NSF Large Facilities Cyberinfrastructure Workshop

Oregon State University College of Earth, Ocean, and Atmospheric Sciences:

Regional Class Research Vessel Project, http://ceoas.oregonstate.edu/ships/rcrv/

Science Mission: The coastal ocean encompasses the most complex range of oceanic phenomena on the globe. Coastal regions are sensitive to human alteration from water and air pollution, resource extraction, transportation, and recreational activities. Wind- and freshwater-driven coastal ocean flows directly affect regional climate. As conveyors for heat and salt and regions of strong vertical mixing, boundary currents play an outsized role in the large-scale ocean circulation. Vigorous interactions between the coastal ocean and the atmosphere control many biogeochemical processes (e.g., the exchange of macronutrients and micronutrients between the land, ocean, and continental margin sediments).

The coastal oceans are extremely productive, accounting for a large percentage of the world's wild seafood and most of the aquaculture. They are the dominant sites for burial of organic matter, important in net marine uptake of atmospheric CO_2, and locations of major hydrocarbon resources, including oil, gas, and methane gas hydrate. The coastal oceans can be sites of wind and wave energy extraction, play host to the deposition of river sediments, including dredge spoils, and are sites of tectonic activity, including hazardous earthquakes and tsunamis. To better understand such coastal phenomena and their importance in the Earth system, ocean scientists and educators must accelerate exploration and sustained regional observations of marine physical, chemical, biological, and geological processes.

Even with the development of new platforms to study the ocean—such as cabled observatories and underwater robots— coverage is scant, and ships are more vital than ever for multi-disciplinary observations and sampling of the ocean. The RCRVs will feature advanced sensors and sampling systems, and through telepresence capabilities and satellite communications, will bring science at sea to classrooms, the public, and researchers ashore. Oregon State is proud to be leading the charge in developing next-generation vessels that promise state-of-the-art platforms for the nation's scientists and students to explore our ocean planet

Facility size & composition during construction: Core team - OSU = 15 (members), Engineering & Design Support - The Glosten Associates = 4, Science Oversight Committee = 11

Facility size & composition when operational: OSU Class Management Office = 4, OSU Ship Operations = 15, Institution Two = approx. 15, Institution Three = approx. 15.

Key Products and Services: Oceanographic research ships, and the Regional Class Research Vessels specifically, are the primary platform from which ocean science is conducted. A research vessel must function as observatory, lab, and accommodation. Therefore the facility must provision cyberinfrastructure for the research enterprise, for vessel operations and for quality of life. In addition to these core services the RCRV facility shall also provide a system

for real-time bi-directional transfer of data and information between shipboard and shoreside parties.

To support these requirements we've developed a system for sensor data transmission, capture, archive, replication, and use. The system incorporates a variety of open-source and commercial products including, Enterprise DB Postgres Advanced Server, Apache, Django, Highcharts, Tableau, Mapserver, Leaflet, and ERDDAP.

Facility Cyberinfrastructure: The figure below describes the basic architecture, components, and services of the RCRV Datapresence System. The system is currently under development and testing and has been deployed successfully during prototype cruises.