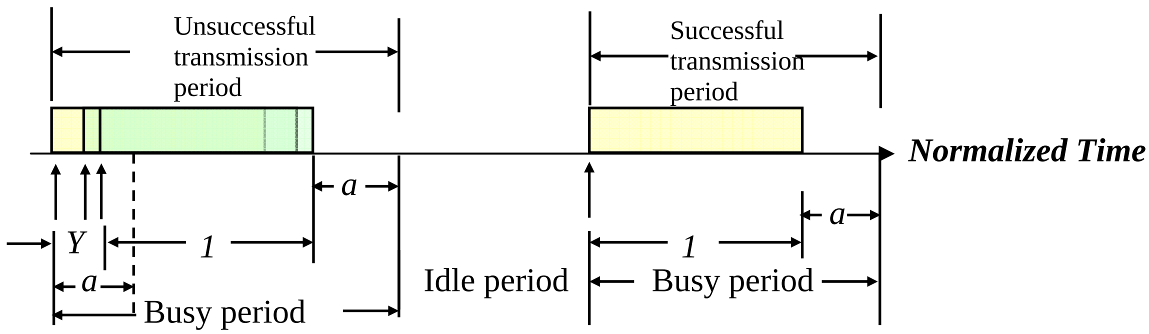
The following analysis in the next page is extracted from the paper:

L. Kleinrock and F. A. Tobagi, "Packet Switching in Radio Channels:
Part I - Carrier Sense Multiple Access Modes and Their
Throughput-Delay Characteristics"
IEEE transactions on communications, December, 1975

Analysis of Non-persistent CSMA



Consider a time cycle as a busy period plus the following idle period. In each this cycle, it could be either a successful transmission period following by an idle period or an unsuccessful transmission period following by an idle period.
Let us define following parameters:
B: mean length of busy period
I: mean length of idle period
T: length of a frame transmission, T=1
U: probability of a successful transmission in a busy period
Then, (B+I) is the average length of a time cycle.
In general, the expected channel throughput can be regarded as the overall output by averaging all cycles:

$$S = \frac{TU}{B+I} = \frac{U}{B+I}$$

Now, let us view each transmission period from the first transmitter X's perspective.
If X is the first one to send a frame at time, it will succeed because no one else access the channel in (t, t+a). This occur with a probability $U = e^{-aG}$. Note that in this case, the busy period B is 1+a, but we cannot regard the whole "1+a" as the channel output, because only the "1" portion can be counted as throughput.
However, if during time (t, t+a), there are other access events. X will experience a busy period as long as 1+a+**Y**, in which Y is a random variable between (0, a).
The CDF of **Y** can be found by:
$\boldsymbol{F_Y(y)}$=*P{no packet occur in an duration of a-y } =* $e^{-G(a-y)}$

Then, we can have the PDF and calculate the mean of Y is $E(Y) = a - \frac{1}{G}(1 - e^{-aG})$

From, B, I, U, we can have $S = \dfrac{Ge^{-aG}}{G(1+2a) + e^{-aG}}$