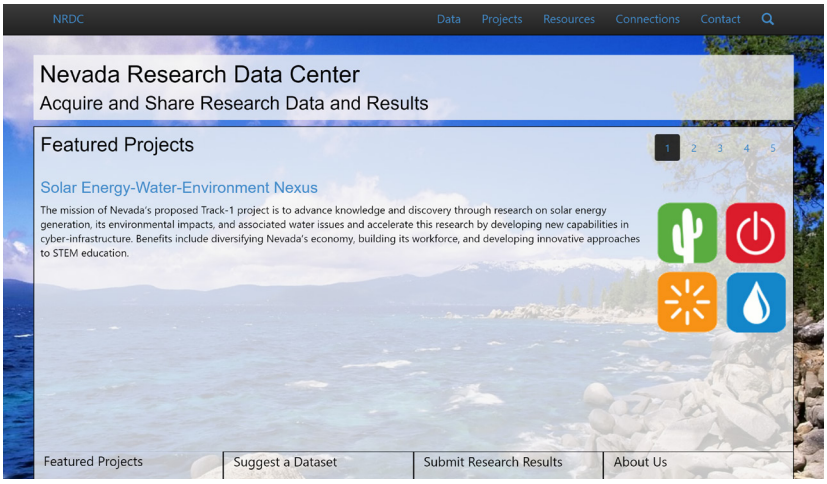
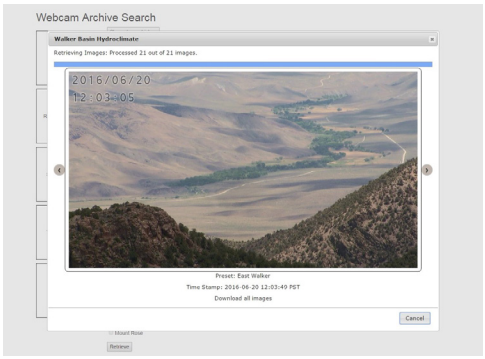
Solar Energy | Water | Environment
Nexus IN NEVADA

Innovative research to achieve water efficient and environmentally friendly solar power

SOLAR ENERGY-WATER-ENVIRONMENT NEXUS PROJECT





The Nevada Research Data Center (NRDC)

Introduction and goal

The primary goal of building a statewide data center is to provide advanced services for modern scientific data-driven endeavors. End-to-end management for a wide variety of streaming, dynamic, and high-volume data from sensor systems is generally lacking in Nevada. The Nexus cyberinfrastructure (CI) team is creating an end-to-end system for data collection, transfer, storage, and processing that supports data-intensive research projects. The centerpiece of the Nexus CI, NRDC – with facilities at both UNR and UNLV – will provide modern computing resources for acquiring and sharing research data and results as well as disseminating educational material generated in the Nexus project and beyond.

Where does this research fit within the NEXUS project?

NRDC supports the Nexus objective 5 of Goal 1 of developing new and leveraging existing cyberinfrastructure capabilities to accelerate Nexus research by: (i) making CI resources more accessible to Nevada scientists, educators, and students; (ii) providing digital network connectivity to remote study areas; (iii) acquiring camera imagery from remote research sites; (iv) storing, managing, and providing access to a variety of Nexus research data and results; and (v) unifying emerging CI across Nevada institutions to support diverse Nexus research and education goals.

Why is this research important and what knowledge gap does it fill?

CI integration with non-computer sciences is still an exploratory field. NRDC's capabilities have been designed to fill such integration gaps in Nevada and provide useful services for sciences and engineering. NRDC's model is constantly refined to fulfil its dual role of integrating new research in computer science and engineering (e.g., on data processing and computer networks) as well as of enabling scientific work in Nexus-related fields.

What is the originality of the approach?

Because truly integrative CI is still lacking in interdisciplinary research, NRDC's approach to building a scalable and adaptive end-to-end system to be used in a variety of disciplines is novel. We are building our blueprint for NRDC by responding to high-priority research needs starting with data acquisition and ending with data processing and information dissemination. Continuity, data integrity, and research efficiency are the primary results that NRDC is looking for when integrating new research-intensive projects.

How is the new NEXUS equipment being used now and in the future?

NRDC systems are being used to: (i) stream live data from research sites; (ii) store data in separate project databases; (iii) provide data curation and dissemination using query and flat-file services; (iv) run various software services and computing tools. Future services include: (i) automated and supervised data QC; (ii) user-managed interfaces with metadata generation; (iii) processing of specialized data products; and (iv) additional computing capabilities and software tools.

Key results to date

Major results pertaining to NRDC include: (i) creation of a robust, expandable architecture that ensures reliable live data acquisition from multiple research sites; (ii) construction of a modern computing cluster, with 11 compute nodes and 92 CPU cores; (iii) storage and management of over 2.4 billion data measurements; (iv) dedicated web sites for Nexus research and education project components; (v) besides Nexus, support for other four data-intensive projects; (vi) a constant increase in NRDC's number of users (about 2,300 in 2014, 2,800 in 2015, and circa 5,400 projected in 2016); (vii) integration as level 1 member node with DataONE; and (viii) over 12 peer-reviewed publications so far based on NRDC data and other resources.

How is the research and/or equipment fostering collaboration now, and in the future?

NRDC allows collaboration through uniform data sharing services, as well as by providing a computing environment that can be used jointly by scientists, educators, and students. Future collaboration will be enhanced by user-based data management services, and the expanded use of the NRDC in other research areas.

Future plans

NRDC's future plans include: (i) finalization of a new, scalable multi-project database and associated micro-services based architecture; (ii) identification of long-term staffing and physical infrastructure needs, together with related mechanisms for sustainability; (iii) maintenance and support of currently integrated research projects; (iv) integration of NRDC facilities into formalized campus and NSHE CI plans; (v) expansion to include new data-intensive projects, for example emerging "Internet of Things"-based scientific projects; (vii) creation of new software services and tools; and (viii) extension of collaboration with high-level data-focused associations and working groups (e.g., DataONE, CUAHSI).

Contact us

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