

## Case Study:

# How Sky High Standards for Networking Enable Cutting-Edge Research

## Challenge

**Mapping the origins of the universe** is a monumental task that involves vast amounts of data and the combined work of scientists and robust computers. Gathering this data requires powerful networking technologies.

In collaborative research to study changes in cosmic microwave background (CMB) radiation in the atmosphere, Jet Propulsion Laboratories and Caltech One incorporates a Niagara Networks packet broker as a key element in aggregating data from different sources.

Scientists are utilizing an array of 20,000 detectors to capture analog CMB images and send them to graphical processing units to render digital images and derive useful information. One challenge was to reliably and efficiently route packets from the detectors to the processing server.

Preventing loss of any packets and the data they provide is paramount. “Every packet is essential,” says Lorenzo Minutolo, a scientist on the project. “If we lose a single packet, we need to start collecting them all over again.”

Scale was another critical factor in selecting a packet broker. Detectors continue to evolve and links connecting to them are of varying capacities, so the packet broker must easily facilitate this and incorporate a heterogeneous mix of different speeds.

Caltech is a world-renowned science and engineering institute that marshals some of the world's brightest minds and most innovative tools to address fundamental scientific questions and pressing societal challenges.

The Institute manages JPL for NASA, sending probes to explore the planets of our solar system and quantify changes on our home planet. Caltech also owns and operates large-scale research facilities such as the Seismological Laboratory and a global network of astronomical observatories, including the Palomar and W. M. Keck Observatories; and cofounded and co-manages LIGO.

Caltech is an independent, privately supported institution with a 124-acre campus located in Pasadena, California

Caltech One selected a packet broker from Niagara Networks. Making the choice was straightforward, as Niagara Networks offered a significant advantage with all the vital factors.

“We tested a lot of solutions before coming to Niagara, but most of them dropped packets over time,” recounts Minutolo. “We needed an absolutely perfect packet collection system – not just fault-tolerant, but fault-free – and Niagara provided that.”



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Caltech

## Solution

**Easy, Unlimited Provisioning** Using an intuitive, Graphical User Interface, the Niagara Networks packet broker enables instant “mixing and matching” of input and output ports and provides full control and functionality.

“The Niagara solution was instrumental to my research by enabling flexible data rates brokerage of the collected traffic and ease of use that simplified my production environment.” says Minutolo.

Currently, the system is undergoing lab testing at Caltech, but it is slated for deployment at the South Pole in October 2020. The atmosphere at the South Pole is ideal for capturing polarization information, and Minutolo will be part of a team spending six months at the Pole to make the system operational.

As the scientific work progresses, network changes and challenges will continue to mount. Having a Niagara Networks packet broker provides the flexibility and management to accommodate new demands and variations with ease.

According to Minutolo, “Niagara allows me to scale my project. It allows me to scale the number of pixels captured, and the more pixels you have, the better the picture.”

As deployed, the system will feature dozens of detectors, multiple packet brokers, and multiple servers to convert the data to images. Niagara Networks will be involved every step of the way, providing the equipment and expertise to support the crucial movement of data.

## Value Proposition

From higher efficiency in data center networks to the exploring the origins of the universe, Niagara’s packet brokers deliver the reliability and flexibility to keep up data-handling challenges.

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