## The Swarm Telescope Concept

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We present a new approach to the construction, management, and operation of large radio telescope arrays called the swarm concept. Our concept is based on the idea of "swarm intelligence" where multiple independent components operate and interact with their environment to create complex behaviors. Similarly, we envision radio telescope arrays where the individual elements operate autonomously through software defined operators that control every aspect of the element. These operators then communicate with each other in order to schedule and form *ad hoc* arrays to accomplish particular observations. By moving the operation and monitoring of each element away from a centralized point and to the control systems of the elements, the manual oversight needed to manage the array is reduced, and human resources can be freed to focus on the scientific output of the instrument. Furthermore, the swarm concept allows for automation of postobserving tasks such as data delivery to observers and archiving through functions in the software defined operators.

The swarm concept was originally developed to run the two Long Wavelength Array stations in New Mexico. As such it has unique advantages for low frequency dipole arrays and other instruments that are capable of multiple, independent primary observations by allowing each resource to be monitored and scheduled separately. This allows for more efficient telescope time usage through dynamic resource allocation. In addition, the distributed nature of the swarm allows a large array to be assembled by allowing multiple independent groups to build single elements that can work together. This is the basis for the proposed Long Wavelength Array Swarm which utilizes the existing LWA stations along with "mini-stations" built by multiple universities to synthesize a large, low frequency interferometer with arc second resolution.