**Highlights**

* We combine RPL and GOAFR protocols for IPv6-enabled large-scale wireless networks.
* Main drawbacks of the RPL protocol for P2P communication are discussed.
* A routing protocol (GeoRank) is proposed and its scalability is compared to RPL.
* Simulations were performed on networks extracted from real street maps.
* GeoRank is adaptive to variable link densities found in large-scale networks.