Data transport for the SKA

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The Square Kilometre Array (SKA) will be the world's largest and most sensitive radio telescope. It will address fundamental unanswered questions about our Universe including how the first stars and galaxies formed after the big bang, how dark energy is accelerating the expansion of the Universe, the role of magnetism in the cosmos, the nature of gravity, and the search for life beyond Earth. In this paper we discuss the data transport challenge posed by this transformational instrument.

The astronomical data network is itself split into 3 sub-systems which have very different requirements:

a. The Digital Data Backhaul (DDBH) network transports signals from the receptors to the Central Signal Processor (CSP). The key issues here are that hundreds of end-points for the network must be accommodated and that the telescope configuration calls for very different distribution distances, requiring different technical solutions.

b. The CSP network transports data products from the CSP to the Science Data Processor (SDP). The data rate out of the CSP is comparable to that going into it and now the data must be transported ~900km out of the desert to a high performance computer.

c. The SDP network distributes data from the SDP to the regional SKA Data Centres. The data rate out of SDP is much reduced, but still substantial. However, there is now a requirement that this data now be distributed over inter-continental distances for use by astronomers.

In addition, this data transport network must be implemented in both South Africa and Australia and must address the different data rates, different number of receptors and different data products from the components of the overall SKA located at these two sites.