

Starting with the relativistic Boltzmann equation for a system of particles defined by a distribution function, we have derived the virial relation for a spherical structure within an expanding background in the context of general relativity. This generalized form of the virial relation is then applied to the static case of a spherically symmetric structure to see the difference in the simplest case to the Newtonian relation. A relativistic Mass-Temperature relation for this simple case is also derived which can be applied to compact objects in astrophysics. Our general virial relation is then applied to the non-static case of a structure within an expanding universe where an extra term, usually missed in studies of structures in the presence of the dark energy, appears.