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I am currently investigating the Busy Period structure of a correlated MEP/MEP/1 system. Busy Period for a system is defined as the time interval between any two successive idle periods. It starts when a customer arrives to an empty system and ends when the departing customer leaves the system idle. We use Linear Algebraic Queueing Theory (LAQT) to study the path taken by a queueing system during a busy period.

In an ideal world all the processes would be Markovian (memoryless). But abundant literature exists that supports the fact that a number of processes that occur in real life systems such as Telecommunication systems and Internet are non-Markovian. The marginals of these processes are known to have persistent correlations, both long-range as well as short-range. It has also been known for some time that the effects of these correlations on Network provisioning are significant but the exact effect of these correlations on busy periods is largely unknown.

For Markovian systems (i.e., either the arrival process or the service process or both are exponential and therefore renewal), the busy period can be analyzed by embedding the markov chain at these renewal instants. But when the system being considered has correlated Arrival and Service processes there is no known way to compute the probabilities for number served during a busy period nor is the probability distribution for the length of the busy period characterized.

Characterizing these Busy Periods is very important because they give us insight into the transient behaviour of a system. Often times we talk about steady state solutions for Queueing systems but in reality a lot of system do not achieve steady state during their active life times, or they go offline and come back again to be active just long enough to be in some transient state. To understand how the system behaves in these times, we need to understand this transient state of the system. We believe that characterizing these Busy Periods not only gives us one such tool to understand the transient system behavior, but will also give us insights that lead to further understanding of other transient properties of the system as well.

We have derived recursive formulations for the number of customers served during the Busy Period of a correlated MEP/MEP/1 system. This system is as general as a simple Queueing system can get, representing correlated arrivals and service processes. We also derived a representation for the probability distribution for the duration of this busy period. But because of the inherent nature of the problem (processes being correlated) we have to deal with large matrices and inverses of large matrices. We further want to find computationally simpler forms to derive the means and higher moments of these busy period distributions.