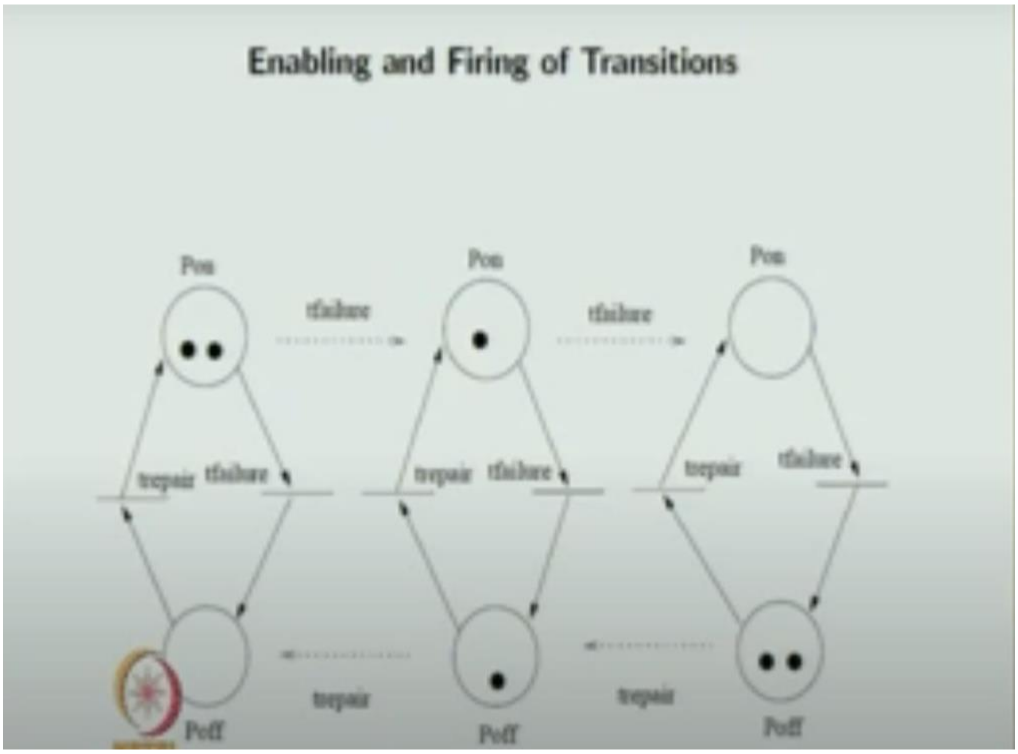
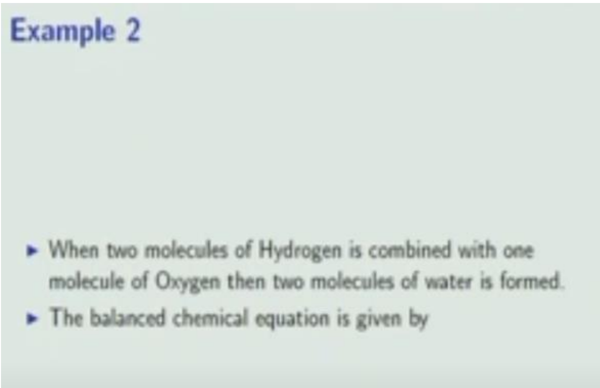
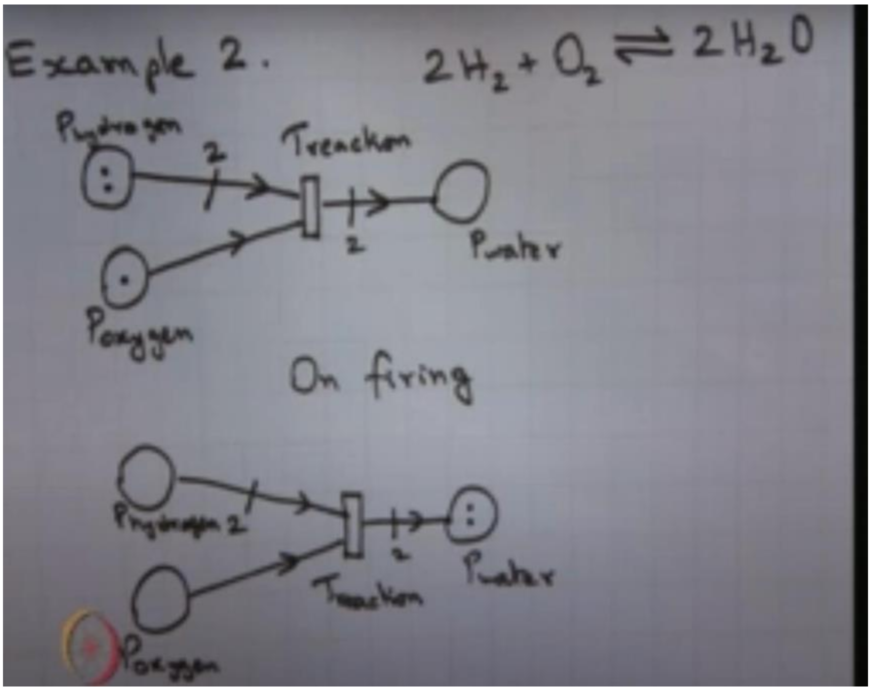
Example 1:



