{n}$ FA
 n BL

$(1-x)^y \approx e^{-xy}$
 for small x
 $x \ll 1$

$\underline{q_a, q_r \ll 1}$

$\checkmark \underline{q_a < q_r}$

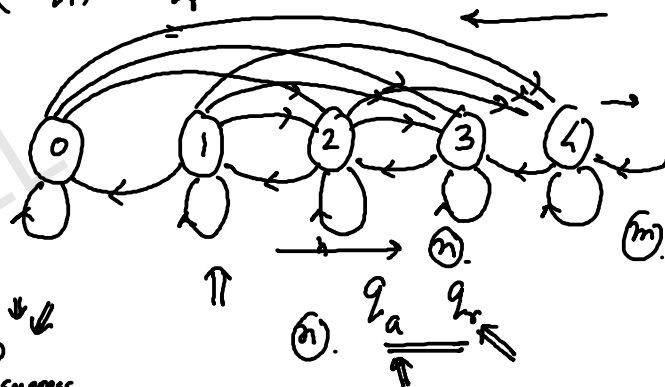
$m q_a$



$\checkmark Q_a(i, n) = \binom{m-n}{i} (1-q_a)^{m-n-i} q_a^i$

$\checkmark Q_r(i, n) = \binom{n}{i} (1-q_r)^{n-i} q_r^i$

$P_{n, n+i} = \{ \dots$



Drift

$\checkmark D_n = \frac{(m-n)q_a}{\uparrow} - \frac{P_{\text{success}}}{\downarrow}$

$\checkmark P_{\text{success}} = \underline{Q_a(1, n) Q_r(0, n)} + \underline{Q_a(0, n) Q_r(1, n)}$

$= \binom{m-n}{1} (1-q_a)^{m-n-1} q_a \binom{n}{0} (1-q_r)^n$
 $+ \binom{m-n}{0} (1-q_a)^{m-n} \binom{n}{1} (1-q_r)^{n-1} q_r$

$\approx \frac{(m-n)q_a e^{-q_a(m-n-1)} e^{-q_r n}}{1} + \frac{n q_r e^{-q_a(m-n)} e^{-q_r(n-1)}}{1}$

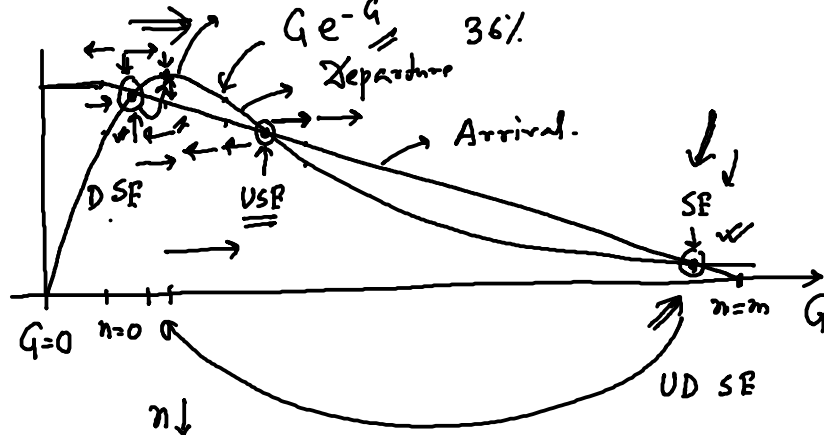
$\approx \left[(m-n)q_a + n q_r \right] e^{-[(m-n)q_a + n q_r]} \approx X(n) e^{-X(n)}$

$G(n). X(n) = \underbrace{(m-n)q_a}_{\downarrow \text{FA}} + \underbrace{n q_r}_{\uparrow}$
 $\lambda + \Delta = G$
 $X(n) = G(n)$
 $G(n) e^{-G(n)}$
 $P_{\text{success}} = G(n) e^{-G(n)}$
 $\checkmark G e^{-G} \quad n=0$

$$G(n) = m q_a + n(q_r - q_a)$$

$$(m-n) q_a$$

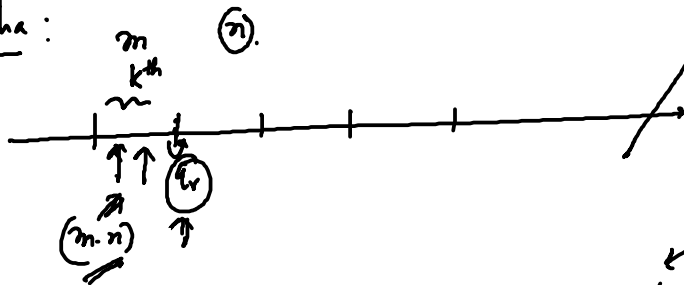
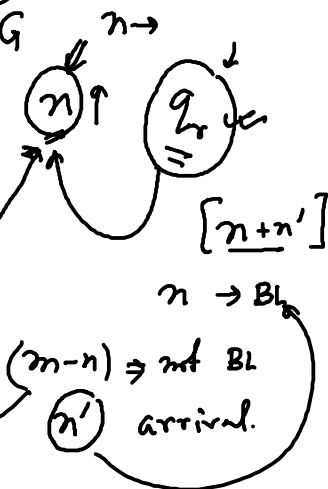
$$m q_a$$



$$G(n)$$

$$P_{\text{success.}}$$

Stabilized Slotted Aloha:



①.

