We consider the static Einstein-Vlasov system in spherical symmetry. Existence of different types of solutions to this system for zero cosmological constant has been shown for the isotropic and anisotropic case by Rein-Rendall, Rein, and Wolansky. In this talk I shortly review existing results on static solutions and describe a method to prove existence of static solutions to the Einstein-Vlasov system with positive cosmological constant. The energy density and the pressure of these solutions have compact support and outside a finite ball these solutions are identical to a Schwarzschild-deSitter spacetime. Moreover other classes of new non-vacuum solutions that we have constructed will be presented like solutions containing a black hole surrounded by Vlasov matter for both negative and positive cosmological constants. Finally, the global structure of the constructed non-vacuum spacetimes will be discussed with the help of Penrose diagrams. The results presented in the talk are joint work with H. Andréasson and D. Fajman.