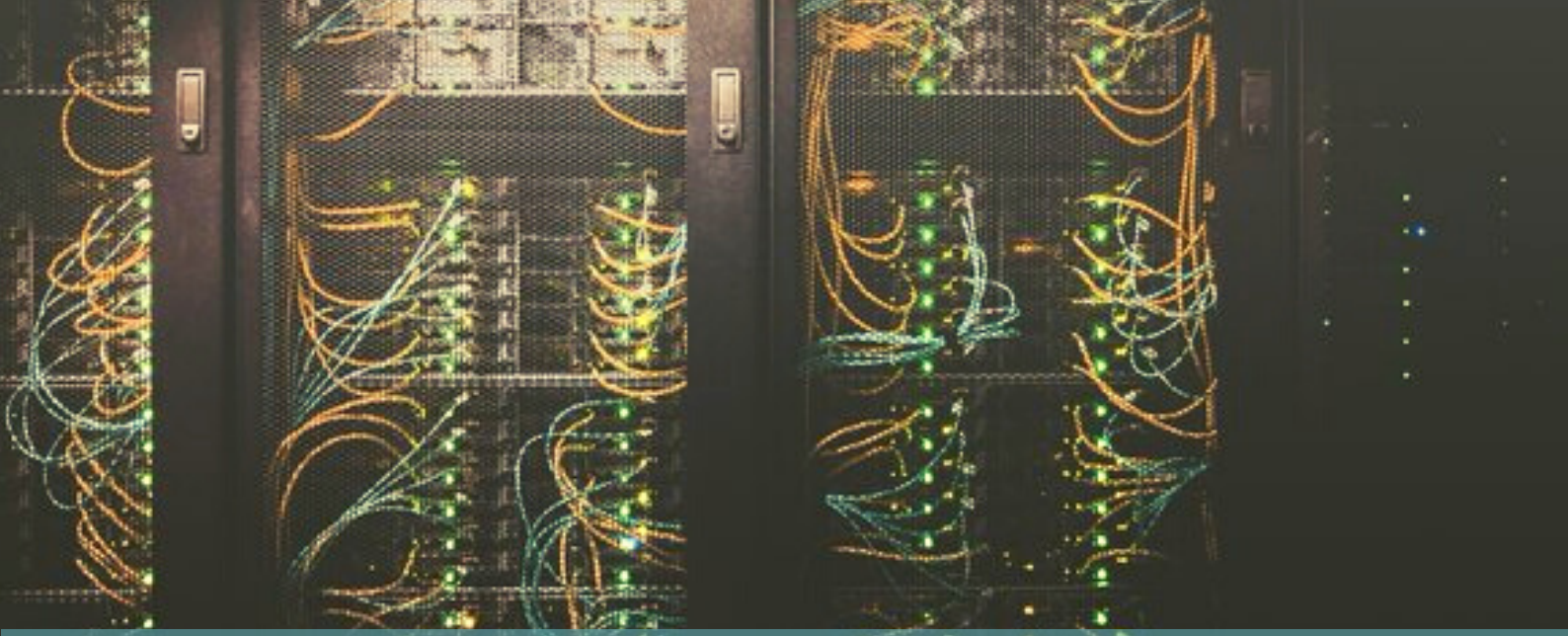

Research in Action: Investigating air flows around critical infrastructure

We depend on information communications networks more than ever before.

This is a truly global infrastructure, comprising of data centres and telecommunications technologies that host and provide access to the internet, cloud storage, and computing from anywhere in the world. These technologies produce a lot of heat and must be kept cool to prevent critical thermal failures. Cooling alone can account for up to half of the total energy use, and this is most often achieved by blowing air over the electronic devices.

As populations grow and countries develop, more data centres and technologies are required, sometimes in harsher operating environments blighted by poor quality air. Where air, both indoor and outdoor, contains higher levels of particle pollutants (PM2.5 and PM10) there is an accompanying risk. The risk of poor-quality air to human health is significant, but it can also lead to premature mechanical, thermal, and chemical corrosion failures when pollutants stick to the surfaces of electronics.

Researchers at the IGI-IAS are working to develop interdisciplinary solutions to reduce this risk. By employing advanced flow diagnostics and numerical modelling techniques, they are studying and predicting how these harmful microscale particles are transported in air flows. These allow us to reveal the pathways they take, and importantly, where they end up.

Working together with Nokia Bell Labs, the team have identified the physical mechanisms that accelerate the deposition of pollutants onto the surfaces of sensitive electronic devices installed in poor air quality environments. From there, they developed aerodynamic solutions that control the flow of these pollutants, reducing their interaction with sensitive electronic devices and doing so with a substantially lower energy penalty compared to contemporary filtering.

Now the team is looking to extend multiphase flow approaches to investigating complex source-exposure pathways into other areas, including urban road transport. This can inform solutions that reduce the impact of particle pollution on human and environmental health.

"The involvement with the Clean Air Theme has opened up many opportunities for cross-disciplinary discussions and ideas. This has strengthened existing research activities while also providing new avenues where my research can be applied to critical clean air problems."

Dr Jason Stafford