The separation of collected data, from the geometry of instrument setup has proven to be a core strength in the Mantid Framework, a data reduction application used extensively at time-of-flight neutron sources around the world. Converting units, performing calibration and numerous other post-acquisition activities, are made possible though the virtual instrument concepts that Mantid supports.

While the concept has been very successful, continual advancement in the complexity of experiments, as well in increases flux and pixilation of modern beam lines, provides large challenges for future design. Recent profiling work reveals that the current virtual instrument is far from optimal in many of the common situations in which we now use it. Since, The European Spallation Source have selected Mantid to be their platform of choice for data reduction, there is extra incentive to make the framework increasingly capable of handling tomorrows neutron scattering beamlines.

The Mantid team is currently in the process ratifying a novel and fundamentally different design for the virtual instrument. We explore the requirements that have led us towards this new solution, as well as providing a detailed look at the solution itself. Replacement of the existing instrument with the new version will represent a major engineering challenge; we will present our plans for tackling this difficult upgrade task.