

# A Test bed for the New Internet

## ✦ The Issue

Like a plant that has outgrown its pot, the Internet has sprouted applications and possibilities far beyond what its creators could have imagined. That's why top researchers and engineers from across the nation are pushing the frontiers of network innovation to envision a future Internet that is more secure, available and manageable. GENI, the Global Environment for Network Innovations, is a National Science Foundation-funded project coordinating this collaborative effort to build a global test bed on which novel concepts, ideas and approaches to designing and implementing the new Internet can be tested at scale.

## ✦ The RENCi Project

RENCi is home to an experimental infrastructure that allows innovative thinkers from across North Carolina to imagine and test complex networks, making it a valuable resource for the national GENI endeavor. With funding from the National Science Foundation, RENCi is further developing its cutting-edge network experimentation resources to serve as a test bed environment for GENI and other ambitious network research projects.

One of RENCi's unique resources for advanced network research is BEN—the Breakable Experimental Network. Just as an electrician turns off the power before trying a new wiring configuration, BEN allows researchers to experiment with new networks without the risk of damaging or disrupting production systems. This custom-built infrastructure is “breakable” because it doesn't demand the 24-hour reliability of a commercial network and can therefore be taken out of commission if required by an experiment. It's experimental because it's “dark fiber”—an environment removed from the demands of a production network and partitioned off so one experiment won't interfere with another. It is equipped with state-of-the-art systems to give researchers access to a modern advanced network infrastructure.

To manage experiments on the BEN infrastructure, researchers from RENCi and Duke University are deploying the Open Resource Control Architecture (ORCA), software developed by Duke University professor Jeff Chase. ORCA is a control framework that makes advanced networking research possible by securely and efficiently managing heterogeneous distributed resources without imposing any particular structure on users, making the network experimentation resources more accessible to researchers and giving them greater flexibility.

## ✦ The Expertise

In addition to the distinctive infrastructure it offers through ORCA/BEN, RENCi also serves as a hub of top intellectual resources—statewide researchers from academia and industry working together to advance networking research. RENCi nodes at three North Carolina institutions are connected by high-speed networking, enabling researchers and engineers from across the state to tap into RENCi's experimental network and collaborate seamlessly as a large, distributed virtual organization.

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## ✦ The Partners

**Duke University**  
**Infinera**

## ✦ The Impact

Currently in the prototyping and design phase, this GENI is still in the bottle. But the ambitious, national-scale virtual GENI laboratory is expected to ultimately lead to networks vastly surpassing today's capabilities. A fundamentally multidisciplinary effort, GENI challenges collaborators to understand networks broadly and at multiple layers of abstraction—with the ultimate goal of developing new knowledge and connectivity with potentially huge social and economic impact.

RENCi is well-positioned to make major contributions to GENI through its research infrastructure and statewide virtual organization. Collaborations among RENCi experts and institutional partners are enabling large-scale experiments tackling the challenges of distributed systems, storage systems and performance bottlenecks to advance innovative solutions and expand opportunities for future networks.