We have a Petri Nett with three locations in this example: P1, P2, and P3. The Petri Nett has one input arc, one output arc, and one inhibitor arc. The output arc's multiplicity or cardinality is indicated by the numbers next to the arcs. In the event that no number is indicated next to the arcs, multiplicity is set to 1 by default. There are no tokens in place P1, one token in position P2, and no tokens in place P3 during the initial marking. If there is at least one token in location P1, the transition cannot occur due to the inhibitory arc that connects it to the transition.

Example 2:



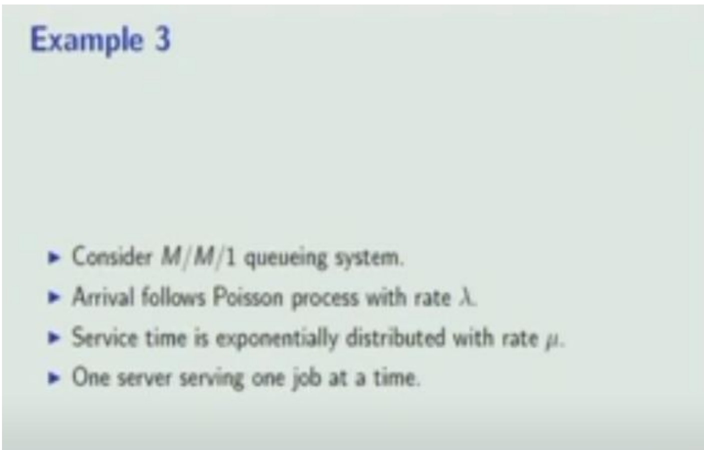


Two molecules of water (H2O) are created when two hydrogen (H2) molecules join with one oxygen (O2) molecule. For this reaction, the balanced chemical equation is 2 H2 + O2 → 2 H2O.

Three locations are identified in the Stochastic Petri Nett model for this reaction: P water, P oxygen, and P hydrogen. One transition, designated as t reaction, exists. Two tokens, or hydrogen molecules, are needed for the transition, as indicated by the input arc's multiplicity of two from the P hydrogen to the t process. The arc from P oxygen to t reaction has multiplicity 1, meaning that one token—a molecule of oxygen—is needed. Lastly, the output arc's multiplicity from the t reaction to P water is 2, meaning that when the transition fires, two tokens—which represent water molecules—are created.

