This research investigated an alternative modeling and simulation terrain database generation paradigm that rapidly harmonizes changes in target formats throughout a distributed simulation system while accommodating bandwidth and processing time limitations. This dissertation proposes a distributed partial bi-directional terrain database re-generation paradigm, which envisions network based terrain database updates between reliable partners. The approach is very attractive as it reduces the amount of processing and bandwidth required to distribute locally emergent changes throughout a distributed system by only updating the affected target format data elements. In the prototype theoretical architecture that implements the approach, agent theory and ontologies are used to interpret data changes in external target formats and implement the necessary transformations on a server internal terrain database generation system. These changes are then distributed to clients to achieve consistency between all correlated representations. Experimental findings with the prototype suggests smaller network utilization and processing times than conventional terrain database generation will experience while maintaining correlated heterogeneous terrain database representations over time. This Bi-Directional Ontology-driven TDB Re-Generation Architecture has the potential to revolutionize the traditional terrain database generation pipeline paradigm.