

Taming Lambda's for Applications: The OptIPuter System Software

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Dense wavelength-division multiplexing (DWDM), dark fiber, and low-cost optical switches provide the technological capability for private, high bandwidth communication in shared distributed computing environments. These emerging environments are often called lambda grids. However, at present, knowledge and control cutting across many traditional systems and network abstractions are needed for applications to benefit from these dynamic optical connections. This hurdle is dauntingly complex and error prone, and too great to surmount for most applications.

We are developing application abstractions called Distributed Virtual Computers (DVC), which simplify application use of dynamic optical resources. DVC descriptions naturally express communication and computation resource requirements, enabling coordinated resource binding. In addition, DVCs provide shared namespace provides a natural vehicle for incorporating a range of novel capabilities, including novel transport protocols which expose and exploit the capabilities DWDM environment, including efficient multi-point to point (GTP), optical multicast, real-time communication, and fast point to point transports. DVCs also provide a convenient model for integrating a wide array of network-attached instruments and storage.

We will describe initial experience with DVCs and how they provide an integrating architecture for lambda grids.

The OptIPuter project is a large multi-institutional project led by Larry Smarr at the University of California, San Diego (UCSD) and Tom DeFanti at the University of Illinois at Chicago (UIC). Other software efforts include optical signaling software, visualization, distributed configuration management, and two driving applications involving petabytes of data (in conjunction with the Biomedical Informatics Research Network and the Scripps Institute of Oceanography). We are also constructing a high-speed OptIPuter testbed. www.optiputer.net

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