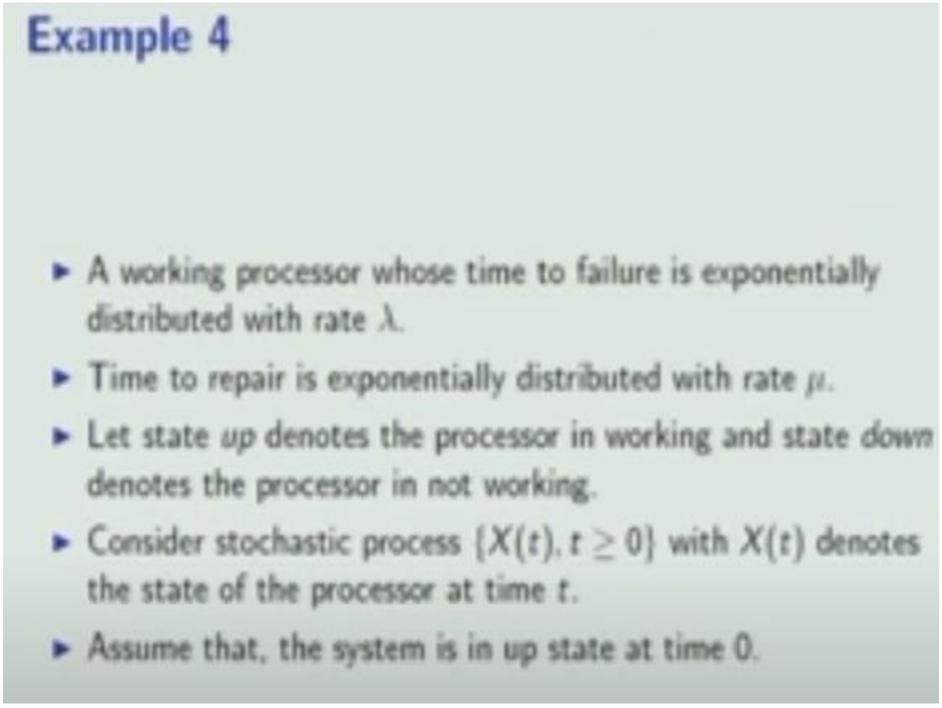
Two tokens are taken out of P hydrogen, one token is taken out of P oxygen, and two tokens are placed in P water upon the firing of the t reaction transition. As is common with timed transitions in stochastic petri netts, the timing of the transition follows an exponential distribution.

Example 3:



A queuing system with a single server and queue is known as the M/M/1 model. This model has a Poisson process with a lambda rate for job arrivals and an exponential distribution with a mu rate for service times per job. This queuing model is represented by a stochastic Petri Nett with one location, the P system, and two timed transitions, one for arrival and one for service. One token is deposited into the P system at the arrival transition, and one token is removed during the service transition. The quantity of patrons in the queue system is represented by the amount of tokens in the P system.
The M/M/1 queuing model's reachability graph displays the transitions connecting the markers as well as the maximum amount of tokens that can be in the P system (0, 1, 2, etc.). For instance, the arrival transition can be fired at a rate of lambda to reach the marking 1, and the service transition can be fired at a rate of mu to reach the marking 0 from the marking 1. The continuous-time Markov chain of the system is isomorphic to the reachability graph of the M/M/1 queuing model.

Example 4:

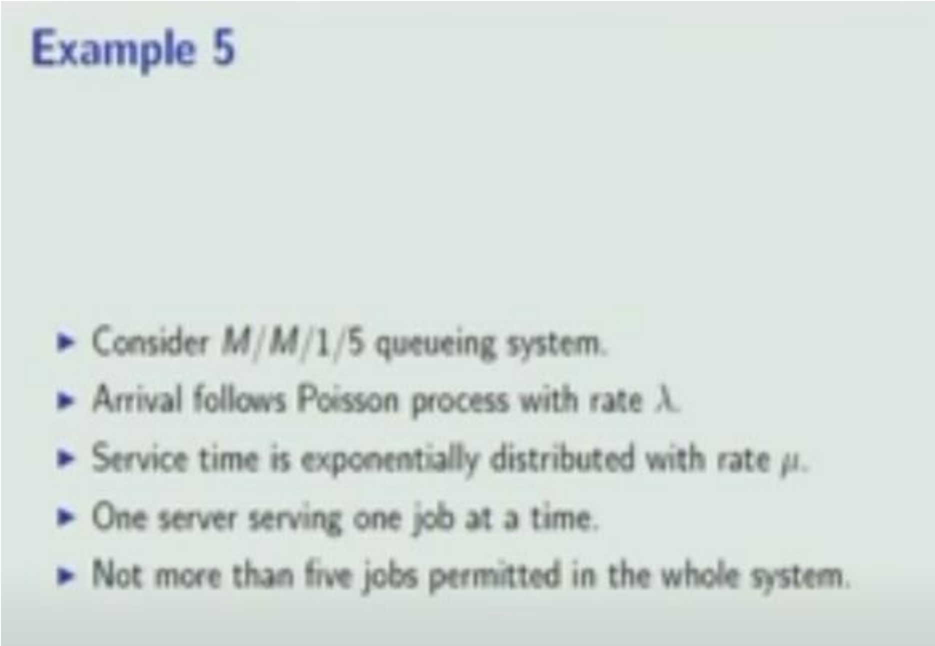


We are talking about a functional processor system in this case, where the time to repair has an exponential distribution with rate mu, and the time to failure has an exponential distribution with rate lambda. A graphic is used to describe the system; the states "up" and "down" correspond to the different states of the processor, respectively. The state of the process at time t is represented by the associated stochastic process, x(t).

