One day in 2013, shortly after dawn broke over the Russian city of Chelyabinsk, a violent explosion in the air above the town caused a flash as bright as the sun, a shockwave that injured more than a thousand people and extensive damage to property. A single large meteoroid had entered the Earth’s atmosphere, where it exploded with a force of around 30 times that of the Hiroshima bomb.

Protecting against such hazards begins with monitoring them to calculate their precise orbits; this requires fast, reliable internet connections – such as that provided by the Central Asia Research and Education Network (CAREN) – so the huge volumes of observation data can be sent speedily and reliably to scientists around the world for analysis.

**Understanding the threat**

The Chelyabinsk meteoroid was one of around 14,000 known ‘near-Earth asteroids’, of which some 1,700 are classified as ‘potentially hazardous asteroids’ (PHA). In other words, objects that represent a real danger to the entire biosphere and all human activity. This meteoroid’s diameter was 17 metres; we know of at least one PHA – called Adonis – due to make a close approach to Earth in 2029 that is about twenty times bigger.

Powerful telescopes operated by the Institute of Astrophysics of the Academy of Sciences of the Republic of Tajikistan help us understand the threat in detail. To minimise the effects of light pollution, the telescopes need to be sited well away from population centres; they are located in Tajikistan’s mountainous regions – one in Gissar, and one in Sanglokh, near Danghara. However, the necessary remoteness of these locations creates a problem: transferring the huge volume of observation data generated by the telescopes to the Institute's facility in Dushanbe, where researchers are engaged on an international programme to identify PHAs whose trajectories threaten us.

**The challenge:** to contribute to the worldwide efforts to track and understand the potentially catastrophic threat to the planet of hazardous asteroids.

**The solution:** to provide access for research institutes across the world to the data collected by telescopes in Tajikistan, using the CAREN, GÉANT and Internet2 networks.

**Key benefits:** data from the Tajik observatories adds to information processed and held by the International Astronomical Union’s Minor Planet Centre in the USA – the worldwide focus for monitoring the threat from 1,700 potentially hazardous asteroids.

**Fast connections, speedy response**

At present the telescope data is transferred manually on disks and USB sticks to the Institute, recently connected via fibre optics to TARENA, the Tajik national research and education network. TARENA, in turn, is connected at gigabit speed to the...
For many centuries, the Silk Road was the long-distance route through which Asia and Europe traded and communicated. Today, CAREN is upgrading this ancient trade route to a high-speed internet highway, connecting researchers and educationalists throughout the region. Launched in 2009, CAREN – now in its third phase – currently interconnects R&E communities in Kyrgyzstan and Tajikistan, with plans to re-connect Kazakhstan and Turkmenistan. Uzbekistan is a candidate for future inclusion. Links to other continental networks, such as GÉANT, give CAREN worldwide reach, allowing seamless co-operation between scientists, academics and students in Central Asia and the rest of the world.

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For more information:
CAREN: https://caren.geant.org
GÉANT: www.geant.org
TAREN A: www.tarena.tj
Internet2: www.internet2.edu
EU: https://ec.europa.eu/europeaid

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