abstract We present deep near-infrared images, taken with Subaru Telescope, of the region around the $z = 1.08$ radio source 3C 356 which show it to be associated with a poor cluster of galaxies. We discuss evidence that this cluster comprises two subclusters traced by the two galaxies previously proposed as identifications for 3C 356, which both seem to harbour AGN, and which have the disturbed morphologies expected if they underwent an interpenetrating collision at the time the radio jets were triggered. We explain the high luminosity and temperature of the diffuse X-ray emission from this system as the result of shock-heating of intracluster gas by the merger of two galaxy groups. Taken together with the results on other well-studied powerful radio sources, we suggest that the key ingredient for triggering a powerful radio source, at least at epochs corresponding to $z \sim 1$, is a galaxy–galaxy interaction which can be orchestrated by the merger of their parent subclusters. This provides an explanation for the rapid decline in the number density of powerful radio sources since $z \sim 1$. We argue that attempts to use distant radio-selected clusters to trace the formation and evolution of the general cluster population must address ways in which X-ray properties can be influenced by the radio source, both directly, by mechanisms such as inverse-Compton scattering, and indirectly, by the fact that the radio source may be preferentially triggered at a specific time during the formation of the cluster.