

13-Node Transportation Network with IEEE 33-Bus Test Power Distribution System

The 13-node transportation network is designed based on Salt Lake City transportation system with existing charging infrastructure that is mapped to the IEEE 33-bus test power distribution system, as shown in Fig. 1. The connectivity map of autonomous electric ride sharing system (AERS) and power system is shown in Table 1.

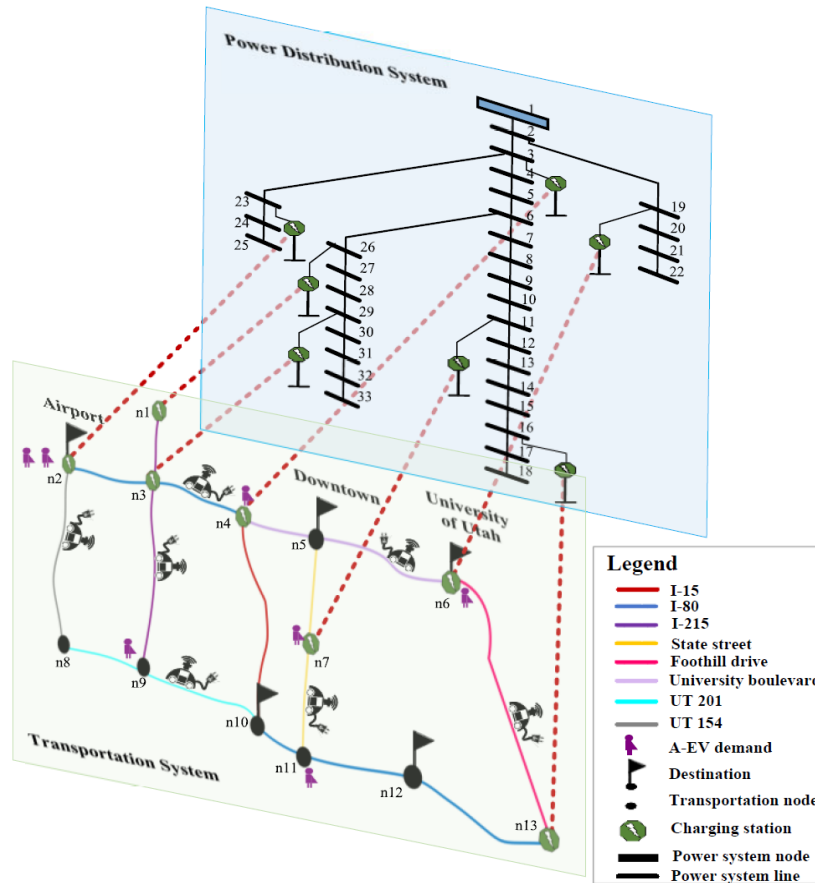


Fig. 1. 13-node (Salt Lake City) transportation network and IEEE 33-bus test power distribution system.

Table 1. Connectivity map of the AERS network and IEEE 33-bus test power distribution system.

Charging Station	S1	S2	S3	S4	S5	S6	S7
AERS node	n1	n2	n3	n4	n6	n7	n13
Power Sys. Bus	b26	b23	b29	b3	b19	b11	b16

The urban structure of Salt Lake City is utilized to model the highways, important roads, and demand areas (downtown, the University of Utah campus, the airport, etc.). The Salt Lake City transportation network comprises 13 nodes and 16 roads, where the average annual hourly dataset for the Salt Lake City metro area is scaled down by a factor of 12 with a linear interpolation to fit the 5-minute operating time scale in this paper. A synthetic data is used for the spatio-temporal passenger demand of ride-hailing systems, where the mean and standard deviation of the traffic data is adopted to generate a normally distributed spatio-temporal passenger demand. The AERS operates one hundred autonomous electric vehicles (AEVs). All data are provided in the accompanying database file *DB_33bus_power_13node_transportation.xlsx*, which include the following data tabs:

- **Road Data:** presents the distance and maximum density of road sections in the traffic network and includes:
 - From (origin point)
 - To (destination point)
 - Length (in miles)
 - Max density (cars per minute)
 - Min density (cars per minute)
- **Traffic data:** presents the traffic in terms of average number of 5-min time intervals that it takes to travel between each two points of the traffic network, during 24 hours.
- **Passenger Demand:** presents the demand and required energy data between 6AM and 8PM (168 5-min intervals) and includes:
 - Time
 - Origin
 - Destination
 - Demand (passengers)
 - Required Energy (kWh)
 - Duration (5-min)
 - Distance (mile)