**Microgrid Monitoring Protocol Specification**

Version: 1.0.0 – Active Development

Overview: This document provides the details of the monitoring protocol developed as part of Dr. Park’s Microgrid research in April 2018. The purpose of the protocol is to accurately communicate grid topology and live measurement data between JADE agents. This communication should enable live monitoring of Microgrid systems. There are fundamentally two types of data in this protocol: grid topology and live measurement. These two types of data are treated differently in the protocol implementation.

Grid topology data is treated as a graph data structure. Each controller agent is responsible for sending its “subgraph” to the receiving agent. The receiving agent the combines all subgraphs it has received into a final graph. Grid topology will rarely change in production systems and will change fairly slowly in development. As a result, grid topology is considered “semi-permanent” when it is sent. Sender agents are expected to send grid topology on startup. This grid topology data is expected to carry an expiration date. This puts the responsibility for determining how often topology data should be updated in the hands of sender implementation agents. Sender agents should send updates of their grid topology to the receiving agents just before the previous set of topology expires.

Measurement data is assumed to constantly change. It is also assumed to exist at some point on the grid topology graph. Each measurement consists of a measurement type, grid location, and a measurement.

Another goal of the communication protocol is to avoid re-inventing the wheel. JADE provides a transport layer to send Java objects as messages between JADE agents. Thus, we use Jade’s Agent Identifier (AID) identification system for agents, all communication is implemented via JADE INFORM messages containing serialized Java objects. As a result, the remainder of this document will describe Java classes. All data will be wrapped in “Message” objects in order to separate message processing logic from data model. The data model should function independently of the messaging layer used to move it.