

Network Defined Radio Apertures

Current and future radio arrays are moving in the direction of digitising the radio signals soon after detection by an antenna to flexibly filter and process the electromagnetic signals according to the application that is required. In this paper, we will discuss a new software architecture which allows users to flexibly configure phased arrays with large numbers of antennas (>256). This new architecture allows the user to configure the aperture on-the-fly according to the use-case that is required. Moreover, it allows for the possibility of several aperture configurations to be run simultaneously allowing multiple users to use the radio array commensally. The software architecture, primarily developed for the Low-Frequency Aperture Array component of the Square Kilometre Array, allows users to configure the aperture array, calibrate the selected configuration and collect data both in real-time and off-line to continually monitor the status of each antenna in the array. Limited only by the bandwidth of the data network which connects the antennas together, this architecture can be scaled easily to larger numbers of antennas, in phased arrays which could require several use cases to be running simultaneously. This paper focusses on a particular application of the software architecture to the first Aperture Array Verification System (AAVS-1), an SKA prototype with 256 antennas deployed in the Western Australian desert.