



A collaboration of **The University of California at Santa Barbara,**  
**The University of Southern California** and  
**Brigham Young University**

**nees@UCSB**

The George E. Brown, Jr. Network for Earthquake Engineering Simulation

## **Facilities, Systems and Software**

Utilizing NEES@UCSB for Research

### **NEES@UCSB**

A Collaboration of

Brigham Young University

The University of California at Santa Barbara

The University of Southern California

Revision 1.0

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## **Overview**

NEES@UCSB consists of two permanently instrumented field laboratories as well as the sensors, digitizers and software that provide data acquisition at the site.

## **Facilities**

NEES@UCSB along with the distributed computing resources of NEES, provides state-of-the-art facilities for earthquake engineering research. Our two field sites, with their unique characteristics, our real-time data collection services, and computer systems and software all provide a laboratory for experimentation and analysis.

### **Garner Valley Array and SFSI Structure**

Less than twenty kilometers from the San Andreas Fault, in a very active seismic zone, is the Garner Valley. The site has been thoroughly characterized and instrumented, with records going back over ten years. The valley is a bowl shaped bedrock basin filled with low density alluvium soils transitioning to decomposed granite and a high water table. In wetter years, the water table can be just a meter below the surface, while in other years it is up to three meters.

Built on this liquefiable soil is the Soil Foundation Structure Interaction Testbed, a fully instrumented structure designed by its weight and area to exhibit SFSI effects during strong motion.

### **Wildlife Liquefaction Array**

Near the Salton Sea, in California's Imperial Valley, and within the Salton Sea National Wildlife Refuge, is the Liquefaction Array of pore pressure transducers and accelerometers. Additionally, there are prepared locations on a slope where inclinometers can be installed.

## **Computer Systems and Software**

Access to NEES@UCSB computing resources is possible through the secure shell protocol (SSH). On Windows systems, SSH is available through the freeware "PuTTY" program or in the command shell of the freeware Cygwin. Commercial versions are also available. On Unix/Linux systems, it is available in the command shell.

Installed on these systems are data collection and analysis software. It is possible to see real-time streams of accelerometer readings, browse collected waveforms for approximately the last three months and manipulate wave form data using a variety of tools. Manuals and documentation for these tools is provided elsewhere. This guide is provided to familiarize you with the names and locations of NEES@UCSB systems.

In order to access any systems, you will need to establish a user account with the Institute for Crustal Studies. In the process you will become familiar with the University's and departments computer usage policies, particularly those pertaining to computer security. Although you will receive a personal login, you will want to use the special account "rt" to run software. The "Runtime" user, rt, has an environment configured to run the data collection and other software.

The computer systems are often referred to by colloquial names, in part because most systems have two interfaces. One interface is accessible from the whole Internet and the other is only accessible from within the Virtual Private Network (VPN) that the data collection software

operates over. The following table lists the familiar names of the systems, which you will often hear staff use, as well as the actual public and private network hostnames you must use to access them.

<b>Familiar Name</b>	<b>Public Hostname</b>	<b>VPN Hostname</b>
rattle	rattle.crustal.ucsb.edu	n/a
neespop	nees.ucsb.edu	icspop
tpm	tpm.nees.ucsb.edu	icstpm
stirred	stirred.nees.ucsb.edu	icsstir
shaken	stirred	gvastir
rolled	rolled	gvaroll
cube		wlacube

<b>Familiar Name</b>	<b>Description</b>
rattle	
neespop	Linux, runs the NEES collaborative software.
tpm	Linux, runs the Telepresence server software.
stirred	Solaris, runs data collection software and waveform database at the UCSB campus.
shaken	Solaris, runs data collection software at the Garner Valley Array.
rolled	Linux, backup for data collection as well as a workstation at Garner Valley.
cube	Runs data collection software at Wildlife Liquefaction Array.

It is possible to log into the public interface and have full access to all the systems on the VPN.

