1153-18-226 **Jade Master*** (jmast003@ucr.edu). *Generalized Petri Nets.*

We give a definition of Q-net, a generalization of Petri nets based on a Lawvere theory Q for which many existing variants of Petri nets are a special case. We show how Q-nets can be upgraded from closed systems to open systems; Q-nets where tokens can flow in and out of specified boundary sets. The definition of Q-net is functorial with respect to change in Lawvere theory and we exploit this to explore the relationships between different kinds of Q-nets as both closed and open systems. To justify our definition of Q-net, we construct a family of adjunctions for each Lawvere theory Q explicating the way in which Q-nets present free models of Q in Cat. This gives a functorial description of the operational semantics for an arbitrary category of Q-nets. We show how this construction can be used to give a functorial operational semantics for Petri nets, pre-nets, integer nets, and elementary net systems. When applied to open Q-nets, these adjunctions give an operational semantics which can be built in a compositional way. (Received August 28, 2019)