Several attempts have been made to describe the mechanism of electrical conductivity network in the earth. However, realistic conduction mechanism within the crustal rock and mineral is unknown and relevant theories have not been successful. The aim of our study is to quantify the electrical conductivity network in the rock and mineral. We developed a cell-type lattice network model to evaluate the electrical conductivity mechanism of fluid-mineral interaction. Prior to our model study, we have performed the electrical conductivity measurements on hydrous rock and mineral samples from well-known geological sites. To measure the conductivity of hydrous rock and mineral, we have observed a remarkable conductivity change associated with dehydration. Though small amount of fluid was formed after dehydration, bulk conductivity of the sample showed high conductivity. Based on these electrical conductivity data obtained from laboratory experiments, we have constructed electrical conductivity model of rock and mineral samples. Using cell-type lattice model, we simulated the various electrical paths and connectivity in the sample. Considering fractal dimensions, our model has been compared with results from Electron Probe Micro Analysis. In the initial model, we assumed a network model consists of 100 by 100 elements. Then we have randomly generated and put the conductive and resistive cells using the scheme of Mesenne twister. To test various models, we have performed a great number of realization on each mineral distribution patterns explaining realistic conductivity network model.