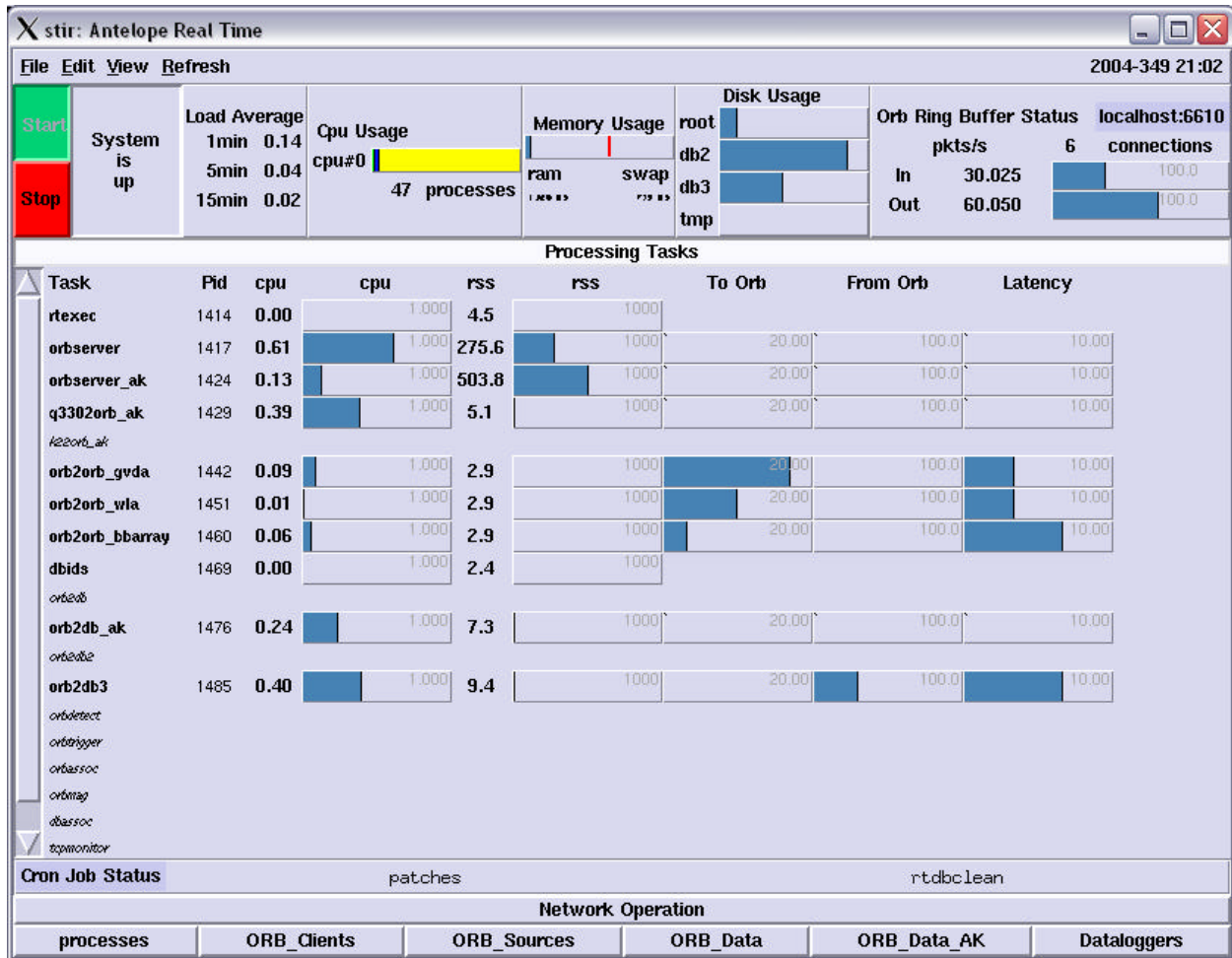
For example:

```
# ssh rt@stirred.nees.ucsb.edu
stirred.nees.ucsb.edu Login:rt
Password:
Last login: Mon Dec 13 05:00:26 2004 from ip68-6-49-52.sb
[rt@stirred 2004/12/14 20:56 /home/rt]
>
```

Notice the two line prompt which contains the user, date and current directory. If you wanted to see the status of the Antelope data collection software, you could:

```
[rt@stirred 2004/12/14 20:56 /home/rt]
> cd rtsystem4.6
[rt@stirred 2004/12/14 20:56 /home/rt/rtsystem4.6]
> rtm &
```

You might see a window like this:



Details on this software are provided elsewhere, under Major Equipment.

## Data Acquisition

Data acquisition is accomplished through the Antelope Runtime System and the Digitex collection software. Details and manuals for both of these are provided elsewhere.

## Accelerometers, Seismometers, Piezometers

Complete specifications for the instruments are provided. In general, broad band accelerometers, at least one seismometer (to measure displacement) and many piezometers are placed at strategic depths in the array.

The SFSI structure is instrumented with very high gain accelerometers.

## Antelope DAQ Software

The Antelope Runtime System for seismic monitoring arrays is the main acquisition software.

The software is produced by Boulder Real-time Technologies. Complete references are available and our specific configurations are provided elsewhere.

### **Digitexx SFSI DAQ Software**

Data acquisition on the SFSI structure is accomplished through a custom Digitexx software that is adapted to work with Antelope. This way all data is archived to one format with the same time sequence.

### **Data Analysis**

Antelope contains many excellent analysis tools. The PASSCAL library from ANSS as well as the commercial product Matlab is available.