**Table 1| Generation Network**

| Reaction Network | Kinetic Constants | Opened Network | Kinetic Constants |
|---|---|---|---|
| g --> t | $k_1$=1 | 0 --> t | $k_1$*$T_T$=50 |
| t --> 0 | $k_2$=1 | s --> s + t | -$k_1$=-1 |
| t --> t + g | $k_3$=1 | t --> 2t | -$k_1$=-1 |
| t --> t + s | $k_4$=1 | t --> 0 | $k_2$=1 |
| s --> 0 | $k_5$=1 | t --> t | $k_3$=1 |
| | $T_t$=50 | t --> t + s | $k_4$=1 |
| | | s --> 0 | $k_5$=1 |
| Reference: Aurelien Alfonsi, Eric Cances, Gabriel Turinici, Barbara Di Ventura, and Wilhelm Huisinga. 2005 Adaptive simulation of hybrid stochastic and deterministic models for biochemical systems https://www.esaim-proc.org/articles/proc/pdf/2005/01/alfonsi.pdf | | | |

The original network consists of a three component, five reaction system. In order to open up the reaction network one of the three components has to be removed. To do this a mass balance on the system is taken as:

$$T_T = g + t + s \tag{1}$$

$T_T$ is used to represent the total concentration. The mass balance is solved for component g, which is applied to the reaction network to open the system. The results are displayed in Table 1. By opening the network, reaction one from the original network is now represented by the first three reactions in the Opened Network column of Table 1. Kinetic constant $k_1$ is also replaced for these three reactions by $k_1T_T$, -$k_1$, and -$k_1$ respectively. Reaction three from the original network is also updated and represented by reaction five in the opened network scheme. The kinetic constant for this reaction remains unchanged. From the opened network scheme, steady state balances on components t and s are derived.

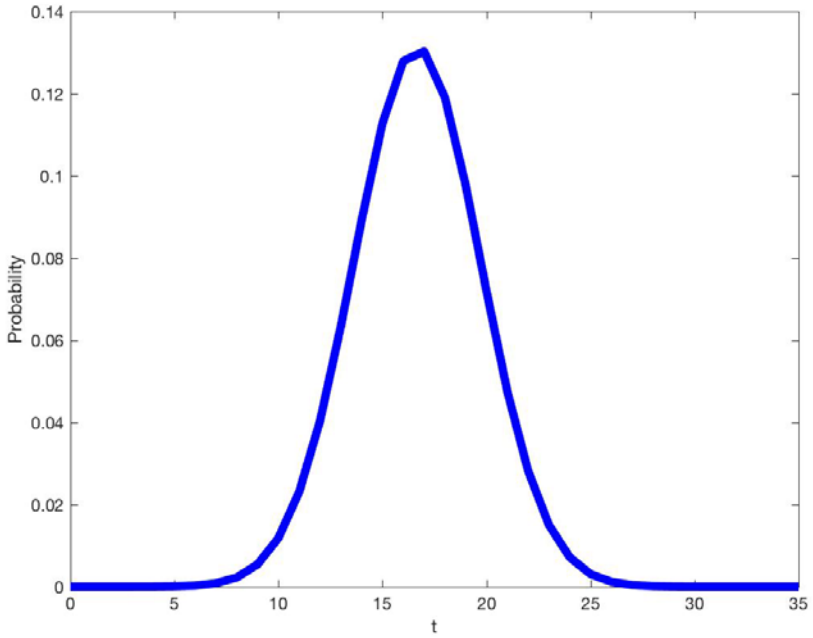
$$\frac{dt}{dt} = 0 = k_1T_T - k_1s - k_1t - k_2t \tag{2}$$

$$\frac{ds}{dt} = 0 = k_4t - k_5s \tag{3}$$

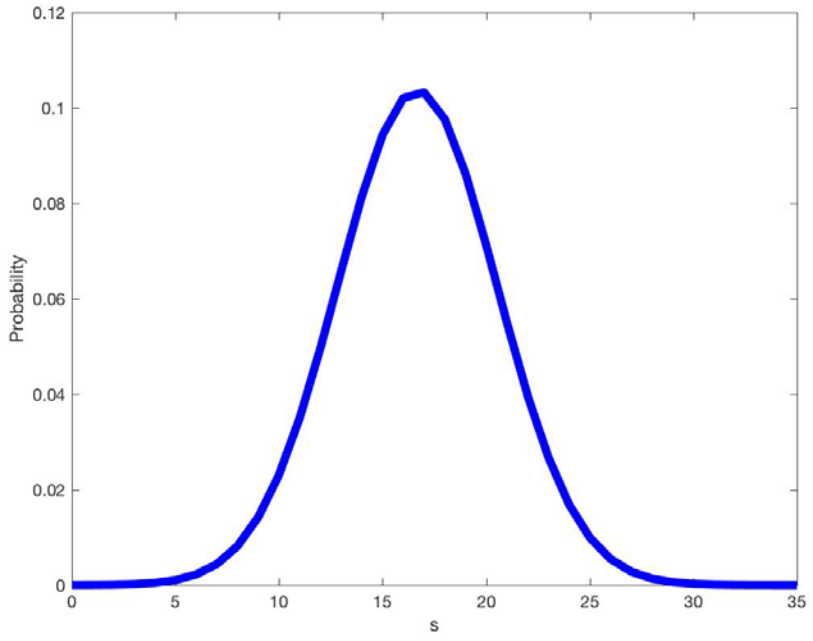
From the steady state balances, there are two equations and eight unknown variables, which leaves six variables to be specified. In this case the kinetic constants were specified as 1 and the total concentration was set to 50 molecules. The average concentrations for t and s are solved as 16.7 molecules for both components. To run the simulation the minimum values for both components are set to zero, and the maximum value for both components is set to 35. This value is chosen to roughly center the steady state graphically for both components. The maximum number of moments is set to 2, and all of the initial guesses for the Lagrange Multipliers are set to zero. Table 2 summarizes the parameters required for the simulation, and Figure 1 displays the results. The plots properly depict the same steady state calculated from the component balances.

**Table 2| Simulation Parameters**

| Minimum Values (t,s) | Maximum Value (t,s) | Maximum Number of Moments | LaGrange Multipliers (Initial Guess) |
|---|---|---|---|
| 0 | 35 | 2 | 0 |




**(A)**




**(B)**

**Figure 1| Results from Simulation. A.** Component t **B.** Component s