1080-60-331 **Jin Wang*** (jin.d.wang@gmail.com), Department of Chemistry and Physics, Stony Brook University, Stony Brook, NY 11794-3400. *Potential and Flux Landscape Theory of Networks.*

We developed a general framework to quantify three key ingredients for dynamics of nonequilibrium systems. First, we identify dominant kinetic paths as the ones with optimal weights, leading to effective reduction of dimensionality or degrees of freedom from exponential to polynomial so large systems can be treated. Second, we uncover the underlying nonequilibrium potential landscapes from the explorations of the state space through kinetic paths. We apply our framework to a specific example of nonequilibrium network system: lambda phage genetic switch. Two distinct basins of attractions emerge. The dominant kinetic paths from one basin to another are irreversible and do not follow the usual gradient path along the landscape. It reflects the fact that the dynamics of nonequilibrium systems is not just determined by potential gradient but also the curl flux force. Third, we have calculated dynamic transition time scales from one basin to another critical for stability of the system and uncover its correlations to the underlying landscape topography: the barrier heights along the dominant paths. Our theoretical framework is general and can be applied to other nonequilibrium systems. (Received January 31, 2012)