One token is deposited in location P up at time 0, when it is expected that the system is in the up state. Failure in the transition can facilitate, but not the transition t repair, so in order to permit the transition t repair, one token must be placed in location P down. After a random period of time that has an exponential distribution with parameter lambda, the t failure transition occurs. One token is taken out of location P up and placed in place P down when it fires.
The transition to repair can activate after a single token is placed in position P down. After a random period of time that has an exponential distribution with parameter mu, it fires. One token is taken out of location P down and placed in place P up when it shoots. In this system, the possible markings are (0,1) and (1,0), which stand for the number of tokens in positions P down and P up, respectively. The transitions from (1,0) to (0,1) and from (0,1) to (1,0) are represented by the arcs between the markers (1,0) and (0,1), respectively, with rates lambda and mu.
This system's behaviour can be examined by creating a Stochastic Petri Nett and examining the reachability graph that underlies it. This system can be represented as a

continuous-time Markov chain. The continuous-time Markov chain is equal to the reachability graph. The next tool is the generalised Stochastic Petri Nett (GSPN), where transitions might be instantaneous or timed. Transitions in stochastic Petri Netts are timed and follow exponential distributions, whereas transitions in traditional Petri Netts are instantaneous. Transitions in GSPN can combine instantaneous and timed transitions.

Example 5:

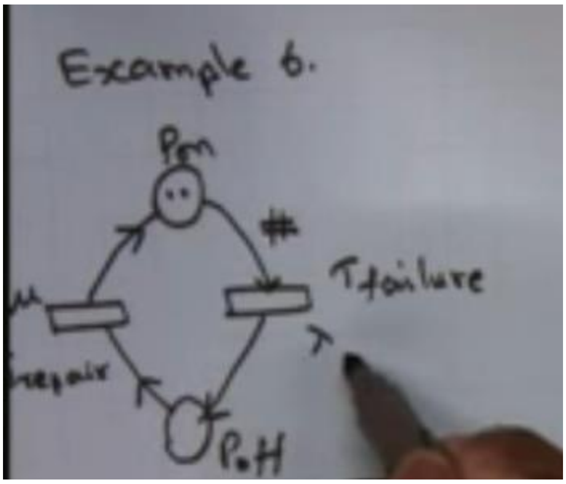


In a M M 1 5 queuing system, where arrivals follow a Poisson process with rate lambda and service times follow an exponential distribution with rate mu, I'm thinking about implementing a GSPN. One server may service one work at a time under this queuing scheme, with a maximum of 5 jobs allowed throughout the system.

We may use the Stochastic Petri Nett designed for the M M 1 queuing system and add the feature of a finite capacity—in this case, the maximum number of tasks that can be processed in the system—to develop the GSPN for the M M 1 5 queuing system. To manage the restriction of not more than 5 tokens in the place P system, this entails designing two arcs. When there are six tokens in the place P system, they are all removed simultaneously, and five tokens are added back in right away. The term "t loss" refers to this transition, where "t" stands for an instantaneous transition.

There is one location, two timed transitions, and one immediate transition in the GSPN for the M M 1 5 queuing system. The reachability graph for this GSPN displays the range of possible token counts, from 0 to 5. Lambda and mu, which reflect the transitions firing and the behaviour of the system, are used to describe the transitions from one marking to another.

Example 6:



We examine a basic stochastic reward nett in this example, which has two states (P on and P off) and two transitions (T failure and T repair). Both the input and output arcs of the T failure transition and the input and output arcs of the T repair transition are present. There is an exponential distribution with parameter lambda for the T failure transition and an exponential distribution with parameter mu for the T repair transition. We consider a system consisting of two components, each of which fails according to an exponential distribution with a rate λ.

This Stochastic Reward Net's reachability graph comprises markers like (2,0), (1,1), and (0,2) that indicate how many tokens are in the P on and P off positions. Depending on how many tokens are present in the input locations, the appropriate transitions have rates of 2 lambda, lambda, mu, and mu. We allocate reward rates, r i, to every marking i in order to determine the system's availability. The reward rate is 1 if there are two tokens or one token in the place P on, showing that the system is operational. The reward rate is 0 if there are no tokens at location P.